eem
1973-74

VOLUME
1

TEST
INSTRUMENTS

EQUIPMENT
AND
SYSTEMS

UNITED TECHNICAL PUBLICATIONS

eem 1973-74

ELECTRONIC ENGINEERS MASTER

Volume 1

Test Instruments
Equipment and Systems

HOW TO USE eem

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Need directory information?

EEM contains four complete directories which provide the most up-to-date information available. These directories are listed and described at the right. They appear in all three volumes, with the exception of the Trade Mark Directory which appears only in Volume 1. Directory references to Volume 4 indicate the 1973 edition, which you received in January. That copy of Volume 4 should be retained to complete the 4-volume set.

Add Volume 4/1973 to your copies of Volumes 1, 2 and 3 to make a complete set of EEM for 1973-74.

UNITED TECHNICAL PUBLICATIONS

Included in this volume are:

The Product Index and Directory

The Product Index and Directory (green section, page 9) lists more than 6,000 types of electronic products alphabetically, by product. Under each product heading is a complete, alphabetical listing of manufacturers who make that product. **Bold face** listings indicate which manufacturers have provided catalog data on that product in the white pages.

The Manufacturers and Sales Office Directory

The Manufacturers and Sales Office Directory (starts yellow section of each volume) lists more than 3,000 manufacturers of electronic components, materials, instruments, assemblies, systems, and key services. Provided are complete addresses, phone numbers, sales managers' names, names of application engineers, TWX numbers where applicable, selected distributors. **Bold face** listings indicate that manufacturers have provided catalog data in the white pages and that sales offices are listed.

The Distributor Directory

The Distributor Directory (yellow section, page 1594, with black edge marking) lists more than 1,000 electronic distributors and branch locations, alphabetically by distributor's name, geographically by state and city.

Need catalog information?

For complete catalog information on any product, refer to the Product Index and Directory (green section, page 9, all volumes) which provides a complete listing of all the manufacturers who supply a particular product. Those manufacturers listed in bold face with page and volume number references have provided catalog data on this product in the catalog section (white pages) where you can find the information you need. References to Volume 4 indicate the Volume 4 you received in January and which should be retained to complete your 4-volume set of EEM.

Need additional information in a hurry?

Two special telephone services are being maintained for EEM users to provide extra information you need. If you need to determine a local source of supply, just **D.I.A.L. EEM.** This toll-free service (**D**istributor **I**nformation **A**nd **L**istings), provides you with the name of a sales office or distributor in your area who can provide a needed product.
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Need additional assistance?

Contact the EEM editorial staff, at United Technical Publications, Inc., 645 Stewart Avenue, Garden City, N. Y. 11530, or phone (516) 248-9700.

introduction

The 1973-74 edition of EEM, Volumes 1, 2 and 3, is designed to integrate with Volume 4/'73, published in January 1973. The complete 4-volume set is the largest, most comprehensive edition of EEM ever published, providing catalog data in four separate volumes, all fully cross-referenced:

Volume 1 — Test Instruments / Equipment and Systems

Volume 2 — Active Components / Circuit Assemblies Controls and Drives / Filters

Volume 3 — Passive Components / Materials / Hardware

Volume 4 (1973) — All product categories included in Volumes 1, 2, and 3

The 53 EEM product sections have been individually assigned to their appropriate volume. Product categories within each volume are listed on the cover. A complete listing of the 53 Product Sections appears on page 3 and on the second page of the catalog section in each volume. This listing indicates in which volumes, and on which pages, specific products can be located.

The eem System

United Technical Publications' Time-Saving Product Information System

Designed to provide a complete answer to your need for electronic product information:

- **eem / Electronic Engineers Master**
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- **D.I.A.L. eem Toll-Free Phone Service**
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- **IC Update Hotline**
  Toll-free phone service to provide daily updating of IC functions available from each manufacturer.
- **Semiannual Product Postcard Mailers**
  Providing additional and updated product data between editions of EEM.
- **Electronic Distributors Master Catalog Program**
  Comprehensive quarterly catalog program for distributors.

Prices

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Vol.2 ACTIVE COMPONENTS CIRCUIT ASSEMBLIES / FILTERS CONTROLS & DRIVES

Vol.3 PASSIVE COMPONENTS MATERIALS / HARDWARE

Vol.4 COMBINES PRODUCT CATEGORIES INCLUDED IN VOLS. 1, 2, AND 3

eem — Electronic Engineers Master saves you engineering, specifying and purchasing time. Manufacturers' catalogs are grouped under easy-to-remember headings.

The 53 Product Sections categorize related electronic components, equipment, materials, instruments and systems, and fabrication services, enabling you to quickly compare and evaluate similar items.

To find a specific manufacturer's catalog pages refer to the Index of Manufacturers which appears in two places in this volume, at the beginning of the green section and at the beginning of the white section.

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1600	Vol.3•518	Vol.4•324	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
1700	Vol.2•323		Circuit Assemblies, Circuit Boards & Breadboarding Kits
1800	Vol.3•518		Coils (Inductors, Chokes), Assemblies, Forms
1900	Vol.1•319		Communications Equipment (Facsimile, Telephone, Television)
2000	Vol.1•321	Vol.4•325	Computing, Data Handling Equipment & Accessories
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2400	Vol.2•458	Vol.4•397	Panel Components (Including Lighting & Readouts)
2500	Vol.3•1004	Vol.4•401	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
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3000	Vol.1•536	Vol.4•430	Instruments, Graphic Recording
3100	Vol.3•1074		Insulators, Insulating Materials & Parts
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3450	Vol.2•607	Vol.4•438	Microwave, Laser & Radar (Components/Accessories)
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Product Index and Directory

The Product Index and Directory is designed to help you locate manufacturers of specific types of electronic products. Products are listed alphabetically, with many helpful cross references. This index has been completely revised and updated since the last edition of EEM Many product headings have been changed; many have been added, in an effort to keep the directory current with changing technology. Review it thoroughly for complete information.

Under each product heading there is a complete alphabetical listing of manufacturers who make that product. The first portion of the listing, in **bold face** with volume and page numbers indicated, consist of those manufacturers who have provided catalog data on this specific product in the white pages of EEM. The second part of the listing includes those manufacturers who make this product but have not provided catalog data on it in EEM. **Bold face** names in this portion of the list indicate manufacturers who have catalog pages in EEM but which do not include information about this specific product.

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electronic engineers master
1973-74

This directory was completely revised and updated for this edition prior to publication. Thus the information is current as of Spring 1973. This same index appears in all three volumes of EEM.

Abrasive Belts, Compounds, Cords, Powders, etc.

Carborundum Co., Niagara Falls, N.Y.
Communications Technology Corp., Los Angeles, Cal.
Cratex Rubberized Abrasives, Burlingame, Calif.
Engis Corp., Morton Grove, Ill.
Norton Coated Abrasive & Tape Divs., Troy, N.Y.
3M Co., St. Paul, Minn.
Union Carbide, San Diego, Cal.

Absorbers, Shock—See Mounts, Shock & Vibration

Accelerators & Accessories, Particle

High Voltage Engrg. Corp., Burlington, Mass.
Kaman Sciences Corp., Colorado Springs, Colo.
Maxwell Labs., Inc., San Diego, Calif.
Radiation Dynamics, Inc., Westbury, N.Y.
Trio-Tech, Inc. of Calif., Burbank, Calif.
Varian Assocs., Palo Alto, Cal.

Accelerometers

Unholtz-Dickie Corp., Hamden, Conn. **Vol 1•530**
Advanced Dynamic Instrs. Div., Alexandria, Va.
B & K Instrs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp., Davenport, Iowa
Bourns, Inc., Instr. Div., Riverside, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Cole Instrument Corp., Costa Mesa, Cal.
Columbia Resch. Labs., Woodlyn, Pa.
Conrac Corp., Duarte, Cal.
Delco Elctrns. Div., Kokomo, Ind.
Dytronics Co., Columbus, Ohio
Emerson & Cuming, Inc., Canton, Mass.
Endevco, Pasadena, Calif.
Engdahl Enterprises, Costa Mesa, Cal.
General Radio Co., Concord, Mass.
Genisco Technolgy Corp., Instrument Div. (Transducers), Compton, Cal.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
Honeywell, Minneapolis, Minn.
Humphrey, Inc., San Diego, Calif.
Impact-O-Graph Corp., Bedford, Ohio
IMPACT-O-GRAPH Div., Bedford, Ohio
Kaman Sciences Corp., Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Kulite Semiconductor Prod., Ridgefield, N.J.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Metrix Instr. Co., Houston, Tex.
PCB Piezotronics, Inc., Depew, N.Y.
Pickering & Co., Plainview, N.Y.
Poly-Scientific, Blacksburg, Va.
Raymond Engrg. Inc., Middletown, Conn.
Reliance Elec. Co., Cleveland, Ohio
Rohde & Schwarz Sls., Passaic, N.J.
Schaevitz Engrg., Pennsauken, N.J.
Sensotec, Inc., Columbus, Ohio
Shure Bros., Inc., Evanston, Ill.
Singer Co., Little Falls, N.J.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Statham Instrs., Inc., Oxnard, Cal.
Systron-Donner Inertial Division, Concord, Cal.
Teledyne Geotech, Dallas, Tex.
Vibra-Metrics, Inc., E. Haven, Conn.
Vibrac Corp., Chelmsford, Mass.
West Coast Resch. Corp., Los Angeles, Calif.

Acoustic Noise Generators—See Generators, Acoustic, High Intensity Noise

Acoustic Test Chambers—See Chambers, Acoustical Test, High Intensity Noise

Actuators, Servo, Linear

Control Technology Co., L.I.C., N.Y. **Vol 2•987**
TRW/Globe Motors, Dayton, Ohio **Vol 2•667**
American Elctrns., Inc., Fullerton, Cal.
Bafco, Inc., Warminster, Pa.
Bendix Corp., N. Hollywood, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Glentek, Inc., Santa Monica, Calif.
Honeywell, Ft. Washington, Pa.
Ind'l. Control Co., Farmingdale, N.Y.
Jordan Controls, Milwaukee, Wisc.
Lear Siegler, Inc., Santa Monica, Calif.
Lisk, G.W. Co., Clifton Springs, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Magnecraft Elec., Chicago, Ill.
Magnedyne Inc., Carlsbad, Calif.
Magnetic Technology, Canoga Pk., Cal.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Metal Bellows Corp., Sharon, Mass.
MPC Prods. Corp., Chicago, Ill.
Precision Mechanisms Corp., Westbury, N.Y.
Raymond Engrg. Inc., Middletown, Conn.
Servotronics, Inc., Buffalo, N.Y.
Skinner Polynoid Div., New Britain, Conn.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Taylor Instr. Process Control Div., Rochester, N.Y.
Torque Systems, Waltham, Mass.
Transicoil, Inc., Worcester, Pa.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Zonic Tech. Labs., Cincinnati, Ohio

Actuators, Servo, Rotary

Control Technology Co., L.I.C., N.Y. **Vol 2•987**
Aeroflex Labs., Plainview, N.Y.
Allard Instr. Corp., Westbury, NY
American Elctrns., Inc., Fullerton, Cal.
Bafco, Inc., Warminster, Pa.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp., N. Hollywood, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Carco Elctrns., Menlo Park, Calif.
Consolidated Controls Corp., Bethel, Conn.
Gap Instr. Corp., Hauppauge, N.Y.
General Scanning, Watertown, Mass.
Glentek, Inc., Santa Monica, Calif.
Hills-McCanna Co., Carpentersville, Ill.
Honeywell, Ft. Washington, Pa.
IMC Magnetics Corp., Maywood, Cal.
Ind'l. Control Co., Farmingdale, N.Y.
Jordan Controls, Milwaukee, Wisc.
Lear Siegler, Inc., Santa Monica, Calif.
Lisk, G.W. Co., Clifton Springs, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Magnedyne Inc., Carlsbad, Calif.
Magnetic Technology, Canoga Pk., Cal.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Meltronics Inc., Leeds, Ala.
MPC Prods. Corp., Chicago, Ill.
Northern Precision Labs., Inc., Fairfield, N.J.
Precision Mechanisms Corp., Westbury, N.Y.
Sawyer Inds., Arcadia, Cal.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Taylor Instr. Process Control Div., Rochester, N.Y.
Torque Systems, Waltham, Mass.
Transicoil, Inc., Worcester, Pa.
TRW/Globe Motors, Dayton, Ohio
Varo, Inc., Santa Barbara, Cal.
Vernitech, Deer Pk., N.Y.

Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Western Gear Corp., Pasadena, Cal.
Weston Instruments, Inc., Newark, N.J.
Zonic Tech. Labs., Cincinnati, Ohio

Adapters—See Connector Adapters, Plug Adapters; Socket Adapters; Etc.

Adapters, F-M, Recording

Data-Control Systems, Danbury, Conn.
GC Electronics, Rockford, Ill.
Video Research Corp., Gaithersburg, Md.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Adapters, Panoramic—See Receivers, Panoramic

Adapters, Waveguide

Waveline, Inc., W. Caldwell, N.J. Vol 2•629
Aircom, Inc., Union, N.H.
Americon Microwave Inds., Inc., Waltham, Mass.
Arra Inc., Bay Shore, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Norsal Industries, Inc., Brentwood, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Systron-Donner Corp., Concord, Cal.
Systron-Donner Datapulse Div., Culver City, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.

Adhesives (All Types)

Cox & Co., Inc., New York, N.Y. Vol 2•1160
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn. ..... Vol 3•1079
Acme Chemical & Insulation Co., New Haven, Conn.
Adhesive Prods. Corp., Bronx, N.Y.
Allaco Prods Div., Watertown, Mass.
Amicon Corp., Lexington, Mass.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Armstrong Cork Co., Lancaster, Pa.
Armstrong Prods. Co., Warsaw, Ind.
Bacon Inds., Watertown, Mass.
Brady, W.H. Co., Milwaukee, Wisc.
Cadilac Plastics & Chems., Detroit, Mich.
Chomerics, Inc., Woburn, Mass.
Conap, Inc., Allegany, N.Y.
Dolph, John C. Co., Monmouth Junction, N.J.
Dow Corning Corp., Midland, Mich.
Eastman Chem. Prods., Kingsport, Tenn.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Electro Mats. Corp. Amer., Mamaroneck, N.Y.
Electro-Science Labs., Pennsauken, N. J.
Emerson & Cuming, Inc., Canton, Mass.
Epoxy Technology, Watertown, Mass.
Epoxylite Corp., Anaheim, Calif.
Fenwal, Inc., Ashland, Mass.
GAF Corp., New York, N.Y.
GC Electronics, Rockford, Ill.
General Elec., Insulating Matl's., Schenectady, N.Y.
General Elec. Co., Waterford, N.Y.
General Elec. Company, Providence, R.I.
Hardman Inc., Belleville, N.J.
Hightemp Resins, Inc., Stamford, Conn.
Hysol Div., Olean, N.Y.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Loctite Corp., Newington, Conn.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Miller-Stephenson Chem. Co., Inc., Danbury, Conn.
Morgan Adhesives Co., Stow, Ohio
Packaged Resins Div., Watertown, Mass.
Pennsylvania Ind'l. Chem. Corp., Clairton, Pa.
Philadelphia Quartz Co., Phila., Pa.
Randolph Prods. Co., Carlstadt, N.J.
Schjeldahl, G.T. Co., Northfield, Minn.
Sterling, Sewickley, Pa.
SWS Silicones Div., Adrian, Mich.
Tapecon, Inc., Rochester, N.Y.
Tech Spray, Amarillo, Tex.
Techni-Tool, Inc., Philadelphia, Pa.
3M Co., St. Paul, Minn.
Tra-Con, Inc., Medford, Mass.
Uniroyal, Inc., New York, N.Y.
Vigor Co., New York, N.Y.
Wakefield Engrg., Inc., Components Div., Wakefield, Mass.
Waldom Elctrns., Inc., Chicago, Ill.
Whittaker Corp., Los Angeles, Cal.
Wire Cloth Enterprises, Inc., Pittsburgh, Pa.

Air Cleaners & Filters (Shielded & Unshielded)

Evans, George Corp., Moline, Ill. Vol 3•1045
Master Appliance Corp., Racine, Wisc. Vol 3•1241
Agnew-Higgins, Inc., Garden Grove, Calif.
Balston, Inc., Lexington, Mass
Cal-Metex Corp., Inglewood, Cal.
Carey Elctrn. Engrg. Co., Springfield, Ohio
Clean Room Prods., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Hollis Engrg., Inc., Nashua, N.H.
Honeywell, Mpls., Minn.
Johnson Corp., Three Rivers, Mich.
Lisk, G.W. Co., Clifton Springs, N.Y.
McLean Engrg. Labs., Princeton Jctn., N.J.
Metex Corp., Edison, N.J.
Midget Louver Co., Norwalk, Conn.
Pall Corp., Glen Cove, N.Y.
Pall Trinity Micro Corp., Cortland, N.Y.
Research Prods. Corp., Madison, Wisc
Torit Corp., St. Paul, Minn.
Union Carbide, Carbon Prods. Div., New York, N.Y.
Zero Mfg. Co., Burbank, Cal.

Air Conditioners (For Equipment)

Electro Impulse, Inc., Red Bank, N.J. Vol 3•1044
Eastern Industries, Hamden, Conn.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Inc., Fountain Valley, California
Standard Environmental Systems, Inc., Totowa, N.J.

Air Filtering & Ventilating Panels (Shielded & Unshielded)—See Air Cleaners & Filters

Alarms & Alarm Systems

Bird Elctrn., Cleveland, Ohio.... Vol 1•396
GRM Corp., Medford, N.J. ..... Vol 1•319
Harrel, Inc., E. Norwalk, Conn. Vol 2•1163
North Hills Elctrns., Inc., Glen Cove, N.Y. ..... Vol 2•358
Projects Unlimited, Inc., Dayton, Ohio Vol 2•365
Re-el Circuits, Inc., Saddle Brook, N.J. Vol 1•320
Struthers-Dunn, Inc., Pitman, N.J. Vol 2•881
Triac Elctrn. Sys., Forest Hills, N. Y. Vol 2•371
Acromag, Inc., Wixom, Mich.
Allied Elctrns., Chicago, Ill.
Alnor Instr. Co., Chicago, Ill.
American Instr. Co., Silver Spring, Md.
AMF Electical Prods., Alexandria, Va.
Amperex Electronic Corp., Hicksville, N.Y.
Applied Control Co., Fairfield, N.J.
Atlas Sound Div., Parsippany, N.J.
Autocon Inds., Inc., Minneapolis, Minn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autronics Corp., Pasadena, Calif.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., (AISSD), Fullerton, Cal.
Beckman Instrs., Cedar Grove, N.J.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
Bogen Div., Paramus, N.J.
Bramco Controls, Piqua, Ohio
Bristol Div, Waterbury, Conn
Brooks Instr. Div., Hatfield, Pa.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
CGS Units, Inc., Rochester, N.Y.
Chatham Controls Corp., Chatham, N.J.
Cognitronics Corp., Stamford, Conn.
Columbia Resch. Labs., Woodlyn, Pa.
Compuline Corp., Paoli, Pa.
Computer Labs, Greensboro, N.C.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Cordover, Carl & Co., Mineola, N.Y.
Cramer Division, Old Saybrook, Conn.
Datacom, Inc., Ft. Walton Bch., Fla.
Delco Elctrns. Div., Kokomo, Ind.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dukane Corp., St. Charles, Ill.
Eastcraft Security Systems Corp., Melbourne, Fla.
Edison, Instr. Div., W. Orange, N.J.
EG&G, Inc., Bedford, Mass.
El Instruments, Derby, Conn.
Emergency Beacon Corp., New Rochelle, N. Y.
Engdahl Enterprises, Costa Mesa, Cal.
Erdco Engrg. Corp., Addison, Ill.
Esterline Angus Div., Indianapolis, Ind.
Fenwal, Inc., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
GC Electronics, Rockford, Ill.
GTE Lenkurt Inc., San Carlos, Calif.
Guardian California, Culver City, Cal.
Hathaway Instruments, Inc., Denver, Colo.
Heath Co., Benton Harbor, Mich.
Henschel Corp., Amesbury, Mass.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Integrated Systems, Inc., Norcross, Ga.
Int'l. Instrs., Orange, Conn.
ITT Mackay Marine, Elizabeth, N.J.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kidde, Walter & Co., Belleville, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Luft Instrs., Inc., Lincoln, Mass.
Mack Elec. Devices, Wyncote, Pa.
Mag-Con, Inc., New Brighton, Minn.
Melpar, Falls Church, Va.
Metra Instruments, Inc., Mt. View, Cal.
Metrix Instr. Co., Houston, Tex.
Micro Instr. Co., Hawthorne, Cal.
Mobil Elctrns., Inc., Anderson, Ind.
New Era Products, Cleveland, Ohio
Paraplegics Mfg., Bensenville, Ill.
Photobell Co., Inc., New York, N.Y.
Pioneer/Instrumentation, Cleveland, Ohio
Power Conversion Prods. Inc., Crystal Lake, Ill.
PPM, Inc., Bedford, Ohio
RCA Govt. & Comm. Sys., Moorestown, N.J.
Scientific Technology, Mountain View, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Telectro Sys. Corp., Corona, N.Y.
Teledyne Geotech, Dallas, Tex.
Tempo Instrument, Inc., Plainview, N.Y.
Tenney Engrg., Inc., Union, N.J.
Theta Instr. Corp., Fairfield, N.J.
3M Co., St. Paul, Minn.
W.V. Industries Inc., Franklin Lakes, N.J.
Webster Elec. Co., Inc., Racine, Wisc.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Worner Elctrn. Devices, Rankin, Ill.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Alarms, Controls, Photoelectric

Applied Control Co., Fairfield, N.J.
Innovation Industries Inc., Roswell, N.M.
Laser Sys. Corp., Ann Arbor, Mich.
Micro Switch, Freeport, Ill.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Scientific Technology, Mountain View, Cal.
Skan-A-Matic Corp., Elbridge, N. Y.
Spectronics, Inc., Richardson, Tex.
Tri-Tronics Co., Oak Brook, Ill.
Triac Elctrn. Sys., Forest Hills, N. Y.
W.V. Industries Inc., Franklin Lakes, N.J.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Alligator Clips—See Clips, Alligator

Alloys, Brazing

Alpha Metals, Inc., Jersey City, N.J.
Anaconda American Brass Co., Waterbury, Conn.
Anchor Alloys, Inc., Brooklyn, N.Y.
Cerac, Inc., Butler, Wisc.
Chemetron Corp., Chicago, Ill.
Goldsmith Precious Metals Div., Chicago, Ill.
GTE Sylvania, Inc., Towanda, Pa.
Gte Sylvania Inc., Belmont, Cal.
Handy & Harman, New York, N.Y.
Kawecki Berylco Inds., Inc., New York, N.Y.
Westinghouse Elec., Sykesville, Md.

Alloys, Metal - Ceramic

Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y..... Vol 3•1018
Alpha Metals, Inc., Jersey City, N.J.
Anchor Alloys, Inc., Brooklyn, N.Y.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Bram Metallurgical-Chem. Co., Phila., Pa.
Centralab Elctrns Div., Milwaukee, Wisc
Cerac, Inc., Butler, Wisc.
Colt Industries, Elizabethtown, Ky.
Gardiner Solder Co., Chicago, Ill.
GTE Sylvania, Inc., Towanda, Pa.
GTE Sylvania Inc., Newark, N.J.
Gulton Inds., Newport Bch., Cal.
Kawecki Berylco Inds., Inc., New York, N.Y.
Leico Inds., Inc., New York, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
National Beryllia Corp., Haskell, N.J.
NL Inds., Inc., Metal Div., New York, N.Y.
Perfection Mica Co., Bensenville, Ill.
Philips Elmet Corp., Lewiston, Me.
Reynolds Metals Co., Richmond, Va.
Union Carbide, San Diego, Cal.
United Mineral & Chem. Corp., New York, N.Y.

Alloys, Metal-To-Glass Sealing—See Seals, Glass-To-Metal

Alphanumeric Keyboards—See Keyboards, Alphanumeric & Decimal

Alphanumeric Readout Tubes—See Tubes, Readout

Alphanumeric Readouts—See Readouts As Modified

Alternators

Eastern Air Devices, Inc., Dover, N.H. Vol 2•640
Georator Corporation, Manassas, Va. Vol 1•690

Aluminizers, Vacuum—See Deposition Equip.; Evaporation Equip.

Ammeters—See Meters, Ampere

Amplifiers, A-F (Excluding Hi-Fi)

CML-Macarr, Inc., Edison, N.J. Vol 1•644
Crown Int'l., Elkhart, Ind. ..... Vol 1•309
Ithaco, Inc., Ithaca, N.Y. ..... Vol 2•317
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Solitron Devices, San Diego, Cal. Vol 2•943
Solitron Devices, Inc., Riviera Bch., Fla. Vol 2•943
Solitron Devices, Inc., Tappan, N.Y. Vol 2•943
ADC Prods., Minneapolis, Minn.
Advanced Dynamic Instrs. Div., Alexandria, Va.
Allison Labs., Inc., Austin, Tex.
Altec Div., Anaheim, Calif.

American Time Products, Woodside, N.Y.
AMF Electical Prods., Alexandria, Va.
Arvee Engrg. Co., Torrance, Calif.
Arvin Sys., Inc., Dayton, Ohio
B & K Instrs., Inc., Cleveland, Ohio
Barker & Williamson, Inc., Bristol, Pa.
Bay Labs., Inc., Cleveland, Ohio
Beckman Instrs., (AISSD), Fullerton, Cal.
Beckman Instrs., Cedar Grove, N.J.
Bell P/A Prods. Corp., Columbus, Ohio
Biocom, Inc., Culver City, Cal.
Bogen Div., Paramus, N.J.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C-COR Elctrns., State College, Pa.
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communications Equip. Co., Indianapolis, Ind.
Control Technology Co., L.I.C., N.Y.
Davis J.W. & Co., Dallas, Texas
Digitech Data Inds., Inc., Ridgefield, Conn.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dukane Corp., St. Charles, Ill.
Dynaco, Inc., Philadelphia, Pa.
Dynamic Measurements Corp., Winchester, Ma.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Ectron Corp., San Diego, Cal.
Edison Elctrns. Div., Manchester, N.H.
Edo Western Corp., Salt Lake City, Utah
Electro/Data, Inc., Garland, Tex.
Elctrn. Assocs., W. Long Branch, N.J.
Elgar Corp., San Diego, Cal.
Encom Prods. Co., Inc., Oxford, Pa.
Executone, Inc., Long Island City, N.Y.
Fairchild Sound Equip., Commack, N.Y.
Junction Modules, Inc., Irvine, Cal.
General Radio Co., Concord, Mass.
GRM Corp., Medford, N.J.
HGA Elctrns., Mt. Vernon, N.Y.
Holt Instr. Labs., Oconto, Wisc.
Hope Elctrns., Clifton, N.J.
ILC Data Device Corp., Hicksville, N.Y.
Intronics, Inc., Newton, Mass.
ISC/Telephonics Div, Huntington, N.Y.
ITI Electronics, Inc., Clifton, N.J.
Keithley Instrs., Inc., Cleveland, Ohio
Krohn-Hite, Cambridge, Mass.
Lear Siegler, Inc., Santa Monica, Calif.
Lithic Systems, Inc., Cupertino, Cal.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Midwest Audio Corp., Chicago, Ill.
Millen, James Mfg., Malden, Mass.
Mini-Circuits Lab., Brooklyn, N.Y.
Mini-Systems, Inc, North Attleboro, Mass.
Murata Corp. of America, Elmsford, N.Y.
Murata Mfg. Co. Ltd., Kyoto, Japan
Newcomb Audio Prods. Co., Sylmar, Calif.
NH Research, Inc., Santa Ana, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Opamp Labs. Inc., Los Angeles, Cal.
Optimation, Inc., Chatsworth, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
Pulse Techniques, Inc., Teaneck, N.J.
Quan-Tech, Whippany, N.J.
Ratelco, Inc., Seattle, Wash.
RCA Corp., Camden, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Shure Bros., Inc., Evanston, Ill.
Signetics. Corp., Sunnyvale, Calif.
Singer - Tele-Signal, Woodbury, N.Y.
Spectra Sonics, Ogden, Utah
Sprague Elec. Co., No. Adams, Mass.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Telex Comm. Div., Minneapolis, Minn.
Trutone Elctrns., Inc., No. Hollywood, Cal.
Unholtz-Dickie Corp., Hamden, Conn.
University Sound, Anaheim, Cal.
Webster Elec. Co., Inc., Racine, Wisc.

Amplifiers, Antenna

Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
Aertech Inds., Sunnyvale, Calif.
AMF Electical Prods., Alexandria, Va.
Anzac Elctrns., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif.
BF Elctrns., Solana Beach, Calif.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
C-COR Elctrns., State College, Pa.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Comdel, Inc., Beverly, Mass.
Delta-Benco Ltd., Rexdale, Ont., Can.
Electro/Data, Inc., Garland, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Emergency Beacon Corp., New Rochelle, N. Y.
Environmental Communications Inc., Santa Ana, Cal.
Honeywell, Denver, Colo.
Hope Elctrns., Clifton, N.J.
Kaman Sciences Corp., Colorado Springs, Colo.
Lorch Elctrns. Corp., Englewood, N.J.
Millen, James Mfg., Malden, Mass.
Mu-Del Elctrns., Silver Spring, Md.
Radiation Devices Co., Baltimore, Md.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sierra Sys., Mountain View, Cal.
Sitco Antennas, Portland, Ore.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Varian Assocs., Palo Alto, Cal.
Wide Band Engrg. Co., Phoenix, Ariz.

Amplifiers, Charge

Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal. ..... Vol 2•310,311
Ithaco, Inc., Ithaca, N.Y. ..... Vol 2•317
Unholtz-Dickie Corp., Hamden, Conn. Vol 1•530
Advanced Dynamic Instrs. Div., Alexandria, Va.
Bell & Howell Co., Pasadena, Calif.
Columbia Resch. Labs., Woodlyn, Pa.
Dytronics Co., Columbus, Ohio
Ectron Corp., San Diego, Cal.
Endevco, Pasadena, Calif.
Junction Modules, Inc., Irvine, Cal.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Intech, Santa Clara, Cal.
Intronics, Inc., Newton, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Kistler Instr. Co., Redmond, Wash.
Metrix Instr. Co., Houston, Tex.
NH Research, Inc., Santa Ana, Calif.
PCB Piezotronics, Inc., Depew, N.Y.
Perry Amplifier, Brookline, Mass.
PPM, Inc., Bedford, Ohio
SSR Instrs. Co., Santa Monica, Cal.
Teledyne Philbrick, Dedham, Mass.
Vibration Instrs. Co., Anaheim, Cal.

Amplifiers, Compressor

Altec Div., Anaheim, Calif.
BF Elctrns., Solana Beach, Calif.
CBS Laboratories, Stamford, Conn.
Comdel, Inc., Beverly, Mass.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynascan Corp., Chicago, Ill.
Executone, Inc., Long Island City, N.Y.
Fairchild Sound Equip., Commack, N.Y.
General Radio Co., Concord, Mass.
GRM Corp., Medford, N.J.
Intech, Santa Clara, Cal.
Ithaco, Inc., Ithaca, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lithic Systems, Inc., Cupertino, Cal.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Opamp Labs. Inc., Los Angeles, Cal.
Spectra Sonics, Ogden, Utah
Webster Elec. Co., Inc., Racine, Wisc.

Amplifiers, Current

Control Technology Co., L.I.C., N.Y. Vol 2•986
Ithaco, Inc., Ithaca, N.Y. ..... Vol 2•317
Analogic, Wakefield, Mass.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Dynamic Measurements Corp., Winchester, Ma.
Executone, Inc., Long Island City, N.Y.
Junction Modules, Inc., Irvine, Cal.
Ind'l. Test Equip., Clifton, NJ
Intronics, Inc., Newton, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Newport Labs., Inc., Santa Ana, Cal.
Optimation, Inc., Chatsworth, Cal.
Perry Amplifier, Brookline, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Torque Systems, Waltham, Mass.
United Detector Technology Inc., Santa Monica, Cal.
Zeltex, Inc., Concord, Calif.

Amplifiers, D-C

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Ectron Corp., San Diego, Cal... Vol 2•313
Opamp Labs. Inc., Los Angeles, Cal. Vol 2•319
Preston Scientific, Anaheim, Cal. Vol 1•369; Vol 2•320,321
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Torque Systems, Waltham, Mass. Vol 2•322
Acromag, Inc., Wixom, Mich.
ADC Prods., Minneapolis, Minn.
Advance Instr. Corp., Belmar, N. J.
Analogic, Wakefield, Mass.
Arnold Magnetics, Culver City, Cal.
Arvee Engrg. Co., Torrance, Calif.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bay Labs., Inc., Cleveland, Ohio
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bell & Howell, Bridgeport, Conn.
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
Bowmar/ALI, Inc., Acton, Mass.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Chronetics, Inc., Mt. Vernon, N.Y.
Clifton Precision, Clifton Hgts., Pa.
Collins Radio Co., Dallas, Tex.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Cross Electronics Inc., Warrendale, Pa.
Crown Int'l., Elkhart, Ind.
Dana Labs., Inc., Irvine, Calif.
Datum, Inc., Anaheim, Calif.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynamic Measurements Corp., Winchester, Ma.
Electronic Modules, Inc., Pasadena, Cal.
Esterline Angus Div., Indianapolis, Ind.
Fogg System Co., Denver, Col.
Foxboro Co., Foxboro, Mass.
Junction Modules, Inc., Irvine, Cal.
General Computers, Inc., Los Angeles, Calif.
General Devices, Inc., Princeton, N.J.
General Magnetics, Bloomfield, N.J.
Glentek, Inc., Santa Monica, Calif.
Gould, Inc., Cleveland, Ohio
GPS Corp., Framingham, Mass.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Honeywell, Ft. Washington, Pa.
Honeywell, Denver, Colo.
Hybrid Sys. Corp., Burlington, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Ind'l. Test Equip., Clifton, NJ
Inservco, Inc., La Grange, Ohio
Intech, Santa Clara, Cal.
Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa.
Intronics, Inc., Newton, Mass.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Kepco, Inc., Flushing, N.Y.
Krohn-Hite, Cambridge, Mass.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Lithic Systems, Inc., Cupertino, Cal.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Maxwell Labs., Inc., San Diego, Calif.
McFadden Elctrns. Co., South Gate, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Millen, James Mfg., Malden, Mass.
Mini-Systems, Inc, North Attleboro, Mass.
Neff Instr. Corp., Duarte, Calif.
Newport Labs., Inc., Santa Ana, Cal.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Optimation, Inc., Chatsworth, Cal.
Perry Amplifier, Brookline, Mass.
Photron Instr. Co., Cleveland, Ohio
PPM, Inc., Bedford, Ohio
Precision Monolithics Inc., Santa Clara, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
Quan-Tech, Whippany, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
RIL Elctrns., Inc., Southampton, Pa.
Rosemount Inc., Minneapolis, Minn.
Scientific Columbus, Columbus, Ohio
Scientific Measurements, Wilmette, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Signetics. Corp., Sunnyvale, Calif.
Spectra Sonics, Ogden, Utah
Sprague Elec. Co., No. Adams, Mass.
Statham Instrs., Inc., Oxnard, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Teledyne Taber, No. Tonawanda, N.Y.
United Detector Technology Inc., Santa Monica, Cal.
Westamp, Inc., Santa Monica, Cal.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zeltex, Inc., Concord, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Data—See Amplifiers, Instrumentation

Amplifiers, Decade

AMF Electical Prods., Alexandria, Va.
Arvee Engrg. Co., Torrance, Calif.
B & K Instrs., Inc., Cleveland, Ohio
Burr-Brown Resch. Corp., Tucson, Ariz.
Clarke - Hess, New York, N.Y.
Dynalab Corp., Van Nuys, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Ind'l. Control Co., Farmingdale, N.Y.
Ithaco, Inc., Ithaca, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Neff Instr. Corp., Duarte, Calif.
NH Research, Inc., Santa Ana, Calif.
Quan-Tech, Whippany, N.J.

Amplifiers, Deflection

Bowmar Instr. Corp., Ft. Wayne, Ind.
CELCO, Mahwah, N.J.
Cleveland Elctrns., Inc., Cleveland, Ohio
Dynalab Corp., Van Nuys, Cal.
Dynamic Measurements Corp., Winchester, Ma.
Gould Data Systems, Newton Upper Falls, Mass.
Infodex, Inc., Waterbury, Conn.
Information Displays, Inc., Mt. Kisco, N.Y.
Intronics, Inc., Newton, Mass.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Millen, James Mfg., Malden, Mass.
Minnetech Labs, Minneapolis, Minn.
RCA Solid State Div., Somerville, N. J.
Syntronic Instrs., Inc., Addison, Ill.
Tektronix, Inc., Beaverton, Ore.

Amplifiers, Delay Line

Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif.
Harshaw Chem. Co., Cleveland, Ohio
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microsonics, Inc., Weymouth, Mass.
RHG Elctrns. Lab., Deer Park, N.Y.
Varian Assocs., Palo Alto, Cal.

Amplifiers, Differential

Control Technology Co., L.I.C., N.Y. Vol 2•986
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Hathaway Instruments, Inc., Denver, Colo. ..... Vol 1•451
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Preston Scientific, Anaheim, Cal. Vol 1•369; Vol 2•320
Acromag, Inc., Wixom, Mich.
Anadex Instrs., Inc., Van Nuys, Calif.
Analogic, Wakefield, Mass.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bay Labs., Inc., Cleveland, Ohio
Bell & Howell, Bridgeport, Conn.
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Computer Prods., Ft. Lauderdale, Fla.
Conic Corp., San Diego, Calif.
Dana Labs., Inc., Irvine, Calif.
Data, Inc., Ft. Collins, Col.
Datum, Inc., Anaheim, Calif.
Doric Sci. Corp., San Diego, Calif.
Dynair Elctrns. Inc., San Diego, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Ectron Corp., San Diego, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Fogg System Co., Denver, Col.
Junction Modules, Inc., Irvine, Cal.
General Magnetics, Bloomfield, N.J.
Glentek, Inc., Santa Monica, Calif.
Gould, Inc., Cleveland, Ohio
GPS Corp., Framingham, Mass.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Hills-McCanna Co., Carpentersville, Ill.
Honeywell, Denver, Colo.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Inservco, Inc., La Grange, Ohio
Intech, Santa Clara, Cal.
Jordan Controls, Milwaukee, Wisc.
Keithley Instrs., Inc., Cleveland, Ohio
Kulite Semiconductor Prod., Ridgefield, N.J.
Lithic Systems, Inc., Cupertino, Cal.
McKee-Pedersen Instrs., Danville, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Mini-Systems, Inc, North Attleboro, Mass.
Minnetech Labs, Minneapolis, Minn.
Newport Labs., Inc., Santa Ana, Cal.
NH Research, Inc., Santa Ana, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Oeco Corp., Portland, Ore.
Opamp Labs. Inc., Los Angeles, Cal.
Phoenix Data Inc., Phoenix, Ariz.
PPM, Inc., Bedford, Ohio
Precision Monolithics Inc., Santa Clara, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
Rosemount Inc., Minneapolis, Minn.
Scientific-Atlanta, Inc., Atlanta, Ga.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
Statham Instrs., Inc., Oxnard, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Texas Instruments, Dallas, Tex.
Unholtz-Dickie Corp., Hamden, Conn.
United Detector Technology Inc., Santa Monica, Cal.
Zeltex, Inc., Concord, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Distributed

Altec Div., Anaheim, Calif.
American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y.
C-COR Elctrns., State College, Pa.
Cober Elctrns., Inc., Stamford, Conn.
Hope Elctrns., Clifton, N.J.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Marconi Elctrns. Inc., Elmsford, N.Y.

Amplifiers, Distribution

Re-el Circuits, Inc., Saddle Brook, N.J. Vol 1•320
Altec Div., Anaheim, Calif.
AMF Electical Prods., Alexandria, Va.
Applied Research Inc., Port Washington, N.Y.
Austron, Inc., Austin, Tex.
Bowmar Instr. Corp., Ft. Wayne, Ind.
C-COR Elctrns., State College, Pa.
CBS Laboratories, Stamford, Conn.
Comdel, Inc., Beverly, Mass.
Concord Communications Sys., Farmingdale, N.Y.
Datum, Inc., Anaheim, Calif.
Delta-Benco Ltd., Rexdale, Ont., Can.
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
Dynair Elctrns. Inc., San Diego, Calif.
Executone, Inc., Long Island City, N.Y.
Fairchild Sound Equip., Commack, N.Y.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Frequency Elctrns., New Hyde Pk., N.Y.
Hope Elctrns., Clifton, N.J.
Ithaco, Inc., Ithaca, N.Y.
Jerrold Electronics Corp., Philadelphia, Pa.
Lear Siegler, Inc., Santa Monica, Calif.
Microwave Power Devices, Plainview, N. Y.
Nuclear Resch. Corp., Southampton, Pa.
Radiation Devices Co., Baltimore, Md.
RHG Elctrns. Lab., Deer Park, N.Y.
RIL Elctrns., Inc., Southampton, Pa.
Rohde & Schwarz Sls., Passaic, N.J.
Spectra Sonics, Ogden, Utah
Theta-Com CATV, Phoenix, Ariz
Tracor, Inc., Austin, Tex.
Vectron Labs., Inc., Norwalk, Conn.
Wavetek, San Diego, Cal.
Wavetek Indiana, Inc., Beech Grove, Ind.
Winegard Co., Burlington, Iowa

Amplifiers, I-F

RHG Elctrns. Lab., Deer Park, N.Y. Vol 2•618
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
AMF Electical Prods., Alexandria, Va.
Anzac Elctrns., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
Arvin Sys., Inc., Dayton, Ohio
Avantek, Inc., Santa Clara, Cal.
BF Elctrns., Solana Beach, Calif.
C-COR Elctrns., State College, Pa.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly, Mass.
Dynalab Corp., Van Nuys, Cal.
Dynamic Measurements Corp., Winchester, Ma.
E & M Laboratories, Inc., Westlake Village, Cal.
Elcom Sys., Deer Pk., N.Y.
Electrac, Inc., Anaheim, Calif.
Electro/Data, Inc., Garland, Tex.
Environmental Communications Inc., Santa Ana, Cal.
General Radio Co., Concord, Mass.
Hope Elctrns., Clifton, N.J.
Kay Elemetrics, Pine Brook, N.J.
Keithley Instrs., Inc., Cleveland, Ohio
KMC Semiconductor Corp., Long Valley, N.J.
Lithic Systems, Inc., Cupertino, Cal.
Lorch Elctrns. Corp., Englewood, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Power Devices, Plainview, N. Y.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Omni-Spectra, Inc., Tempe, Ariz.
OPtimax Inc., Colmar, Pa.
Perry Amplifier, Brookline, Mass.
Rodelco, Deer Park, N.Y.
Scientific Communications, Garland, Tex.
Sierra Sys., Mountain View, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Sprague Elec. Co., No. Adams, Mass.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Texas Instruments, Dallas, Tex.
Trak Microwave, Tampa, Fla.
Tyco Filters Div. Inc., Phoenix, Ariz.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Vega Precision Labs., Vienna, Va.

Amplifiers, Instrumentation

Burr-Brown Resch. Corp., Tucson, Ariz. Vol 2•309
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Newport Labs., Inc., Santa Ana, Cal. Vol 4•419*
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W-F Products, Inc., Denver, Co. Vol 1•934
Analogic, Wakefield, Mass.
B & F Instrs., Inc., Cornwells Hgts., Pa.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
CML-Macarr, Inc., Edison, N.J.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Dynalab Corp., Van Nuys, Cal.
Dynamic Measurements Corp., Winchester, Ma.
Electronic Modules, Inc., Pasadena, Cal.
Endevco, Pasadena, Calif.
Fogg System Co., Denver, Col.
Junction Modules, Inc., Irvine, Cal.
General Rand Corp., Edison, N.J.
Heath Co., Benton Harbor, Mich.
Hills-McCanna Co., Carpentersville, Ill.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Inservco, Inc., La Grange, Ohio
Intech, Santa Clara, Cal.
Ithaco, Inc., Ithaca, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Leeds & Northrup Corp., No. Wales, Pa.
Mini-Systems, Inc, North Attleboro, Mass.
Natel Engrg. Co., Canoga Pk., Cal.
Optimation, Inc., Chatsworth, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
Quan-Tech, Whippany, N.J.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
Standard Controls, Seattle, Wash.
Teledyne Philbrick, Dedham, Mass.
Unholtz-Dickie Corp., Hamden, Conn.
Validyne Engrg. Corp., Northridge, Cal.
Wide Band Engrg. Co., Phoenix, Ariz.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Integrating

Acromag, Inc., Wixom, Mich.
Analogic, Wakefield, Mass.
Bell & Howell, Bridgeport, Conn.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
Control Technology Co., L.I.C., N.Y.
Dynamic Measurements Corp., Winchester, Ma.
Elctrn. Assocs., W. Long Branch, N.J.
Fogg System Co., Denver, Col.
Junction Modules, Inc., Irvine, Cal.
Glentek, Inc., Santa Monica, Calif.
Gould, Inc., Cleveland, Ohio
Harshaw Chem. Co., Cleveland, Ohio
HyComp Inc., Maynard, Mass.
Hybrid Sys. Corp., Burlington, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Intech, Santa Clara, Cal.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Kistler Instr. Co., Redmond, Wash.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Mini-Systems, Inc, North Attleboro, Mass.
Scientific Measurements, Wilmette, Ill.
Sensor Corp., Scottsdale, Pa.
Solid State Elctrns. Corp., Sepulveda, Cal.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Systron Donner Computer Systems Div., Concord, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Unholtz-Dickie Corp., Hamden, Conn.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zeltex, Inc., Concord, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Isolation

Control Technology Co., L.I.C., N.Y. Vol 2•986
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Acromag, Inc., Wixom, Mich.
Altec Div., Anaheim, Calif.
AMF Electical Prods., Alexandria, Va.
Analogic, Wakefield, Mass.
Applied Research Inc., Port Washington, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
C-COR Elctrns., State College, Pa.
Clifton Precision, Clifton Hgts., Pa.
Collins Radio Co., Dallas, Tex.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Cross Electronics Inc., Warrendale, Pa.
Dana Labs., Inc., Irvine, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Ectron Corp., San Diego, Cal.
Executone, Inc., Long Island City, N.Y.
Fairchild Sound Equip., Commack, N.Y.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Junction Modules, Inc., Irvine, Cal.
Glentek, Inc., Santa Monica, Calif.
Hope Elctrns., Clifton, N.J.
ILC Data Device Corp., Hicksville, N.Y.
Intech, Santa Clara, Cal.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Kepco, Inc., Flushing, N.Y.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microwave Power Devices, Plainview, N. Y.
Miteq Inc., Hauppauge, N.Y.
Neff Instr. Corp., Duarte, Calif.
Newport Labs., Inc., Santa Ana, Cal.
Oeco Corp., Portland, Ore.
Perry Amplifier, Brookline, Mass.
Power Control Corp., Pittsburgh, Pa.
Quan-Tech, Whippany, N.J.
Rosemount Inc., Minneapolis, Minn.
Singer Co., Little Falls, N.J.
Spectra Sonics, Ogden, Utah
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zeltex, Inc., Concord, Calif.

Amplifiers, Keying

CML-Macarr, Inc., Edison, N.J.

Amplifiers, Klystron

MCL, Inc., La Grange, Ill. .. Vol 1•551,554
Cober Elctrns., Inc., Stamford, Conn.
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Energy Systems, Palo Alto, Cal.
General Microwave Corp., Farmingdale, N.Y.
Litton Inds., San Carlos, Calif.
RCA Elctrns. Comps., Harrison, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Varian Assocs., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.

Amplifiers, Limiting

Environmental Communications Inc., Santa Ana, Cal. ..... Vol 2•611
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Aertech Inds., Sunnyvale, Calif.
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Applied Research Inc., Port Washington, N.Y.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly, Mass.
Control Technology Co., L.I.C., N.Y.

Dynamic Measurements Corp., Winchester, Ma.
Executone, Inc., Long Island City, N.Y.
Fairchild Sound Equip., Commack, N.Y.
GPS Corp., Framingham, Mass.
Lithic Systems, Inc., Cupertino, Cal.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Miteq Inc., Hauppauge, N.Y.
OPtimax Inc., Colmar, Pa.
RFL Inds., Comms. Div., Boonton, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Scientific Communications, Garland, Tex.
Spectra Sonics, Ogden, Utah
Sprague Elec. Co., No. Adams, Mass.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zeltex, Inc., Concord, Calif.

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Hathaway Instruments, Inc., Denver, Colo. ..... Vol 1•451
Re-el Circuits, Inc., Saddle Brook, N.J. Vol 1•320
Altec Div., Anaheim, Calif.
Arvee Engrg. Co., Torrance, Calif.
Beukers Labs., Inc., Hauppauge, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Collins Radio Co., Dallas, Tex.
Control Technology Co., L.I.C., N.Y.
Datum, Inc., Anaheim, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Executone, Inc., Long Island City, N.Y.
Fairchild Sound Equip., Commack, N.Y.
GRM Corp., Medford, N.J.
ILC Data Device Corp., Hicksville, N.Y.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Neff Instr. Corp., Duarte, Calif.
Perry Amplifier, Brookline, Mass.
Radiation Devices Co., Baltimore, Md.
RFL Inds., Comms. Div., Boonton, N.J.
Signetics. Corp., Sunnyvale, Calif.
Singer - Tele-Signal, Woodbury, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Spectra Sonics, Ogden, Utah
Webster Elec. Co., Inc., Racine, Wisc.

Amplifiers, Lock-In

Ithaco, Inc., Ithaca, N.Y. ..... Vol 2•317
American Time Products, Woodside, N.Y.
Clarke - Hess, New York, N.Y.
Control Technology Co., L.I.C., N.Y.
Electro-Optical Inds., Inc., Santa Barbara, Cal.
Keithley Instrs., Inc., Cleveland, Ohio
Princeton Applied Resch. Corp., Princeton, N.J.
SSR Instrs. Co., Santa Monica, Cal.

Amplifiers, Logarithmic

American Astrionics, Costa Mesa, Cal Vol 1•321
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Aertech Inds., Sunnyvale, Calif.
Applied Research Inc., Port Washington, N.Y.
BF Elctrns., Solana Beach, Calif.
Circuit Technology, Farmingdale, N.Y.
Control Technology Co., L.I.C., N.Y.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynalab Corp., Van Nuys, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Junction Modules, Inc., Irvine, Cal.
Gould, Inc., Cleveland, Ohio
GPS Corp., Framingham, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Intech, Santa Clara, Cal.
Intronics, Inc., Newton, Mass.
Jerrold Electronics Corp., Philadelphia, Pa.
Kay Elemetrics, Pine Brook, N.J.
Keithley Instrs., Inc., Cleveland, Ohio
McKee-Pedersen Instrs., Danville, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Meloy Laboratories Inc., Springfield, Va.
Microphase Corp., Cos Cob, Conn.
Milletron, Inc., Pittsburgh, Pa.
Miteq Inc., Hauppauge, N.Y.
Pacific Meas., Inc., Palo Alto, Calif.
Perry Amplifier, Brookline, Mass.
Quan-Tech, Whippany, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sierra Sys., Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
SSR Instrs. Co., Santa Monica, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Telonic Inds., Inc., Laguna Beach, Calif.
Texas Instruments, Dallas, Tex.
Thermo Sys., Inc., St. Paul, Minn.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Vega Precision Labs., Vienna, Va.
Wiltron Co., Palo Alto, Calif.

Amplifiers, Magnetic

Acme Elec. Corp., Cuba, N.Y.
Acromag, Inc., Wixom, Mich.
ADC Prods., Minneapolis, Minn.
American Trans-Coil Corp., Richmond Hill, N.Y.
Arnold Magnetics, Culver City, Cal.
Basler Elec. Co., Highland, Ill.
Bell Industries, Compton, Cal.
Biometrics Instrument Corp., Garland, Tex.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Cross Electronics Inc., Warrendale, Pa.
Electro-Pacific, Inc., Goleta, Calif.
Electrocom Inds., So. Bend, Indiana
EWC, Inc., Kenilworth, N.J.
Freed Transformer Co., Bklyn., N.Y.
General Magnetics, Bloomfield, N.J.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
HGA Elctrns., Mt. Vernon, N.Y.
Huntington Elctrns. Corp., Van Nuys, Cal.
Ind'l. Control Co., Farmingdale, N.Y.
K.G.S. Elctrns., Pasadena, Cal.
Leeds & Northrup Corp., No. Wales, Pa.
Mag-Con, Inc., New Brighton, Minn.
Magnetico, Inc., E. Northport, N.Y.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Oeco Corp., Portland, Ore.
Polyphase Instr. Co., Bridgeport, Pa.
Queensboro Transformer & Mach., College Pt., N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Telectro Sys. Corp., Corona, N.Y.
Telex Comm. Div., Minneapolis, Minn.
Torwico Elctrns., Inc., Lakewood, N.J.
Transmagnetics Inc., Farmingdale, N. Y.
Varian Assocs., Palo Alto, Cal.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
Zaring Inds., Inc., Westfield, Ind.

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AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
American Elctrn. Labs., Inc., Lansdale, Pa.
Anzac Elctrns., Waltham, Mass.
Applied Microwave, Westwood, Mass.
Applied Research Inc., Port Washington, N.Y.
Avantek, Inc., Santa Clara, Cal.
C-COR Elctrns., State College, Pa.
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
E & M Laboratories, Inc., Westlake Village, Cal.
Energy Systems, Palo Alto, Cal.
GAF Corp., New York, N.Y.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Microwave Corp., Farmingdale, N.Y.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
KMC Semiconductor Corp., Long Valley, N.J.
Litton Inds., San Carlos, Calif.
LNR Communications, Inc., Farmingdale, N.Y.
Loral Elctrn. Sys., Bronx, N.Y.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Power Devices, Plainview, N. Y.
Microwave Semiconductor Corp., Somerset, N.J.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
OPtimax Inc., Colmar, Pa.
Polarad Elctrn. Instrs., Lake Success, N.Y.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCA Elctrns. Comps., Harrison, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
Scientific Communications, Garland, Tex.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Sperry Elctrn. Tube, Gainesville, Fla.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Technical Research & Mfg. Co., Manchester, N.H.
Teledyne Mec., Palo Alto, Cal.
Teledyne Micronetics, San Diego, Calif.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Varian, Solid State West Division, Palo Alto, Cal.
Vega Precision Labs., Vienna, Va.
Watkins Johnson Co., Palo Alto, Cal.
Wiltron Co., Palo Alto, Calif.

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Altec Div., Anaheim, Calif.
Anzac Elctrns., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
Bell & Howell Co., Pasadena, Calif.
Communications Equip. Co., Indianapolis, Ind.
Conic Corp., San Diego, Calif.
Conrac Corp., Cedar Rapids, Iowa
Data-Control Systems, Danbury, Conn.
Executone, Inc., Long Island City, N.Y.
Fairchild Sound Equip., Commack, N.Y.
General Devices, Inc., Princeton, N.J.
Harshaw Chem. Co., Cleveland, Ohio
HGA Elctrns., Mt. Vernon, N.Y.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Newcomb Audio Prods. Co., Sylmar, Calif.
OPtimax Inc., Colmar, Pa.
Pulse Techniques, Inc., Teaneck, N.J.
Solid State Elctrns. Corp., Sepulveda, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Spectra Sonics, Ogden, Utah
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Vega Precision Labs., Vienna, Va.

Amplifiers, Narrow-Band

Aertech Inds., Sunnyvale, Calif.
Anzac Elctrns., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C-COR Elctrns., State College, Pa.
CML-Macarr, Inc., Edison, N.J.
Dana Labs., Inc., Irvine, Calif.
Dynalab Corp., Van Nuys, Cal.
Dynamic Measurements Corp., Winchester, Ma.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
E & M Laboratories, Inc., Westlake Village, Cal.
Environmental Communications Inc., Santa Ana, Cal.
General Devices, Inc., Princeton, N.J.
General Radio Co., Concord, Mass.
Hope Elctrns., Clifton, N.J.
Ithaco, Inc., Ithaca, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Lorch Elctrns. Corp., Englewood, N.J.
Microwave Power Devices, Plainview, N. Y.
Microwave Semiconductor Corp., Somerset, N.J.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Neff Instr. Corp., Duarte, Calif.
OPtimax Inc., Colmar, Pa.
Perry Amplifier, Brookline, Mass.
Princeton Applied Resch. Corp., Princeton, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Sierra Sys., Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
Special Microwave Devices Oper., Waltham, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Eastern Tube Div., Beverly, Mass.
Zeltex, Inc., Concord, Calif.

Amplifiers, Null

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Acromag, Inc., Wixom, Mich.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Control Technology Co., L.I.C., N.Y.
General Radio Co., Concord, Mass.
Glentek, Inc., Santa Monica, Calif.
Honeywell, Ft. Washington, Pa.
Ind'l. Control Co., Farmingdale, N.Y.
Intronics, Inc., Newton, Mass.
Jordan Controls, Milwaukee, Wisc.
Keithley Instrs., Inc., Cleveland, Ohio
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Measurements, Wilmette, Ill.
Solid State Elctrns. Corp., Sepulveda, Cal.
Theta Instr. Corp., Fairfield, N.J.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.

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Analogic, Wakefield, Mass.
Bell & Howell, Bridgeport, Conn.

Bell & Howell Co., Pasadena, Calif.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Computer Labs, Greensboro, N.C.
Datel Systems Inc., Canton, Mass.
Digital Equip. Corp., Maynard, Mass.
Dynamic Measurements Corp., Winchester, Ma.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Junction Modules, Inc., Irvine, Cal.
General Computers, Inc., Los Angeles, Calif.
Glentek, Inc., Santa Monica, Calif.
Gould, Inc., Cleveland, Ohio
GPS Corp., Framingham, Mass.
Halex, Inc., Torrance, Cal.
Heath Co., Benton Harbor, Mich.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Test Equip., Clifton, NJ
Intech, Santa Clara, Cal.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Kepco, Inc., Flushing, N.Y.
Kinetic Tech., Inc., Santa Clara, Cal.
Leeds & Northrup Corp., No. Wales, Pa.
McFadden Elctrns. Co., South Gate, Calif.
McKee-Pedersen Instrs., Danville, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Precision Monolithics Inc., Santa Clara, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
Radiation Devices Co., Baltimore, Md.
RCA Solid State Div., Somerville, N. J.
Scientific Measurements, Wilmette, Ill.
Signetics. Corp., Sunnyvale, Calif.
Singer Co., Little Falls, N.J.
Solid State Elctrns. Corp., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
Systron Donner Computer Systems Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Texas Instruments, Dallas, Tex.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zeltex, Inc., Concord, Calif.

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American Elctrn. Labs., Inc., Lansdale, Pa.
Junction Modules, Inc., Irvine, Cal.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
LNR Communications, Inc., Farmingdale, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Teledyne Philbrick, Dedham, Mass.
TRG Prods., E. Boston, Mass.
Watkins Johnson Co., Palo Alto, Cal.

Amplifiers, Peak-Limiting

Burr-Brown Resch. Corp., Tucson, Ariz.
CBS Laboratories, Stamford, Conn.
Dynamic Measurements Corp., Winchester, Ma.
Environmental Communications Inc., Santa Ana, Cal.
Hybrid Sys. Corp., Burlington, Mass.
Intech, Santa Clara, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Miteq Inc., Hauppauge, N.Y.
RCA Corp., Camden, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.

Amplifiers, Phase-Lock Loop

Clarke - Hess, New York, N.Y.
Elctrn. Assocs., W. Long Branch, N.J.
Keithley Instrs., Inc., Cleveland, Ohio
Lithic Systems, Inc., Cupertino, Cal.
Scientific Technology, Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
Varian, Beverly, Mass.
Vibration Instrs. Co., Anaheim, Cal.

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Aerospace Avionics, Inc., Bohemia, N.Y.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
Allis, Louis Div., Milwaukee, Wisc.
Altec Div., Anaheim, Calif.
American Elctrn. Labs., Inc., Lansdale, Pa.
Anzac Elctrns., Waltham, Mass.
Applied Control Co., Fairfield, N.J.
Applied Microwave, Westwood, Mass.
Applied Research Inc., Port Washington, N.Y.
Arnold Magnetics, Culver City, Cal.
Arvee Engrg. Co., Torrance, Calif.
Avantek, Inc., Santa Clara, Cal.
Behlman Div., California Instrs., San Diego, Cal
Bell & Howell Co., Pasadena, Calif.
Bell P/A Prods. Corp., Columbus, Ohio
Bogen Div., Paramus, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
C-COR Elctrns., State College, Pa.
Calico Div., San Diego, Cal.
California Instrs. Co., San Diego, Cal.
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Clarke - Hess, New York, N.Y.
Collins Radio Co., Dallas, Tex.
Constant Voltage Co., Chicago, Ill.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Control Technology Co., L.I.C., N.Y.
Datron Systems, Chatsworth, Cal.
Dukane Corp., St. Charles, Ill.
Dynaco, Inc., Philadelphia, Pa.
Dynamic Measurements Corp., Winchester, Ma.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Edo Western Corp., Salt Lake City, Utah
Eimac, San Carlos, Calif.
Elctrn. Assocs., W. Long Branch, N.J.
Elgar Corp., San Diego, Cal.
Elin Div., San Diego, Cal.
Energy Systems, Palo Alto, Cal.
Environmental Communications Inc., Santa Ana, Cal.
Fairchild Sound Equip., Commack, N.Y.
General Radio Co., Concord, Mass.
Glentek, Inc., Santa Monica, Calif.
Gotham Audio Corp., New York, N.Y.
Halmar Elctrns., Inc., Columbus, Ohio
Henry Prods. Co., Inc., Inwood, N.Y.
Holt Instr. Labs., Oconto, Wisc.
Honeywell, Ft. Washington, Pa.
Hope Elctrns., Clifton, N.J.
ILC Data Device Corp., Hicksville, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Ind'l. Test Equip., Clifton, NJ
Intech, Santa Clara, Cal.
Kepco, Inc., Flushing, N.Y.
Kistler Instr. Co., Redmond, Wash.
Krohn-Hite, Cambridge, Mass.
Lear Siegler, Inc., Santa Monica, Calif.
Lithic Systems, Inc., Cupertino, Cal.
Lorch Elctrns. Corp., Englewood, N.J.
McFadden Elctrns. Co., South Gate, Calif.
McKee-Pedersen Instrs., Danville, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Melpar, Falls Church, Va.
Microwave Power Devices, Plainview, N.Y.
Millen, James Mfg., Malden, Mass.
Mini-Circuits Lab., Brooklyn, N.Y.
Miteq Inc., Hauppauge, N.Y.
MPC Prods. Corp., Chicago, Ill.
Mu-Del Elctrns., Silver Spring, Md.
Newcomb Audio Prods. Co., Sylmar, Calif.
NH Research, Inc., Santa Ana, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
OPtimax Inc., Colmar, Pa.
Paraplegics Mfg., Bensenville, Ill.
Perry Amplifier, Brookline, Mass.
RCA Corp., Camden, N.J.
RCA Solid State Div., Somerville, N. J.
Resdel Engrg. Corp., Arcadia, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Robicon Corp., Pittsburgh, Pa.
Rohde & Schwarz Sls., Passaic, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Solar Elctrns. Co., Hollywood, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Spectra Sonics, Ogden, Utah
Sprague Elec. Co., No. Adams, Mass.
SRC Div., Newport Bch., Cal.
Telex Comm. Div., Minneapolis, Minn.
Trutone Elctrns., Inc., No. Hollywood, Cal.
Unholtz-Dickie Corp., Hamden, Conn.
Varian Assocs., Palo Alto, Cal.
Vectrol, Inc., Rockville, Md.
Webster Elec. Co., Inc., Racine, Wisc.
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Arvee Engrg. Co., Torrance, Calif.
Avantek, Inc., Santa Clara, Cal.
Bell & Howell Co., Pasadena, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
C-COR Elctrns., State College, Pa.
Chronetics, Inc., Mt. Vernon, N.Y.
CML-Macarr, Inc., Edison, N.J.
Cober Elctrns., Inc., Stamford, Conn.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Dynamic Measurements Corp., Winchester, Ma.
Energy Systems, Palo Alto, Cal.
Environmental Communications Inc., Santa Ana, Cal.
Hamamatsu Corp. (E), Middlesex, N. J.
Harshaw Chem. Co., Cleveland, Ohio
Hope Elctrns., Clifton, N.J.
Infodex, Inc., Waterbury, Conn.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Intronics, Inc., Newton, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Lasermetrics, Inc., Rochelle Park, N.J.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
Litton Inds., San Carlos, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microwave Power Devices, Plainview, N.Y.
Milletron, Inc., Pittsburgh, Pa.
Nuclear Data, Palatine, Ill.
Nuclear Resch. Corp., Southampton, Pa.
Optimation, Inc., Chatsworth, Cal.
Perry Amplifier, Brookline, Mass.
RHG Elctrns. Lab., Deer Park, N.Y.
RIL Elctrns., Inc., Southampton, Pa.
Scientific Measurements, Wilmette, Ill.
Sensor Corp., Scottsdale, Pa.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
SRC Div., Newport Bch., Cal.
SSR Instrs. Co., Santa Monica, Cal.
United Detector Technology Inc., Santa Monica, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Travel Wave Tube Div., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Vega Precision Labs., Vienna, Va.
Velonex, Santa Clara, Calif.

Amplifiers, Pulse-Limiting

Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
CML-Macarr, Inc., Edison, N.J.
Cober Elctrns., Inc., Stamford, Conn.
Environmental Communications Inc., Santa Ana, Cal.
Microwave Assocs., Inc., Burlington, Mass.
RHG Elctrns. Lab., Deer Park, N.Y.
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Advanced Kinetics, Costa Mesa, Calif.
AEL Communications Corp., Sub. of Amer. Elctrn. Labs. Inc., Lansdale, Pa.
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
American Elctrn. Labs., Inc., Lansdale, Pa.
AMF Electical Prods., Alexandria, Va.
Amperex Electronic Corp., Hicksville, N.Y.
Anzac Elctrns., Waltham, Mass.
Applied Microwave, Westwood, Mass.
Arvee Engrg. Co., Torrance, Calif.
Arvin Sys., Inc., Dayton, Ohio
Avantek, Inc., Santa Clara, Cal.
Barker & Williamson, Inc., Bristol, Pa.
BF Elctrns., Solana Beach, Calif.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
C-COR Elctrns., State College, Pa.
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
CML-Macarr, Inc., Edison, N.J.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly, Mass.
Conic Corp., San Diego, Calif.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Dynamic Measurements Corp., Winchester, Ma.
E & M Laboratories, Inc., Westlake Village, Cal.
Eimac, San Carlos, Calif.
Elcom Sys., Deer Pk., N.Y.
Elctrn. Comm., Inc., St. Petersburg, Fla.

Electronic Research Co., Shawnee Mission, Kan.
Emergency Beacon Corp., New Rochelle, N. Y.
Energy Systems, Palo Alto, Cal.
Farinon Electric, San Carlos, Calif.
Heath Co., Benton Harbor, Mich.
Henry Prods. Co., Inc., Inwood, N.Y.
Honeywell, Denver, Colo.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Instrs. For Ind., Inc., Farmingdale, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Jerrold Electronics Corp., Philadelphia, Pa.
Johnson E. F. Co., Waseca, Minn.
Kay Elemetrics, Pine Brook, N.J.
Keithley Instrs., Inc., Cleveland, Ohio
KMC Semiconductor Corp., Long Valley, N.J.
Krohn-Hite, Cambridge, Mass.
Lithic Systems, Inc., Cupertino, Cal.
Litton Inds., San Carlos, Calif.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Power Devices, Plainview, N. Y.
Microwave Semiconductor Corp., Somerset, N.J.
Millen, James Mfg., Malden, Mass.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
OPtimax Inc., Colmar, Pa.
Pace Div., Harbor City, Calif.
Perry Amplifier, Brookline, Mass.
PRD Elctrns., Inc., Westbury, N.Y.
Radiation Devices Co., Baltimore, Md.
Radio Resch. Co., Rockaway, N.J.
RCA Solid State Div., Somerville, N. J.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Communications, Garland, Tex.
Sierra Sys., Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
Sinclair Radio Labs., Maple, Ont., Can.
Solid State Elctrns. Corp., Sepulveda, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Sperry Elctrn. Tube, Gainesville, Fla.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Technical Mat'l., Mamaroneck, N.Y.
Teledyne Mec., Palo Alto, Cal.
Trak Microwave, Tampa, Fla.
TRW Elctrnc. Functions, Candem, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Travel Wave Tube Div., Palo Alto, Cal.
Varian, Beverly, Mass.
Watkins Johnson Co., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.
Wide Band Engrg. Co., Phoenix, Ariz.
Wiltron Co., Palo Alto, Calif.
Winegard Co., Burlington, Iowa

Amplifiers, Sample & Hold

Burr-Brown Resch. Corp., Tucson, Ariz. Vol 1•328
ILC Data Device Corp., Hicksville, N.Y. Vol 2•315
Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa. .. Vol 1•353
Preston Scientific, Anaheim, Cal. Vol 1•369; Vol 2•320,321
American Elctrn. Labs., Inc., Lansdale, Pa.
Analogic, Wakefield, Mass.
Astrosystems, Inc., Lake Success, N.Y.
Bell & Howell, Bridgeport, Conn.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Chronetics, Inc., Mt. Vernon, N.Y.
Circuit Technology, Farmingdale, N.Y.
Clarke - Hess, New York, N.Y.
Computer Conversions Corp., East Northport, N.Y.
Computer Prods., Ft. Lauderdale, Fla.
Datum, Inc., Anaheim, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
E-H Resch. Labs., Inc., Oakland, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Emergency Beacon Corp., New Rochelle, N. Y.
Junction Modules, Inc., Irvine, Cal.
General Microwave Corp., Farmingdale, N.Y.
GPS Corp., Framingham, Mass.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Hybrid Sys. Corp., Burlington, Mass.
Intronics, Inc., Newton, Mass.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Phoenix Data Inc., Phoenix, Ariz.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Teledyne Philbrick, Dedham, Mass.
Transmagnetics Inc., Farmingdale, N. Y.
Varian, Beverly, Mass.
Xerox Data Sys., El Segundo, Cal
Zeltex, Inc., Concord, Calif.

Amplifiers, Servo

Arnold Magnetics, Culver City, Cal. Vol 1•601
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. Vol 2•984,985
Control Technology Co., L.I.C., N.Y. Vol 2•986
Ind'l. Control Co., Farmingdale, N.Y. Vol 2•988
Torque Systems, Waltham, Mass. Vol 2•322,991
Unholtz-Dickie Corp., Hamden, Conn. Vol 1•530
Advance Instr. Corp., Belmar, N. J.
American Elctrns., Inc., Fullerton, Cal.
American Time Products, Woodside, N.Y.
Applied Control Co., Fairfield, N.J.
A.R.F. Products, Inc., Boulder, Colo.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Circuit Technology, Farmingdale, N.Y.
Clifton Precision, Clifton Hgts., Pa.
Collins Radio Co., Dallas, Tex.
Crown Int'l., Elkhart, Ind.
Datron Systems, Chatsworth, Cal.
Datum, Inc., Anaheim, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Electro-Craft Corp, Hopkins, Minn
Elctrn. Assocs., W. Long Branch, N.J.
Esterline Angus Div., Indianapolis, Ind.
Farrand Controls, Inc., Valhalla, N.Y.
Gap Instr. Corp., Hauppauge, N.Y.
Glentek, Inc., Santa Monica, Calif.
Gould, Inc., Cleveland, Ohio
Henschel Corp., Amesbury, Mass.
Hills-McCanna Co., Carpentersville, Ill.
Honeywell, Ft. Washington, Pa.
Hybrid Sys. Corp., Burlington, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Innovatek Enterprise, Millerton, N.Y.
Intech, Santa Clara, Cal.
Ithaco, Inc., Ithaca, N.Y.
Jordan Controls, Milwaukee, Wisc.
Kelk, George Ltd., Don Mills, Ont., Canada
Kepco, Inc., Flushing, N.Y.
Kistler Instr. Co., Redmond, Wash.
Lear Siegler, Inc., Santa Monica, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Linear Instrs. Corp., Costa Mesa, Cal.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Magnetico, Inc., E. Northport, N.Y.
McFadden Elctrns. Co., South Gate, Calif.
McKee-Pedersen Instrs., Danville, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Midland Standard Inc., Elgin, Ill.
Mini-Systems, Inc, North Attleboro, Mass.
MPC Prods. Corp., Chicago, Ill.
NH Research, Inc., Santa Ana, Calif.
Oeco Corp., Portland, Ore.
Opamp Labs. Inc., Los Angeles, Cal.
Orbit Instr. Corp., Syosset, N.Y.
RCA Solid State Div., Somerville, N. J.
Robicon Corp., Pittsburgh, Pa.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Co., Little Falls, N.J.
Solid State Elctrns. Corp., Sepulveda, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Taylor Instr. Process Control Div., Rochester, N.Y.
Transicoil, Inc., Worcester, Pa.
Westamp, Inc., Santa Monica, Cal.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Single-Sideband

Elctrn. Navigation Inds., Inc., Rochester, N.Y. ..... Vol 2•314
Barker & Williamson, Inc., Bristol, Pa.
BF Elctrns., Solana Beach, Calif.
CCA Elctrns. Corp., Gloucester, N.J.
Comdel, Inc., Beverly, Mass.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Eimac, San Carlos, Calif.
Heath Co., Benton Harbor, Mich.
ITT Mackay Marine, Elizabeth, N.J.
Lithic Systems, Inc., Cupertino, Cal.
Marconi Elctrns. Inc., Elmsford, N.Y.
Microwave Power Devices, Plainview, N. Y.
Resdel Engrg. Corp., Arcadia, Cal.
Technical Mat'l., Mamaroneck, N.Y.

Amplifiers, Standing Wave

Bay Labs., Inc., Cleveland, Ohio
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Soltec Corp., No. Hollywood, Cal.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

Amplifiers, Strain Gauge—See Amplifiers, Transducer

Amplifiers, Sweep

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C-COR Elctrns., State College, Pa.
Gould Data Systems, Newton Upper Falls, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Intech, Santa Clara, Cal.
Jerrold Electronics Corp., Philadelphia, Pa.
Kay Elemetrics, Pine Brook, N.J.
Microwave Power Devices, Plainview, N. Y.
Millen, James Mfg., Malden, Mass.
Syntronic Instrs., Inc., Addison, Ill.
Wide Band Engrg. Co., Phoenix, Ariz.

Amplifiers, Synchro

Astrosystems, Inc., Lake Success, N.Y. Vol 1•327
Ind'l. Control Co., Farmingdale, N.Y. Vol 2•988
Transmagnetics Inc., Farmingdale, N. Y. Vol 1•379
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C & A Products, Inc., Woodside, N. Y.
Chesapeake Instr. Corp., Shadyside, Md.
Clifton Precision, Clifton Hgts., Pa.
Control Technology Co., L.I.C., N.Y.
Farrand Controls, Inc., Valhalla, N.Y.
Glentek, Inc., Santa Monica, Calif.
ILC Data Device Corp., Hicksville, N.Y.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Oeco Corp., Portland, Ore.
RCA Solid State Div., Somerville, N. J.
Republic Advanced System Technology Group, Chatsworth, Calif.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Co., Little Falls, N.J.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Transicoil, Inc., Worcester, Pa.
Vernitech, Deer Pk., N.Y.

Amplifiers, Telemetering

Scientific Communications, Garland, Tex. ..... Vol 1•567
Acromag, Inc., Wixom, Mich.
Aertech Inds., Sunnyvale, Calif.
Ailtech, City of Industry, Cal.
Analogic, Wakefield, Mass.
Applied Research Inc., Port Washington, N.Y.
Astrosystems, Inc., Lake Success, N.Y.
Avantek, Inc., Santa Clara, Cal.
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
C-COR Elctrns., State College, Pa.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Conic Corp., San Diego, Calif.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Control Technology Co., L.I.C., N.Y.
Dana Labs., Inc., Irvine, Calif.
Data-Control Systems, Danbury, Conn.
Dynalab Corp., Van Nuys, Cal.
Electronic Research Co., Shawnee Mission, Kan.
Fogg System Co., Denver, Col.
General Devices, Inc., Princeton, N.J.
Gould, Inc., Cleveland, Ohio
Gulton Inds., Inc., Metuchen, N.J.
ILC Data Device Corp., Hicksville, N.Y.
Intronics, Inc., Newton, Mass.
Lithic Systems, Inc., Cupertino, Cal.
MCL, Inc., La Grange, Ill.
Microwave Power Devices, Plainview, N. Y.
Microwave Semiconductor Corp., Somerset, N.J.
Neff Instr. Corp., Duarte, Calif.
OPtimax Inc., Colmar, Pa.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rosemount Inc., Minneapolis, Minn.
Solid State Elctrns. Corp., Sepulveda, Cal.
Soltec Corp., No. Hollywood, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Teledyne Geotech, Dallas, Tex.
Transmagnetics Inc., Farmingdale, N. Y.
Varian Assocs., Palo Alto, Cal.
Vega Precision Labs., Vienna, Va.
Watkins Johnson Co., Palo Alto, Cal.

Amplifiers, Thermocouple—See Amplifiers/Transducer

Amplifiers, Thyratron

Cober Elctrns., Inc., Stamford, Conn.
Coil Co. of Amer., Northvale, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

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Ectron Corp., San Diego, Cal... Vol 2•313
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Hathaway Instruments, Inc., Denver, Colo. ..... Vol 1•451
Ithaco, Inc., Ithaca, N.Y. ..... Vol 2•317
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Omega Engrg., Inc., Stamford, Conn. Vol 2•1173
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Active Control Instrumentation, E. Northport, NY
Advanced Kinetics, Costa Mesa, Calif.
AMF Electical Prods., Alexandria, Va.
Analogic, Wakefield, Mass.
Arvee Engrg. Co., Torrance, Calif.
Astrosystems, Inc., Lake Success, N.Y.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bell & Howell, Bridgeport, Conn.
Bell & Howell Co., Pasadena, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Circuit Technology, Farmingdale, N.Y.
CML-Macarr, Inc., Edison, N.J.
Coil Co. of Amer., Northvale, N.J.
Columbia Resch. Labs., Woodlyn, Pa.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Control Technology Co., L.I.C., N.Y.
Crown Int'l., Elkhart, Ind.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Datametrics Inc., Wilmington, Mass.
Datum, Inc., Anaheim, Calif.
Davidson Elctrn. Dev. Co., Erie, Pa.
Digiac Corp., Plainview, N.Y.

Doric Sci. Corp., San Diego, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Dytronics Co., Columbus, Ohio
Electronic Modules, Inc., Pasadena, Cal.
Endevco, Pasadena, Calif.
Fogg System Co., Denver, Col.
Junction Modules, Inc., Irvine, Cal.
General Radio Co., Concord, Mass.
Geo Space, Houston, Tex.
Gould, Inc., Cleveland, Ohio
Hawkeye Instrus., Inc., Marion, Iowa
Himmelstein, S. & Co., Elk Grove Village, Ill.
Honeywell, Denver, Colo.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Hybrid Sys. Corp., Burlington, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Inservco, Inc., La Grange, Ohio
Intech, Santa Clara, Cal.
Intronics, Inc., Newton, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Kelk, George Ltd., Don Mills, Ont., Canada
Kistler Instr. Co., Redmond, Wash.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Metrix Instr. Co., Houston, Tex.
Midland Standard Inc., Elgin, Ill.
Mini-Systems, Inc, North Attleboro, Mass.
Minnetech Labs, Minneapolis, Minn.
Neff Instr. Corp., Duarte, Calif.
Newport Labs., Inc., Santa Ana, Cal.
Opamp Labs. Inc., Los Angeles, Cal.
PCB Piezotronics, Inc., Depew, N.Y.
Perry Amplifier, Brookline, Mass.
Power Instrs., Skokie, Ill.
PPM, Inc., Bedford, Ohio
Schaevitz Engrg., Pennsauken, N.J.
Sensor Technology, Chatsworth, Cal.
Sensotec, Inc., Columbus, Ohio
Skan-A-Matic Corp., Elbridge, N. Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
SRC Div., Newport Bch., Cal.
Standard Controls, Seattle, Wash.
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Tektronix, Inc., Beaverton, Ore.
Telex Comm. Div., Minneapolis, Minn.
Telmar, Inc., Columbus, Ohio
Transducers, Inc., Whittier, Ca.
Tri-Tronics Co., Oak Brook, Ill.
United Detector Technology Inc., Santa Monica, Cal.
Validyne Engrg. Corp., Northridge, Cal.
W-F Products, Inc., Denver, Co.
West Coast Resch. Corp., Los Angeles, Calif.
Zeltex, Inc., Concord, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Traveling-Wave Tube

Cober Elctrns., Inc., Stamford, Conn. Vol 1•545
MCL, Inc., La Grange, Ill. .. Vol 1•551,552
Collins Radio Co., Dallas, Tex.
Energy Systems, Palo Alto, Cal.
Intech, Santa Clara, Cal.
Litton Inds., San Carlos, Calif.
Microwave Assocs., Inc., Burlington, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Sperry Elctrn. Tube, Gainesville, Fla.
Teledyne Mec., Palo Alto, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Travel Wave Tube Div., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.

Amplifiers, Tunnel Diode

Aertech Inds., Sunnyvale, Calif.
Miteq Inc., Hauppauge, N.Y.
RCA Elctrns. Comps., Harrison, N.J.

Amplifiers, Ultrasonic

CML-Macarr, Inc., Edison, N.J. Vol 1•644
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AMF Electical Prods., Alexandria, Va.
Arvee Engrg. Co., Torrance, Calif.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Dukane Corp., St. Charles, Ill.
Intronics, Inc., Newton, Mass.
James Elctrns., Inc., Chicago, Ill.
Krohn-Hite, Cambridge, Mass.
NUSonics, Inc., Paramus, N.J.
Panametrics Inc., Waltham, Mass.
Perry Amplifier, Brookline, Mass.
Quan-Tech, Whippany, N.J.
Signetics. Corp., Sunnyvale, Calif.
Uthe Technology Int'l., Sunnyvale, Cal.
Westinghouse Elec., Sykesville, Md.

Amplifiers, Vibration Pickup—
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American Astrionics, Costa Mesa, Cal Vol 1•321
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Advanced Kinetics, Costa Mesa, Calif.
Aertech Inds., Sunnyvale, Calif.
American Elctrn. Labs., Inc., Lansdale, Pa.
AMF Electical Prods., Alexandria, Va.
Arvee Engrg. Co., Torrance, Calif.
Avantek, Inc., Santa Clara, Cal.
Ballantine Laboratories, Inc., Boonton,, N. J.
Bell & Howell, Bridgeport, Conn.
Burr-Brown Resch. Corp., Tucson, Ariz.
C-COR Elctrns., State College, Pa.
CBS Laboratories, Stamford, Conn.
CELCO, Mahwah, N.J.
Clarke - Hess, New York, N.Y.
Collins Radio Co., Dallas, Tex.
Concord Communications Sys., Farmingdale, N.Y.
Dynair Elctrns. Inc., San Diego, Calif.
Dynalab Corp., Van Nuys, Cal.
Electro/Data, Inc., Garland, Tex.
Electronic Research Co., Shawnee Mission, Kan.
Energy Systems, Palo Alto, Cal.
Environmental Communications Inc., Santa Ana, Cal.
Gould Data Systems, Newton Upper Falls, Mass.
GRM Corp., Medford, N.J.
Honeywell, Denver, Colo.
Hope Elctrns., Clifton, N.J.
ILC Data Device Corp., Hicksville, N.Y.
Infodex, Inc., Waterbury, Conn.
Intech, Santa Clara, Cal.
Intronics, Inc., Newton, Mass.
ITI Electronics, Inc., Clifton, N.J.
Javelin Div., Apollo Lasers, Inc., Los Angeles, Ca.
Kay Elemetrics, Pine Brook, N.J.
Krohn-Hite, Cambridge, Mass.
Lasermetrics, Inc., Rochelle Park, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microphase Corp., Cos Cob, Conn.
Miteq Inc., Hauppauge, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Perry Amplifier, Brookline, Mass.
Radio Resch. Co., Rockaway, N.J.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
RIL Elctrns., Inc., Southampton, Pa.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Communications, Garland, Tex.
Shigoto Inds., Ltd., New York, N.Y.
Sierra Sys., Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
United Detector Technology Inc., Santa Monica, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Vega Precision Labs., Vienna, Va.

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Analogic, Wakefield, Mass.
Connor-Winfield Corp., West Chicago, Ill.
Datum, Inc., Anaheim, Calif.
Dickson Elctrns. Corp., Scottsdale, Ariz
Doric Sci. Corp., San Diego, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Glentek, Inc., Santa Monica, Calif.
Holt Instr. Labs., Oconto, Wisc.
Honeywell, Denver, Colo.
Ind'l. Test Equip., Clifton, NJ
Intech, Santa Clara, Cal.
Intronics, Inc., Newton, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Kepco, Inc., Flushing, N.Y.
Mini-Systems, Inc, North Attleboro, Mass.
Neff Instr. Corp., Duarte, Calif.
NH Research, Inc., Santa Ana, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Optimation, Inc., Chatsworth, Cal.
Signetics. Corp., Sunnyvale, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zeltex, Inc., Concord, Calif.

Amplifiers, Wideband

American Vector Inc., Springfield, N.J. Vol 1•926
CML-Macarr, Inc., Edison, N.J. Vol 1•644
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Advanced Kinetics, Costa Mesa, Calif.
Aertech Inds., Sunnyvale, Calif.
American Elctrn. Labs., Inc., Lansdale, Pa.
AMF Electical Prods., Alexandria, Va.
Anzac Elctrns., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif.
Arvin Sys., Inc., Dayton, Ohio
Avantek, Inc., Santa Clara, Cal.
Baganoff Assocs., Inc., St. Louis, Mo.
Ballantine Laboratories, Inc., Boonton,, N. J.
Bay Labs., Inc., Cleveland, Ohio
Bell & Howell, Bridgeport, Conn.
Bell & Howell Co., Pasadena, Calif.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
C-COR Elctrns., State College, Pa.
CELCO, Mahwah, N.J.
Chronetics, Inc., Mt. Vernon, N.Y.
Clarke - Hess, New York, N.Y.
Collins Radio Co., Dallas, Tex.
Composite Microcircuits, Waltham, Mass.
Computer Labs, Greensboro, N.C.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Dana Labs., Inc., Irvine, Calif.
Data-Control Systems, Danbury, Conn.
Doric Sci. Corp., San Diego, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Elcom Sys., Deer Pk., N.Y.
Electro-Optical Inds., Inc., Santa Barbara, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Energy Systems, Palo Alto, Cal.
Farinon Electric, San Carlos, Calif.
General Devices, Inc., Princeton, N.J.
General Radio Co., Concord, Mass.
GPS Corp., Framingham, Mass.
Halex, Inc., Torrance, Cal.
Honeywell, Denver, Colo.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Test Equip., Clifton, NJ
Instrs. For Ind., Inc., Farmingdale, N.Y.
Intech, Santa Clara, Cal.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Jerrold Electronics Corp., Philadelphia, Pa.
Keithley Instrs., Inc., Cleveland, Ohio
Krohn-Hite, Cambridge, Mass.
Lasermetrics, Inc., Rochelle Park, N.J.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
Lithic Systems, Inc., Cupertino, Cal.
Marconi Elctrns. Inc., Elmsford, N.Y.
MCL, Inc., La Grange, Ill.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microwave Power Devices, Plainview, N. Y.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Newport Labs., Inc., Santa Ana, Cal.
Opamp Labs. Inc., Los Angeles, Cal.
Optimation, Inc., Chatsworth, Cal.
Perry Amplifier, Brookline, Mass.
Princeton Applied Resch. Corp., Princeton, N.J.
Quan-Tech, Whippany, N.J.
Radiation Devices Co., Baltimore, Md.
Radio Resch. Co., Rockaway, N.J.
Raytheon, Mt. View, Calif.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Sierra Sys., Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Spectra Sonics, Ogden, Utah
SSR Instrs. Co., Santa Monica, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tektronix, Inc., Beaverton, Ore.
Teledyne Geotech, Dallas, Tex.
Teledyne Philbrick, Dedham, Mass.
Theta-Com CATV, Phoenix, Ariz
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Varian Assocs., Travel Wave Tube Div., Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.
Wide Band Engrg. Co., Phoenix, Ariz.
Zeltex, Inc., Concord, Calif.

Analog-To-Digital Converters
—See Converters, Analog-To-Digital

Analyzers, A-F

Advanced Dynamic Instrs. Div., Alexandria, Va.
A. P. Circuit Corp., New York, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
Federal Sci. Corp., New York, N.Y.
General Radio Co., Concord, Mass.
Kay Elemetrics, Pine Brook, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
London Co., Cleveland, Ohio
Marconi Instrs., Englewood, N.J.
Nelson Ross Elctrns., Lake Success, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Quan-Tech, Whippany, N.J.
Rockland Sys. Corp., W. Nyack, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Soltec Corp., No. Hollywood, Cal.

Spectral Dynamics Corp. San Diego, San Diego, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.
Tektronix, Inc., Beaverton, Ore.
Vibration Instrs. Co., Anaheim, Cal.
Voiceprint Laboratories Corp., Somerville, N. J.
Vu-data Corp., San Diego, Cal.
Wiltron Co., Palo Alto, Calif.

Analyzers, Antenna Pattern

Carco Elctrns., Menlo Park, Calif.
Dranetz Engrg. Labs., So. Plainfield, N.J.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Nelson Ross Elctrns., Lake Success, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Vari-L Co., Inc., Denver, Colo.
Watkins Johnson Co., Palo Alto, Cal.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

Analyzers, Coincidence

Beckman Instrs., (AISSD), Fullerton, Cal.
Chronetics, Inc., Mt. Vernon, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
NES, Inc., Itasca, Ill.
Soltec Corp., No. Hollywood, Cal.
3M Co., St. Paul, Minn.

Analyzers, Differential—See Analyzers, Phase & Voltage

Analyzers, Dispersion—See Analyzers, Spectrum

Analyzers, Distortion—See Analyzers, A-F

Analyzers, Engine (Gas & Diesel)

Tektronix, Inc., Beaverton, Ore.
Vol 1•513

Analyzers, Frequency—See Analyzers, Spectrum

Analyzers, Frequency Stability—See Meters, Frequency Deviation

Analyzers, Gas

Baganoff Assocs., Inc., St. Louis, Mo.
Barnes Engrg. Co., Stamford, Conn.
Datum, Inc., Anaheim, Calif.
Edwards High Vacuum, Grand Island, N.Y.
Gow-Mac Instr. Co., Madison, N.J.
High Voltage Engrg. Corp., Burlington, Mass.
Lion Precision Corp, Newton, Mass.
Taylor Instr. Process Control Div., Rochester, N.Y.
Uthe Technology Int'l., Sunnyvale, Cal.
Vacumetrics Inc., Waltham, Mass.
Whittaker Corp., Los Angeles, Cal.

Analyzers, Harmonic

A. P. Circuit Corp., New York, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Electro-Optical Inds., Inc., Santa Barbara, Cal.
Federal Sci. Corp., New York, N.Y.
General Radio Co., Concord, Mass.
London Co., Cleveland, Ohio
Marconi Instrs., Englewood, N.J.
Multimetric Industries, Richmond Hill, N.Y.
Nelson Ross Elctrns., Lake Success, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Quan-Tech, Whippany, N.J.
Railway Comm., Raytown, Mo.
Rockland Sys. Corp., W. Nyack, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.
Vibration Instrs. Co., Anaheim, Cal.
Vu-data Corp., San Diego, Cal.
Weston Instruments, Inc., Newark, N.J.

Analyzers, Interference

Bowmar/ALI, Inc., Acton, Mass.
Federal Sci. Corp., New York, N.Y.
Honeywell, Denver, Colo.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Sprague Elec. Co., No. Adams, Mass.

Analyzers, Intermodulation

Crown Int'l., Elkhart, Ind. ..... Vol 1•309
Collins Radio Co., Cedar Rapids, Iowa
London Co., Cleveland, Ohio
Marconi Instrs., Englewood, N.J.
Nelson Ross Elctrns., Lake Success, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Quan-Tech, Whippany, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Spectrum Instrs., Inc., New Rochelle, N.Y.

Analyzers, Magnetic

LDJ Electronics, Troy, Mich..... Vol 1•476
RFL Inds., Instr. Div., Boonton, N.J. Vol 1•497
Electro-Mechanics Co., Austin, Tex.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
High Voltage Engrg. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Magnaflux Corp., Chicago, Ill.
Oeco Corp., Portland, Ore.
Ohio Semitronics, Columbus, Ohio
Systron-Donner Corp., Concord, Cal.
Thomas & Skinner, Inc., Indianapolis, Ind.
Varian Assocs., Palo Alto, Cal.
O. S. Walker Co., Worcester, Mass.

Analyzers, Microwave

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alford Mfg. Co., Winchester, Mass.
AUL Instrs., Inc., Flushng, N.Y.
Collins Radio Co., Dallas, Tex.
Del Electronics Corp., Mt. Vernon, N.Y.
Electro/Data, Inc., Garland, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Loral Elctrn. Sys., Bronx, N.Y.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Nelson Ross Elctrns., Lake Success, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Rantec Div., Calabasas, Calif.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Systron-Donner Corp., Concord, Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
Systron-Donner Datapulse Div., Culver City, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.
Systron Donner Trygon Elctrns. Sub., Westbury, N.Y.
Tektronix, Inc., Beaverton, Ore.
Tucker Electronics Co., Garland, Tex.
Vari-L Co., Inc., Denver, Colo.
Watkins Johnson Co., Palo Alto, Cal.
Wiltron Co., Palo Alto, Calif.

Analyzers, Noise

Elgenco, Inc., Santa Monica, Cal. Vol 1•436-441
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
A. P. Circuit Corp., New York, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Bearing Inspection, Santa Fe Springs, Cal.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
Bowmar/ALI, Inc., Acton, Mass.
Chesterfield Prods. Inc., Saddle Brook, N. J.
Collins Radio Co., Dallas, Tex.
Columbia Resch. Labs., Woodlyn, Pa.
Electro-Optical Inds., Inc., Santa Barbara, Cal.
Elsytec, Inc., Syosset, N.Y.
Federal Sci. Corp., New York, N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Honeywell, Denver, Colo.
Kay Elemetrics, Pine Brook, N.J.
Milletron, Inc., Pittsburgh, Pa.
Nelson Ross Elctrns., Lake Success, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Pulsar Instruments, Inc., Redwood City, Cal.
Quan-Tech, Whippany, N.J.
Rockland Sys. Corp., W. Nyack, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Tracor, Inc., Austin, Tex.
Triplett Corp., Bluffton, Ohio
Vibration Instrs. Co., Anaheim, Cal.

Analyzers, Phase & Voltage

Dranetz Engrg. Labs., So. Plainfield, N.J. ..... Vol 1•427
Automated Meas., Oakland, Calif.
Baganoff Assocs., Inc., St. Louis, Mo.
Bowmar/ALI, Inc., Acton, Mass.
Dytronics Co., Columbus, Ohio
E-H Resch. Labs., Inc., Oakland, Cal.
Elsytec, Inc., Syosset, N.Y.
Federal Sci. Corp., New York, N.Y.
Feedback, Inc., Berkeley Hghts., N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
Gould, Inc., Cleveland, Ohio
Ithaco, Inc., Ithaca, N.Y.
Micro Instr. Co., Hawthorne, Cal.
NH Research, Inc., Santa Ana, Calif.
North Atlantic Inds., Plainview, N.Y.
Quan-Tech, Whippany, N.J.
Rantec Div., Calabasas, Calif.
Scientific-Atlanta, Inc., Atlanta, Ga.
Signal Analysis Oper., Hauppauge, N.Y.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Theta Instr. Corp., Fairfield, N.J.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Vibration Instrs. Co., Anaheim, Cal.
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.

Analyzers, Probability Density

B & K Instrs., Inc., Cleveland, Ohio
CELCO, Mahwah, N.J.
Elsytec, Inc., Syosset, N.Y.
Federal Sci. Corp., New York, N.Y.
Honeywell, Denver, Colo.
Nicolet Instr. Corp., Madison, Wisc.
Quan-Tech, Whippany, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Thermo Sys., Inc., St. Paul, Minn.

Analyzers, Probability Distribution—See Analyzers, Probability Density

Analyzers, Pulse

Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa. .. Vol 1•351
A. D. Data Sys., Inc., Rochester, N.Y.
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
EI Instruments, Derby, Conn.
Elsytec, Inc., Syosset, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
Micro Instr. Co., Hawthorne, Cal.
Nicolet Instr. Corp., Madison, Wisc.
Nuclear Data, Palatine, Ill.
Nuclear Meas. Corp., Indianapolis, Ind.
Packard Instrument Co., Inc., Downers Grove, Ill.
Quan-Tech, Whippany, N.J.
Soltec Corp., No. Hollywood, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.

Analyzers, Radar

Del Electronics Corp., Mt. Vernon, N.Y.
Electrac, Inc., Anaheim, Calif.
Elsytec, Inc., Syosset, N.Y.
Federal Sci. Corp., New York, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Metric Sys., Ft. Walton Beach, Fla.
Nelson Ross Elctrns., Lake Success, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Tektronix, Inc., Beaverton, Ore.
Watkins Johnson Co., Palo Alto, Cal.

Analyzers, Servo

Astrosystems, Inc., Lake Success, N.Y.
Bafco, Inc., Warminster, Pa.
Control Technology Co., L.I.C., N.Y.
Datum, Inc., Anaheim, Calif.
Feedback, Inc., Berkeley Hghts., N.J.
Ind'l. Control Co., Farmingdale, N.Y.
Infodex, Inc., Waterbury, Conn.
North Atlantic Inds., Plainview, N.Y.
Orbit Instr. Corp., Syosset, N.Y.
Singer Co., Little Falls, N.J.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Tasker Systems, Chatsworth, Cal.

Analyzers, Single-Sideband—See Analyzers, Spectrum

Analyzers, Sonic & Subsonic

Quan-Tech, Whippany, N.J. ..... Vol 1•496
Texscan Corp., Indianapolis, Ind. Vol 1•514
A. P. Circuit Corp., New York, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Baganoff Assocs., Inc., St. Louis, Mo.
Elsytec, Inc., Syosset, N.Y.
Federal Sci. Corp., New York, N.Y.
General Radio Co., Concord, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Kay Elemetrics, Pine Brook, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
Multimetric Industries, Richmond Hill, N.Y.
Nelson Ross Elctrns., Lake Success, N.Y.
NUSonics, Inc., Paramus, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Voiceprint Laboratories Corp., Somerville, N. J.
White Instrs., Inc., Austin, Tex.

Analyzers, Spectrum (Including Oscilloscopes With Plug-Ins)

Bafco, Inc., Warminster, Pa. .... Vol 1•393
Electro/Data, Inc., Garland, Tex. Vol 1•546
Quan-Tech, Whippany, N.J. ..... Vol 1•496
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal. ..... Vol 1•507
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal. ..... Vol 1•507
Systron-Donner Corp., Concord, Cal. Vol 1•510
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•510
Systron-Donner Datapulse Div., Culver City, Cal. ..... Vol 1•510
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal. ..... Vol 1•510
Systron-Donner Microwave Div., Van Nuys, Cal. ..... Vol 1•510
Tektronix, Inc., Beaverton, Ore. Vol 1•512
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
A. P. Circuit Corp., New York, N.Y.
AUL Instrs., Inc., Flushng, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Baganoff Assocs., Inc., St. Louis, Mo.
Beckman Instrs., (AISSD), Fullerton, Cal.
Bowmar/ALI, Inc., Acton, Mass.
Bowmar Instr. Corp., Ft. Wayne, Ind.

Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Damon Corp., Westwood, Mass.
Dynair Elctrns. Inc., San Diego, Calif.
Elsytec, Inc., Syosset, N.Y.
Federal Sci. Corp., New York, N.Y.
General Radio Co., Concord, Mass.
Heath Co., Benton Harbor, Mich.
Honeywell, Denver, Colo.
James Elctrns., Inc., Chicago, Ill.
Kay Elemetrics, Pine Brook, N.J.
Marconi Instrs., Englewood, N.J.
Multimetric Industries, Richmond Hill, N.Y.
Nelson Ross Elctrns., Lake Success, N.Y.
Nicolet Instr. Corp., Madison, Wisc.
Packard Instrument Co., Inc., Downers Grove, Ill.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Soltec Corp., No. Hollywood, Cal.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Spectrum Instrs., Inc., New Rochelle, N.Y.
SSR Instrs. Co., Santa Monica, Cal.
Systron Donner Trygon Elctrns. Sub., Westbury, N.Y.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Texscan Corp., Indianapolis, Ind.
Transducer Controls Corp., Covina, Calif.
Tucker Electronics Co., Garland, Tex.
Varian Assocs., Vacuum Div., Palo Alto, Cal.
Voiceprint Laboratories Corp., Somerville, N. J.
Weston Instruments, Inc., Newark, N.J.

Analyzers, Telemetric Data

ADC Prods., Minneapolis, Minn.
Beukers Labs., Inc., Hauppauge, N.Y.
Elsytec, Inc., Syosset, N.Y.
Metric Sys., Ft. Walton Beach, Fla.
Nelson Ross Elctrns., Lake Success, N.Y.
Signal Analysis Oper., Hauppauge, N.Y.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Tau-Tron, Inc., Lowell, Mass.
Video Research Corp., Gaithersburg, Md.
Watkins Johnson Co., Palo Alto, Cal.

Analyzers, Transfer Function

Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa. ..Vol 1•351
American Elctrn. Labs., Inc., Lansdale, Pa.
Bafco, Inc., Warminster, Pa.
Baganoff Assocs., Inc., St. Louis, Mo.
CELCO, Mahwah, N.J.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Federal Sci. Corp., New York, N.Y.
Feedback, Inc., Berkeley Hghts., N.J.
General Radio Co., Concord, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Optics Technology, Palo Alto, Calif.
Quan-Tech, Whippany, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Tasker Systems, Chatsworth, Cal.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Vari-L Co., Inc., Denver, Colo.
Vibration Instrs. Co., Anaheim, Cal.
Zoomar, Inc., Glen Cove, N.Y.

Analyzers, Ultrasonic

A. P. Circuit Corp., New York, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Chesapeake Instr. Corp., Shadyside, Md.
Elsytec, Inc., Syosset, N.Y.
Federal Sci. Corp., New York, N.Y.
General Radio Co., Concord, Mass.
Kinetic Tech., Inc., Santa Clara, Cal.
Magnaflux Corp., Chicago, Ill.
Nelson Ross Elctrns., Lake Success, N.Y.
NUSonics, Inc., Paramus, N.J.
Panametrics Inc., Waltham, Mass.
Quan-Tech, Whippany, N.J.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Techsonics, El Prado, N.M.

Analyzers, Vibration

Unholtz-Dickie Corp., Hamden, Conn. Vol 1•530
Advanced Dynamic Instrs. Div., Alexandria, Va.
American Elctrn. Labs., Inc., Lansdale, Pa.
B & K Instrs., Inc., Cleveland, Ohio
Bafco, Inc., Warminster, Pa.
Baganoff Assocs., Inc., St. Louis, Mo.
Bearing Inspection, Santa Fe Springs, Cal.
Bell & Howell Co., Pasadena, Calif.
Bowmar/ALI, Inc., Acton, Mass.
Dytronics Co., Columbus, Ohio
Electrac, Inc., Anaheim, Calif.
Elsytec, Inc., Syosset, N.Y.
Endevco, Pasadena, Calif.
Federal Sci. Corp., New York, N.Y.
General Radio Co., Concord, Mass.
Honeywell, Denver, Colo.
Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa.
Kay Elemetrics, Pine Brook, N.J.
Lion Precision Corp, Newton, Mass.
Metrix Instr. Co., Houston, Tex.
Nelson Ross Elctrns., Lake Success, N.Y.
Nicolet Instr. Corp., Madison, Wisc.
PCB Piezotronics, Inc., Depew, N.Y.
Quan-Tech, Whippany, N.J.
Reliance Elec. Co., Cleveland, Ohio
Robertshaw Controls Co., Richmond, Va.
Rohde & Schwarz Sls., Passaic, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Tektronix, Inc., Beaverton, Ore.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Vibration Instrs. Co., Anaheim, Cal.

Analyzers, Video—See Analyzers, Spectrum

Analyzers, Waveform—See Analyzers, Harmonic

Anechoic Chambers

Emerson & Cuming, Inc., Canton, Mass.
HRB-Singer, Inc., State College, Pa.
LectroMagnetics, Inc., Los Angeles, Cal.
Rantec Div., Calabasas, Calif.

Annunciators

Aerospace Avionics, Inc., Bohemia, N.Y.
Allard Instr. Corp., Westbury, NY
American Zettler, Irvine, Ca.
AMF Electical Prods., Alexandria, Va.
Applied Control Co., Fairfield, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Autocon Inds., Inc., Minneapolis, Minn.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Cognitronics Corp., Stamford, Conn.
Devco Engrg., W. Caldwell, N.J.
Dialight Corp., Brooklyn, N.Y.
Digitron Corp., Norristown, Pa.
Engdahl Enterprises, Costa Mesa, Cal.
Hathaway Instruments, Inc., Denver, Colo.
Henschel Corp., Amesbury, Mass.
Info-Lite Corp., Corona, N.Y.
Integrated Systems, Inc., Norcross, Ga.
Knowles Elctrns., Inc., Franklin Park, Ill.
Korry Mfg. Co., Seattle, Wash.
LVC Inds. Inc., Flushing, N.Y.
Major Data Corp., Costa Mesa, Cal.
Master Specialties, Costa Mesa, Cal.
Metra Instruments, Inc., Mt. View, Cal.
ONAN Div., Mpls., Minn.
Optron, Inc., Carrollton, Tex.
Penn Keystone Corp., Ansonia, Conn.
Re-el Circuits, Inc., Saddle Brook, N.J.
Stacoswitch, Inc., Costa Mesa, Cal.
Staver Co., Inc., Bay Shore, N.Y.
Switchcraft, Inc., Chicago, Ill.
TEC, Inc., Tucson, Ariz.
Worner Elctrn. Devices, Rankin, Ill.

Antenna Coils—See Coils, Antenna Loading

Antenna Couplers—See Couplers Antenna

Antenna Dummy Loads—See Dummy Loads

Antenna Feed Systems

Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Airtron, Morris Plains, N.J.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Anaren Microwave, Inc., Syracuse, N.Y.
Andrew Corp., Orland Pk., Ill.
Applied Research Inc., Port Washington, N.Y.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Gabriel Elctrns. Inc., Scarborough, Me.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Jerrold Electronics Corp., Philadelphia, Pa.
Lorch Elctrns. Corp., Englewood, N.J.
Maury Microwave Corp., Cucamonga, Calif.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Nurad, Inc., Baltimore, Md.
Phelps Dodge Comm., North Haven, Conn.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Systron-Donner Microwave Div., Van Nuys, Cal.
Tasker Systems, Chatsworth, Cal.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Inc., New York, N.Y.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.

Antenna Filters—See Filters, Antenna

Antenna Lightning Arresters —See Arresters, Lightning

Antenna Pattern Analyzers— See Analyzers, Antenna Pattern

Antenna Position Indicators— See Indicators, Antenna Position

Antenna Reflectors

Andrew Corp., Orland Pk., Ill.
Camusat Gueguen Telecom. Int'l., White Plains, N.Y.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Cubic Corp., San Diego, Cal.
E-Systems Inc., Dallas, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
Gabriel Elctrns. Inc., Scarborough, Me.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Jerrold Electronics Corp., Philadelphia, Pa.
Microflect Co., Salem, Ore.
Nurad, Inc., Baltimore, Md.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Rohn Mfg., Peoria, Ill.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sinclair Radio Labs., Maple, Ont., Can.
Stainless, Inc., N. Wales, Pa.
Teledyne Micronetics, San Diego, Calif.
TRG Prods., E. Boston, Mass.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Antenna Rotators (Industrial & Military)

ABA Industries, Inc., Pinellas Pk., Fla.
Alliance Mfg. Co., Alliance, Ohio
Allis, Louis Div., Milwaukee, Wisc.
American Elctrn. Labs., Inc., Lansdale, Pa.
Andrew Corp., Orland Pk., Ill.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Cornell-Dubilier Elctrns., Newark, N.J.
Datron Systems, Chatsworth, Cal.
GC Electronics, Rockford, Ill.
Geo Space Sys., Tampa, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
IE Mfg. Co., Chicago, Ill.
Ind'l. Control Co., Farmingdale, N.Y.
Lance Inds., Sylmar, Calif.
Meltronics Inc., Leeds, Ala.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Saxton Prods., Congers, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Superior Elec., Bristol, Conn.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Tasker Systems, Chatsworth, Cal.
Telrex Labs., Asbury Park, N.J.
Tri-Ex Tower Corp., Visalia, Calif.

Antenna Switching Matrices

A. D. Data Sys., Inc., Rochester, N.Y.
Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Andrew Corp., Orland Pk., Ill.
Applied Research Inc., Port Washington, N.Y.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Daico Inds. Inc., Compton, Cal.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Kilovac Corp., Santa Barbara, Cal.
LVC Inds. Inc., Flushing, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Transco Prods., Inc., Venice, Cal.
Trompeter Elctrns., Chatsworth, Cal.
Vega Precision Labs., Vienna, Va.

Antenna Towers & Supports

American Elctrn. Labs., Inc., Lansdale, Pa.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Camusat Gueguen Telecom. Int'l., White Plains, N.Y.
Copperweld Bimetallics, Glassport, Pa.
Craig Sys. Corp., Lawrence, Mass.
Elctrn. Comm., Inc., St. Petersburg, Fla.
GC Electronics, Rockford, Ill.
Henry Prods. Co., Inc., Inwood, N.Y.
IE Mfg. Co., Chicago, Ill.
Metric Sys., Ft. Walton Beach, Fla.
Microflect Co., Salem, Ore.
RCA Corp., Camden, N.J.
RF Systems, Inc., Cohasset, Mass.
Rohn Mfg., Peoria, Ill.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sitco Antennas, Portland, Ore.
South River Metal Prods. Co., South River, N.J.
Stainless, Inc., N. Wales, Pa.
Telrex Labs., Asbury Park, N.J.
Titchener, E.H. & Co., Binghamton, N.Y.
Tri-Ex Tower Corp., Visalia, Calif.
Up-Right Scaffolds, Berkeley, Calif.

Antennas, Airborne

Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Union, N.H.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Andrew Corp., Orland Pk., Ill.
Bendix Corp., Ft. Lauderdale, Fla.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Copperweld Bimetallics, Glassport, Pa.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Emergency Beacon Corp., New Rochelle, N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Henry Prods. Co., Inc., Inwood, N.Y.
HRB-Singer, Inc., State College, Pa.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Kaman Sciences Corp., Colorado Springs, Colo.
Loral Elctrn. Sys., Bronx, N.Y.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Microwave Prods., Inc., Chatsworth, Cal.

New-Tronics Corp., Brookpark, Ohio
Norden Div., Norwalk, Conn.
Nurad, Inc., Baltimore, Md.
Phelps Dodge Comm., North Haven, Conn.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Missile & Surface Radar Div., Moorestown, N.J.
Sinclair Radio Labs., Maple, Ont., Can.
Singer Co., Little Falls, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Inc., New York, N.Y.
Titchener, E.H. & Co., Binghamton, N.Y.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Vega Precision Labs., Vienna, Va.

Antennas, Direction Finding

Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Beukers Labs., Inc., Hauppauge, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
Electrospace Systems Inc., Richardson, Tex.
Emergency Beacon Corp., New Rochelle, N. Y.
Frequency Engrg. Labs., Farmingdale, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Henry Prods. Co., Inc., Inwood, N.Y.
HRB-Singer, Inc., State College, Pa.
Instrs. For Ind., Inc., Farmingdale, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Nurad, Inc., Baltimore, Md.
Premier Microwave, Port Chester, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Missile & Surface Radar Div., Moorestown, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Telrex Labs., Asbury Park, N.J.
Thomson-CSF Inc., New York, N.Y.
Titchener, E.H. & Co., Binghamton, N.Y.
TRG Prods., E. Boston, Mass.
Vega Precision Labs., Vienna, Va.

Antennas, Ground Plane

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Andrew Corp., Orland Pk., Ill.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Frequency Engrg. Labs., Farmingdale, N.J.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Denver, Colo.
Hunter Spring, Hatfield, Pa.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Jerrold Electronics Corp., Philadelphia, Pa.
Kreckman, Herb Co., Cresco, Pa.
Mobil Elctrns., Inc., Anderson, Ind.
New-Tronics Corp., Brookpark, Ohio
Nurad, Inc., Baltimore, Md.
Phelps Dodge Comm., North Haven, Conn.
Premax Prods. Div., Niagara Falls, N.Y.
Premier Microwave, Port Chester, N.Y.
Ratelco, Inc., Seattle, Wash.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sinclair Radio Labs., Maple, Ont., Can.
Systron-Donner Microwave Div., Van Nuys, Cal.
Telrex Labs., Asbury Park, N.J.
Thomson-CSF Inc., New York, N.Y.

Antennas, Helical

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Nucleonics Corp., Woodland Hills, Cal
Andrew Corp., Orland Pk., Ill.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
HRB-Singer, Inc., State College, Pa.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Marconi Elctrns. Inc., Elmsford, N.Y.
Premier Microwave, Port Chester, N.Y.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Sinclair Radio Labs., Maple, Ont., Can.
Tasker Systems, Chatsworth, Cal.
Thomson-CSF Inc., New York, N.Y.
Transco Prods., Inc., Venice, Cal.
Vega Precision Labs., Vienna, Va.

Antennas, Log-Periodic

Electro/Data, Inc., Garland, Tex.
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AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Andrew Corp., Orland Pk., Ill.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., Dallas, Tex.
E-Systems Inc., Dallas, Tex.
Electro-Mechanics Co., Austin, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Electrospace Systems Inc., Richardson, Tex.
GC Electronics, Rockford, Ill.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
HRB-Singer, Inc., State College, Pa.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Jerrold Electronics Corp., Philadelphia, Pa.
Lance Inds., Sylmar, Calif.
Marconi Elctrns. Inc., Elmsford, N.Y.
Nurad, Inc., Baltimore, Md.
Phelps Dodge Comm., North Haven, Conn.
Polarad Elctrn. Instrs., Lake Success, N.Y.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sinclair Radio Labs., Maple, Ont., Can.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Stainless, Inc., N. Wales, Pa.
Telrex Labs., Asbury Park, N.J.
Thomson-CSF Inc., New York, N.Y.
Vega Precision Labs., Vienna, Va.

Antennas, Loop

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Connector Corp., Chicago, Ill.
El-Rad Mfg. Co., Chicago, Ill.
Elctrn. Comm., Inc., St. Petersburg, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Denver, Colo.
Instrs. For Ind., Inc., Farmingdale, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RCA Parts & Accessories, Deptford, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Saxton Prods., Congers, N.Y.
Thomson-CSF Inc., New York, N.Y.
Tracor, Inc., Austin, Tex.

Antennas, Microwave

Vega Precision Labs., Vienna, Va.
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Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Union, N.H.
Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Andrew Corp., Orland Pk., Ill.
Camusat Gueguen Telecom. Int'l., White Plains, N.Y.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
Electro/Data, Inc., Garland, Tex.
Electro-Mechanics Co., Austin, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
Gabriel Elctrns. Inc., Scarborough, Me.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
HRB-Singer, Inc., State College, Pa.
Instrs. For Ind., Inc., Farmingdale, N.Y.
ITT Gilfillan Div. of ITT, Van Nuys, Calif.
Jerrold Electronics Corp., Philadelphia, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Microlab/FXR, Livingston, N.J.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
Narda Microwave Corp., Plainview, N.Y.
Nurad, Inc., Baltimore, Md.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
Raytheon Data Systems Co., Norwood, Mass.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Rohn Mfg., Peoria, Ill.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sinclair Radio Labs., Maple, Ont., Can.
Singer Co., Little Falls, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Stainless, Inc., N. Wales, Pa.
Systron-Donner Microwave Div., Van Nuys, Cal.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Inc., New York, N.Y.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Varian Assoc., Solid State East Div., Micro-Link Prods., Beverly, Mass
Waveline, Inc., W. Caldwell, N.J.

Antennas, Parabolic

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Andrew Corp., Orland Pk., Ill.
Camusat Gueguen Telecom. Int'l., White Plains, N.Y.
Collins Radio Co., Dallas, Tex.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
Gabriel Elctrns. Inc., Scarborough, Me.
Geo Space Sys., Tampa, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Jerrold Electronics Corp., Philadelphia, Pa.
Lance Inds., Sylmar, Calif.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Nurad, Inc., Baltimore, Md.
Premier Microwave, Port Chester, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sinclair Radio Labs., Maple, Ont., Can.
Stainless, Inc., N. Wales, Pa.
Tasker Systems, Chatsworth, Cal.
Thomson-CSF Inc., New York, N.Y.
TRG Prods., E. Boston, Mass.
Vega Precision Labs., Vienna, Va.

Antennas, Phased Array

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Airtron, Morris Plains, N.J.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Collins Radio Co., Dallas, Tex.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
Nurad, Inc., Baltimore, Md.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sinclair Radio Labs., Maple, Ont., Can.
Sitco Antennas, Portland, Ore.
Technical Mat'l., Mamaroneck, N.Y.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Inc., New York, N.Y.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Winegard Co., Burlington, Iowa

Antennas, Radar

Vega Precision Labs., Vienna, Va.
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AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Nucleonics Corp., Woodland Hills, Cal
Andrew Corp., Orland Pk., Ill.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Lockheed Elctrns. Co., Watchung, N.J.
Nurad, Inc., Baltimore, Md.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Co., Little Falls, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
Tasker Systems, Chatsworth, Cal.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Inc., New York, N.Y.
Titchener, E.H. & Co., Binghamton, N.Y.
TRG Prods., E. Boston, Mass.

Antennas, Rhombic

Continental Elctrns. Mfg. Co., Dallas, Tex.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Instrs. For Ind., Inc., Farmingdale, N.Y.
RCA Missile & Surface Radar Div., Moorestown, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Sinclair Radio Labs., Maple, Ont., Can.
Stainless, Inc., N. Wales, Pa.
Technical Mat'l., Mamaroneck, N.Y.
Thomson-CSF Inc., New York, N.Y.
Vega Precision Labs., Vienna, Va.

Antennas, Spiral

Electro/Data, Inc., Garland, Tex. Vol 1•547
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Electro-Mechanics Co., Austin, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Frequency Engrg. Labs., Farmingdale, N.J.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
HRB-Singer, Inc., State College, Pa.
Hunter Spring, Hatfield, Pa.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Kaman Sciences Corp., Colorado Springs, Colo.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Teledyne Micronetics, San Diego, Calif.
Telrex Labs., Asbury Park, N.J.
Thomson-CSF Inc., New York, N.Y.
Transco Prods., Inc., Venice, Cal.
Vega Precision Labs., Vienna, Va.

Antennas, Telemetry, Tracking

ABA Industries, Inc., Pinellas Pk., Fla.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Andrew Corp., Orland Pk., Ill.
Beukers Labs., Inc., Hauppauge, N.Y.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
E-Systems Inc., Dallas, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Geo Space Sys., Tampa, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Kaman Sciences Corp., Colorado Springs, Colo.
Nurad, Inc., Baltimore, Md.
Rantec Div., Calabasas, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Stainless, Inc., N. Wales, Pa.
Tasker Systems, Chatsworth, Cal.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Inc., New York, N.Y.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Vega Precision Labs., Vienna, Va.
Whittaker Corp., Los Angeles, Cal.

Antennas, Telescopic

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Andrew Corp., Orland Pk., Ill.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Craig Sys. Corp., Lawrence, Mass.
Geo Space Sys., Tampa, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hunter Spring, Hatfield, Pa.
K-W Engrg. Works, Menomonee Falls, Wisc.
Materials for Elctrns., Inc., Jamaica, N.Y.
New-Tronics Corp., Brookpark, Ohio
Peerless Industries Inc., Chicago, Ill.
Phelps Dodge Comm., North Haven, Conn.
Premax Prods. Div., Niagara Falls, N.Y.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Thomson-CSF Inc., New York, N.Y.
Tri-Ex Tower Corp., Visalia, Calif.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Antennas, Troposcatter

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Camusat Gueguen Telecom. Int'l., White Plains, N.Y.
Collins Radio Co., Dallas, Tex.
E-Systems Inc., Dallas, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
Gabriel Elctrns. Inc., Scarborough, Me.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Marconi Elctrns. Inc., Elmsford, N.Y.
Premier Microwave, Port Chester, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Telrex Labs., Asbury Park, N.J.
TRG Prods., E. Boston, Mass.

Antennas, WHIP & Accessories (Including Marine & Mobile Types)

Instrs. For Ind., Inc., Farmingdale, N.Y.
Pearce-Simpson, Miami, Fla.
Premax Prods. Div., Niagara Falls, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
RCA Missile & Surface Radar Div., Moorestown, N.J.
Tracor, Inc., Austin, Tex.

Anti-Static Compounds & Coatings—See Coatings, Anti-Static

Arc Lamp Power Supplies—See Power Supplies, Arc Lamp

Armatures—See Motor & Generator Armatures, Rotors, Stators

Arms, Phono, Transcription—See Phonographs, Parts & Accessories

Arresters, Electrical Surge-Also See Suppressors, Arc; Protectors, Surge

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Triac Elctrn. Sys., Forest Hills, N. Y. Vol 2•371
Victoreen Instr., Cleveland, Ohio Vol 2•1193
ATR Elctrns., Inc., St. Paul, Minn.
Basic Ceramics Inc., Hawthorne, N.J.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Electrons Co., Fairfield, N.J.
Integrated Systems, Inc., Norcross, Ga.
International Rectifier, El Segundo, Cal.
Joslyn Elctrn. Sys., Goleta, Cal.
Ross Engrg. Corp., Campbell, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Signalite, Neptune, N.J.
Tele-Dynamics/Wanlass, Fort Washington, Pa.
Transtector Systems, Monterey Park, Cal.

Arresters, Lightning

Telecommunications Inds. Inc., Copiague, N. Y. Vol 2•1141
Basic Ceramics Inc., Hawthorne, N.J.
Birnbach Co., Inc., Freeport, N.Y.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
Dale Elctrns., Inc., Yankton, S.D.
Electrons Co., Fairfield, N.J.
GC Electronics, Rockford, Ill.
Integrated Systems, Inc., Norcross, Ga.
Joslyn Elctrn. Sys., Goleta, Cal.
Lance Inds., Sylmar, Calif.
Landis & Gyr, Inc., Elmsford, N.Y.
Pure Carbon Co., Inc., St. Marys, Pa.
Saxton Prods., Congers, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Signalite, Neptune, N.J.
South River Metal Prods. Co., South River, N.J.
Transtector Systems, Monterey Park, Cal.

Attenuators, Audio

Re-el Circuits, Inc., Saddle Brook, N.J. Vol 1•320
Tech Labs., Inc., Palisades Pk., N.J. Vol 2•1140
Vishay Resistor Prod. Div., Malvern, Pa. Vol 3•1198
ADC Prods., Minneapolis, Minn.
Allen Avionics, Mineola, N.Y.
Allen-Bradley Co., Milwaukee, Wisc.
Altec Div., Anaheim, Calif.
Arra Inc., Bay Shore, N.Y.
Chesterfield Prods. Inc., Saddle Brook, N. J.
Clarostat Mfg. Co., Inc., Dover, N.H.
Components Specialties, Freeport, N.Y.
Duncan Elctrns., Costa Mesa, Cal.
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General Resistance, Inc., Mt. Vernon, N.Y.
Gotham Audio Corp., New York, N.Y.
GRM Corp., Medford, N.J.
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Kay Elemetrics, Pine Brook, N.J.
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Rohde & Schwarz Sls., Passaic, N.J.
Sennheiser Elctrn. Corp., New York, NY
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Arra Inc., Bay Shore, N.Y.
Barth Elctrns., Inc., Cleveland, Ohio
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
CES Elctrns., Brooklyn, N.Y.
Daico Inds. Inc., Compton, Cal.
Delta-Benco Ltd., Rexdale, Ont., Can.
E-H Resch. Labs., Inc., Oakland, Cal.
Edison Elctrns. Div., Manchester, N.H.
Elcom Sys., Deer Pk., N.Y.
Electro Impulse, Inc., Red Bank, N.J.
EMC Technology Inc, Cherry Hill, N.J.
Engelmann Microwave, Montville, N.J.
Fifth Dimension, Princeton, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Hope Elctrns., Clifton, N.J.
Jerrold Electronics Corp., Philadelphia, Pa.
Kay Elemetrics, Pine Brook, N.J.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Mini-Circuits Lab., Brooklyn, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
Nurad, Inc., Baltimore, Md.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Pyrofilm Corp., Whippany, N.J.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Sealectro Corp., Mamaroneck, N.Y.
Shallco, Inc., Smithfield, N.C.
Special Microwave Devices Oper., Waltham, Mass.
Telonic Inds., Inc., Laguna Beach, Calif.
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General Microwave Corp., Farmingdale, N.Y.
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General Resistance, Inc., Mt. Vernon, N.Y.
Hope Elctrns., Clifton, N.J.
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Rohde & Schwarz Sls., Passaic, N.J.
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Telonic Inds., Inc., Laguna Beach, Calif.
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Wiltron Co., Palo Alto, Calif.

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Applied Research Inc., Port Washington, N.Y.
Arra Inc., Bay Shore, N.Y.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
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Cir-Q-Tel, Kensington, Md.
Delta-Benco Ltd., Rexdale, Ont., Can.
Edison Elctrns. Div., Manchester, N.H.
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Electronautics, Littleton, Mass.
EMC Technology Inc, Cherry Hill, N.J.
Engelmann Microwave, Montville, N.J.
General Microwave Corp., Farmingdale, N.Y.
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General Resistance, Inc., Mt. Vernon, N.Y.
GRM Corp., Medford, N.J.
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Jerrold Electronics Corp., Philadelphia, Pa.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Narda Microwave Corp., Plainview, N.Y.
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Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
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Arra Inc., Bay Shore, N.Y.
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Cir-Q-Tel, Kensington, Md.
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Daico Inds. Inc., Compton, Cal.
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Hope Elctrns., Clifton, N.J.
Jerrold Electronics Corp., Philadelphia, Pa.
Kay Elemetrics, Pine Brook, N.J.
Lorch Elctrns. Corp., Englewood, N.J.
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Mini-Circuits Lab., Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
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PRD Elctrns., Inc., Westbury, N.Y.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
Shallco, Inc., Smithfield, N.C.
Sinclair Radio Labs., Maple, Ont., Can.
Special Microwave Devices Oper., Waltham, Mass.
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Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
Varian Assocs., Palo Alto, Cal.
Wavetek Indiana, Inc., Beech Grove, Ind.
Weinschel Engrg. Co., Gaithersburg, Md.

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Barth Elctrns., Inc., Cleveland, Ohio
Centralab Elctrns Div., Milwaukee, Wisc
Chesterfield Prods. Inc., Saddle Brook, N. J.
Edison Elctrns. Div., Manchester, N.H.
Elcom Sys., Deer Pk., N.Y.
Engelmann Microwave, Montville, N.J.
General Radio Co., Concord, Mass.
General Resistance, Inc., Mt. Vernon, N.Y.
Hope Elctrns., Clifton, N.J.
Jerrold Electronics Corp., Philadelphia, Pa.
Microlab/FXR, Livingston, N.J.
Mu-Del Elctrns., Silver Spring, Md.
Narda Microwave Corp., Plainview, N.Y.
Ohmite Mfg. Co., Skokie, Ill.
Premier Microwave, Port Chester, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Shallco, Inc., Smithfield, N.C.
Sinclair Radio Labs., Maple, Ont., Can.
Texscan Corp., Indianapolis, Ind.
Trompeter Elctrns., Chatsworth, Cal.
United Mineral & Chem. Corp., New York, N.Y.
Wavetek Indiana, Inc., Beech Grove, Ind.

Attenuators, Logarithmic

Allen-Bradley Co., Milwaukee, Wisc.
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Edison Elctrns. Div., Manchester, N.H.
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Ithaco, Inc., Ithaca, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
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Americon Microwave Inds., Inc., Waltham, Mass.
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AUL Instrs., Inc., Flushng, N.Y.
Avantek, Inc., Santa Clara, Cal.
Barth Elctrns., Inc., Cleveland, Ohio
CES Elctrns., Brooklyn, N.Y.
Cir-Q-Tel, Kensington, Md.
E & M Laboratories, Inc., Westlake Village, Cal.
Elcom Sys., Deer Pk., N.Y.
Electronautics, Littleton, Mass.
EMC Technology Inc, Cherry Hill, N.J.
Engelmann Microwave, Montville, N.J.
Fifth Dimension, Princeton, N.J.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
GHZ Devices, Inc., So. Chelmsford, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
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Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Pyrofilm Corp., Whippany, N.J.
Raytheon Co., Waltham, Mass.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sealectro Corp., Mamaroneck, N.Y.
Sinclair Radio Labs., Maple, Ont., Can.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Somerset Radiation Lab., Arlington, Va.
Systron-Donner Microwave Div., Van Nuys, Cal.
Technical Research & Mfg. Co., Manchester, N.H.
Telonic Inds., Inc., Laguna Beach, Calif.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Wavetek Indiana, Inc., Beech Grove, Ind.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

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American Aerospace Controls Inc., Farmingdale, N.Y.
Computer Labs, Greensboro, N.C.
Edison Elctrns. Div., Manchester, N.H.
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General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Ithaco, Inc., Ithaca, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Luft Instrs., Inc., Lincoln, Mass.
Marconi Instrs., Englewood, N.J.
Mini-Circuits Lab., Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Radio Resch. Co., Rockaway, N.J.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
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Systron-Donner Microwave Div., Van Nuys, Cal.
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Applied Research Inc., Port Washington, N.Y.
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Elctrn. Navigation Inds., Inc., Rochester, N.Y.
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Engelmann Microwave, Montville, N.J.
Fifth Dimension, Princeton, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
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Anaren Microwave, Inc., Syracuse, N.Y.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Carter Mfg. Corp., Hudson, Mass.
Centralab Elctrns Div., Milwaukee, Wisc
Clarostat Mfg. Co., Inc., Dover, N.H.
Comdel, Inc., Beverly, Mass.
Delta-Benco Ltd., Rexdale, Ont., Can.
Duncan Elctrns., Costa Mesa, Cal.
E & M Laboratories, Inc., Westlake Village, Cal.
Edison Elctrns. Div., Manchester, N.H.
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Engelmann Microwave, Montville, N.J.
Fairchild Sound Equip., Commack, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Gotham Audio Corp., New York, N.Y.
GRM Corp., Medford, N.J.
Ithaco, Inc., Ithaca, N.Y.
Jerrold Electronics Corp., Philadelphia, Pa.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.

Maury Microwave Corp., Cucamonga, Calif.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
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PRD Elctrns., Inc., Westbury, N.Y.
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Rohde & Schwarz Sls., Passaic, N.J.
Shallco, Inc., Smithfield, N.C.
Sinclair Radio Labs., Maple, Ont., Can.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Microwave Div., Van Nuys, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
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Vega Precision Labs., Vienna, Va.
Waveline, Inc., W. Caldwell, N.J.
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Datacom, Inc., Ft. Walton Bch., Fla.
Digital Equip. Corp., Maynard, Mass.
Dranetz Engrg. Labs., So. Plainfield, N.J.
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Junction Modules, Inc., Irvine, Cal.
Intronics, Inc., Newton, Mass.
Nicolet Instr. Corp., Madison, Wisc.
Nuclear Data, Palatine, Ill.
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Spectral Dynamics Corp. San Diego, San Diego, Cal.
Teledyne Philbrick, Dedham, Mass.
Unholtz-Dickie Corp., Hamden, Conn.

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Beckman Instrs., Cedar Grove, N.J.
Blue M Engrg. Co., Blue Island, Ill.
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Cambridge Thermionic, Cambridge, Mass
Cincinnati Sub-Zero Prods., Cincinnati, Ohio
Cox & Co., Inc., New York, N.Y.
Custom Sci. Instrs., Inc., Whippany, N.J.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Fisher Sci. Co., Pittsburgh, Pa.
Forma Scientific, Marietta, Ohio
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Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hotpack Corp., Phila., Pa.
Julie Research Lab., New York, N.Y.
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Leeds & Northrup Corp., No. Wales, Pa.
Plessey Enviromental Sys., San Diego, Cal.
Precision Sci. Co., Chicago, Ill.
Procedyne Corp., New Brunswick, N.J.
Rosemount Inc., Minneapolis, Minn.
Standard Environmental Systems, Inc., Totowa, N.J.
Statham Instrs., Inc., Oxnard, Cal.
Tenney Engrg., Inc., Union, N.J.
3M Co., St. Paul, Minn.
VirTis Co., Gardiner, N.Y.
Zeva Elec. Corp., Hanover, N.J.

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Allied Elctrns., Chicago, Ill.
Gould, Inc., St. Paul, Minn.
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RCA Elctrns. Comps., Harrison, N.J.
Shigoto Inds., Ltd., New York, N.Y.

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Ray-O-Vac Div., Madison, Wisc.
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Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Weinschel Engrg. Co., Gaithersburg, Md.
Weston Instruments, Inc., Newark, N.J.

Bridges, Calorimeter
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General Microwave Corp., Farmingdale, N.Y.
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Dranetz Engrg. Labs., So. Plainfield, N.J.
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Electro Sci. Inds., Portland, Ore.
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General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Heath Co., Benton Harbor, Mich.
Ind'l. Test Equip., Clifton, NJ
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Leeds & Northrup Corp., No. Wales, Pa.
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Millen, James Mfg., Malden, Mass.
PRD Elctrns., Inc., Westbury, N.Y.
Radiation Devices Co., Baltimore, Md.
RFL Inds., Comms. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Sennheiser Elctrn. Corp., New York, NY
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Electro Sci. Inds., Portland, Ore.
General Radio Co., Concord, Mass.
Ind'l. Test Equip., Clifton, NJ
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Epic, Inc., New York, N.Y.
Freudenberg, B., Inc., New York, N.Y.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Micro Instr. Co., Hawthorne, Cal.
Penn Airborne Prods., Southampton, Pa.
Teradyne, Inc., Boston, Mass.
Vishay Resistor Prod. Div., Malvern, Pa.

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Biddle, James G., Plymouth Meeting, Pa.
Bird Elctrn., Cleveland, Ohio
General Microwave Corp., Farmingdale, N.Y.
Narda Microwave Corp., Plainview, N.Y.
New-Tronics Corp., Brookpark, Ohio
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Cox & Co., Inc., New York, N.Y.
Dale Elctrns., Inc., Columbus, Neb.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro Sci. Inds., Portland, Ore.
Fogg System Co., Denver, Col.
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General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
General Resistance, Inc., Mt. Vernon, N.Y.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hipotronics, Inc., Brewster, N.Y.
Ind'l. Test Equip., Clifton, NJ
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Marconi Instrs., Englewood, N.J.
Micro Instr. Co., Hawthorne, Cal.
Oxford Instr. Corp., Annapolis, Md.
Penn Airborne Prods., Southampton, Pa.
Precision Standards Corp., Santa Ana, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
RFL Inds., Instr. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Rosemount Inc., Minneapolis, Minn.
Simpson Elec. Co., Chicago, Ill.
Slaughter Co., Ardmore, Okla.
Solatron Enterprises, Inglewood, Calif.
Sticht, Herman H. Co., Inc., New York, N.Y.
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Wiltron Co., Palo Alto, Calif.

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Carco Elctrns., Menlo Park, Calif.
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General Microwave Corp., Farmingdale, N.Y.
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Jerrold Electronics Corp., Philadelphia, Pa.
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Millen, James Mfg., Malden, Mass.
Narda Microwave Corp., Plainview, N.Y.
New-Tronics Corp., Brookpark, Ohio
Pace Div., Harbor City, Calif.
Radiation Devices Co., Baltimore, Md.
Rohde & Schwarz Sls., Passaic, N.J.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
Weinschel Engrg. Co., Gaithersburg, Md.
Wide Band Engrg. Co., Phoenix, Ariz.
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General Radio Co., Concord, Mass.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.

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Doric Sci. Corp., San Diego, Calif.
Electro Sci. Inds., Portland, Ore.
Freudenberg, B., Inc., New York, N.Y.
General Radio Co., Concord, Mass.
Julie Research Lab., New York, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Micro Instr. Co., Hawthorne, Cal.
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Gould, Inc., Cleveland, Ohio
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Keystone Elctrns. Corp., New York, N.Y.
Kwikset Powdered Metal Prods., Anaheim, Cal.
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Beechwood Mfg., Indpls., Ind.
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Digital Equip. Corp., Maynard, Mass.
Douglas Electronics, Inc., San Leandro, Cal.
Falstrom Co., Passaic, N.J.
Fisher Sci. Co., Pittsburgh, Pa.
Foxboro Co., Foxboro, Mass.
General Devices, Inc., Princeton, N.J.
General Elec. Company, Providence, R.I.
Grant Hardware Co., W. Nyack, N.Y.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
High Voltage Engrg. Corp., Burlington, Mass.
Hoffman Engrg. Co., Anoka, Minn.
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Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Ingersoll Prods., Chicago, Ill.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Janitrol Aero Div., Columbus, Ohio
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Lear Siegler, Inc., Santa Monica, Calif.
LMB Heeger, Inc., Los Angeles, Calif.
Lyon Metal Prod., Inc., Aurora, Ill.
Metal Works, Inc., Herman, Mo.
Micrite Metal Mfg., Inc., Canoga Park, Cal.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Midget Louver Co., Norwalk, Conn.
Mobil Elctrns., Inc., Anderson, Ind.
Modpak, Waltham, Mass.
NES, Inc., Itasca, Ill.
Newcomb Audio Prods. Co., Sylmar, Calif.
Panelgraphic Corp., Caldwell, N.J.
Par-Metal Prods. Div., Brooklyn, N.Y.
Perfection Mica Co., Bensenville, Ill.
Photo Chemical Prods. Cal., Santa Monica, Cal.
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Scientific-Atlanta, Inc., Atlanta, Ga.
Standard Environmental Systems, Inc., Totowa, N.J.
Stanford Applied Engrg., Santa Clara, Cal.
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Allied Elctrns., Chicago, Ill.
Althor Prods., Brooklyn, N.Y.
Central Plastics Dists., Chicago, Ill.
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Hudson Wire Co, Ossining, N Y
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Revere Elctrn. Div., Wallingford, Conn.
Standard Wire & Cable, Los Angeles, Cal.
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Times Wire & Cable, Wallingford, Conn.
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Whitmor Wire & Cable, No. Hollywood, Cal.
Wire Research Corp., Chatsworth, Cal.
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Lear Siegler, Anaheim, Cal.
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Victor Wire & Cable, L.A., Cal.
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Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dearborn Wire & Cable Co., Rosemont, Ill.
Hatfield Wire & Cable Div., Linden, N.J.
Lynn Elctrns. Corp., Feasterville, Pa.
Okonite Co., Ramsey, N.J.
Pace Wire & Cable Corp., Oceanside, N.Y.
Phelps Dodge Comm., North Haven, Conn.
Shigoto Inds., Ltd., New York, N.Y.
Standard Wire & Cable, Los Angeles, Cal.
Superior Cable Div., Hickory, N.C.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
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Belden Corp. Elctrn. Div., Richmond, Ind.
Berk Tek, Inc., Reading, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Brand-Rex Co., Willimantic, Conn.
CCA Elctrns. Corp., Gloucester, N.J.
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Daburn Elctrns. & Cable Corp., Bronx, N.Y.
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Flexible Circuits, Inc., Warrington, Pa.
Gore, W.L. & Assocs., Inc., Newark, Del.
Hatfield Wire & Cable Div., Linden, N.J.
Hughes Aircraft Co., Connecting Devices, Newport Beach, Cal.
Jerrold Electronics Corp., Philadelphia, Pa.
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Kaman Sciences Corp., Colorado Springs, Colo.
Manhattan Elec. Cable Corp., Brooklyn, N.Y.
Markel, L. Frank & Sons, Norristown, Pa.
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Pace Wire & Cable Corp., Oceanside, N.Y.
Phelps Dodge Comm., North Haven, Conn.
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Reynolds Metals Co., Richmond, Va.
RF Systems, Inc., Cohasset, Mass.
Standard Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
Times Wire & Cable, Wallingford, Conn.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
Uniform Tubes, Collegeville, Pa.
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Cimco Wire & Cable, Allendale, N.J.
Cities Svc. Co., Chester, N.Y.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dearborn Wire & Cable Co., Rosemont, Ill.
ITT Surprenant Div., Clinton, Mass.
Judd Wire Div., Burlington, Mass.
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Standard Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
Times Wire & Cable, Wallingford, Conn.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
Victor Wire & Cable, L.A., Cal.
Whitmor Wire & Cable, No. Hollywood, Cal.
Wire Research Corp., Chatsworth, Cal.
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ARI Inds., Inc., Franklin Pk., Ill.
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De Soto Elec. Prods., De Soto, Mo.
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Dielectric Sciences, Burlington, Mass
Electrol Co., Inc., York, Pa.
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Paraplegics Mfg., Bensenville, Ill.
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Projects Unlimited, Inc., Dayton, Ohio
Quantrol Elctrns., Inc., El Paso, Tex.
Revere Elctrn. Div., Wallingford, Conn.
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Signet Scientific Co., Burbank, Cal.
Sitco Antennas, Portland, Ore.
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Spectra-Strip Corp., Garden Grove, Cal.
Standard Wire & Cable, Los Angeles, Cal.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Switchcraft, Inc., Chicago, Ill.
Technical Research & Mfg. Co., Manchester, N.H.
Teledyne Positive Connector, Ansonia, Conn.
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Vega Precision Labs., Vienna, Va.
Viking Inds., Inc., Chatsworth, Calif.
Virginia Panel Corp., Waynesboro, Va.
Weinschel Engrg. Co., Gaithersburg, Md.
Wire Research Corp., Chatsworth, Cal.

Wireflex Inc., Calumet City, Ill.
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HAPCO, Boulder, Colo.
Heath Co., Benton Harbor, Mich.
Innovatek Enterprise, Millerton, N.Y.
Monroe, Calculator Co., Orange, N.J.
Solitron Devices, San Diego, Cal.
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Victor Comptometer Corp., Chicago, Ill.
Wang Labs., Inc., Tewksbury, Mass.

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Advanced Dynamic Instrs. Div., Alexandria, Va.
Anchor Specialty Mfg., Teterboro, N.J.
B & K Instrs., Inc., Cleveland, Ohio
Endevco, Pasadena, Calif.
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Maury Microwave Corp., Cucamonga, Calif.
Micro-Tel Corp., Baltimore, Md.
Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
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Solid State Elctrns. Corp., Sepulveda, Cal.
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General Resistance, Inc., Mt. Vernon, N.Y.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
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CAI Div. Bourns Inc., Barrington, Ill.
Chadwick-Helmuth Co., Inc., Monrovia, Calif.
Cole Instrument Corp., Costa Mesa, Cal.
Fairchild Space & Defense Sys., Syosset, N.Y.
Heitz, Karl, Inc., New York, N.Y.
McDonnell Douglas Electronics Co., St. Charles, Mo.
PSC Technology Inc., Glendale, Cal.
Tech Serv., Inc., Fogelsville, Pa.
Teledyne Camera Sys., Arcadia, Cal.
3M Co., St. Paul, Minn.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Cameras, Image Converter
Advanced Kinetics, Costa Mesa, Calif.
Chemical Etching Equip. & Supply, Alexandria, Va.
Circon Corp., Santa Barbara, Ca.
Nuclear Data, Palatine, Ill.
RCA Govt. & Comm. Sys., Moorestown, N.J.
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Westinghouse Elec., Elmira, N.Y.
Wild Heerbrugg Instrs., Farmingdale, N.Y.

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R.C.A. Aerospace Sys. Div., Burlington, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Research Devices, Berkeley Heights, N.J.
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CAI Div. Bourns Inc., Barrington, Ill.
Dumont Oscilloscope Labs., Inc., W. Caldwell, N.J.
General Microwave Corp., Farmingdale, N.Y.
Heitz, Karl, Inc., New York, N.Y.
PSC Technology Inc., Glendale, Cal.
Tech Serv., Inc., Fogelsville, Pa.
Tektronix, Inc., Beaverton, Ore.
Teledyne Camera Sys., Arcadia, Cal.
Test & Measuring Instrs. Inc., Hicksville, N.Y.

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Bunting, Brass & Bronze Co., Toledo, Ohio
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Mechanical Engraving Co., Inc., Bronx, N.Y.

Micrite Metal Mfg., Inc., Canoga Park, Cal.
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Balco Capacitors, Orange, N.J.
Chicago Condenser Corp., Chicago, Ill.
Condenser Prods. Corp., Brooksville, Fla.
Electro Motive Mfg., Willimantic, Conn.
Elctrn. Concepts, Inc., Eatontown, N.J.
Epic, Inc., New York, N.Y.
Erie Technological Prods. (EEM), Erie, Pa.
Film Capacitors, Inc., Passaic, N.J.
Filtron Co., Flushing, N.Y.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Lab. Assocs., Norwich, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Industrial Condenser Corp., Chicago, Ill.
Interelectronics Corp., Congers, N.Y.
Int'l. Components Corp., Farmingdale, N. Y.
ITT Jennings, Monrovia, Cal.
Lapp Insulator Div., Interpace Corp., LeRoy, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Mallory Capacitor Co., Indpls., Ind.
Maxwell Labs., Inc., San Diego, Calif.
Mepco, Inc., Morristown, N.J.
M.I.A.L. U.S.A., Inc., Nutley, N.J.

Microwave Filter Co., Inc., East Syracuse, N.Y.
Murata Mfg. Co. Ltd., Kyoto, Japan
NCI, Inc., W. Palm Beach, Fla.
Nucleonic Prods., Canoga Pk, Cal.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
RF Interonics, Bay Shore, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
S & E I Mfg., Northridge, Cal.
San Fernando Elec. Mfg., San Fernando, Cal.
Sangamo Elec. Co., Pickens, S.C.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
Tobe Deutschmann Labs., Inc., Canton, Mass.
TRW Capacitors, Ogallala, Neb.
United Mineral & Chem. Corp., New York, N.Y.
USCC/Centralab, Elctrns. Div., Burbank, Cal.
Vitramon, Inc., Bridgeport, Conn.
Wesco Elec. Co., Inc., Greenfield, Mass.

Capacitors, Fixed, Laboratory Standard

American Tech. Ceramics, Huntington Sta., N.Y.
ARCO Elctrns., Inc., Great Neck, N.Y.
Boonton Elctrns., Parsippany, N.J.
Condenser Prods. Corp., Brooksville, Fla.
Electro Sci. Inds., Portland, Ore.
Electrocube, San Gabriel, Cal
Elctrn. Assocs., W. Long Branch, N.J.
F-Dyne Elctrns., Bridgeport, Conn.
Film Capacitors, Inc., Passaic, N.J.
General Radio Co., Concord, Mass.
Mallory Capacitor Co., Indpls., Ind.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
S & E I Mfg., Northridge, Cal.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
TRW Capacitors, Ogallala, Neb.
Vitramon, Inc., Bridgeport, Conn.

Capacitors, Fixed, Mica

ARCO Elctrns., Inc., Great Neck, N.Y. Vol 3•361
Custom Elctrns., Oneonta, N.Y. Vol 3•411
Del Electronics Corp., Mt. Vernon, N.Y. Vol 3•436
Electro Motive Mfg., Willimantic, Conn. Vol 3•441
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Illinois Capacitor Sls. Co., Chicago, Ill. Vol 4•319*
Sangamo Elec. Co., Pickens, S.C. Vol 3•498
Soshin Elec. Co., Tokyo, Japan Vol 3•501
Amp Inc., Harrisburg, Pa.
Cornell-Dubilier Elctrns., Newark, N.J.
Erie Technological Prods. (EEM), Erie, Pa.
General Lab. Assocs., Norwich, N.Y.
Materials for Elctrns., Inc., Jamaica, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Tobe Deutschmann Labs., Inc., Canton, Mass.
United Mineral & Chem. Corp., New York, N.Y.

Capacitors, Fixed, Molded Composition

Airco Speer Elctrns, Div. Airco, Inc., Bradford, Pa. ..... Vol 3•519

Capacitors, Fixed, Monolithic

Republic Elctrns. Corp., Paterson, N.J. Vol 3•495
Varadyne Capacitors, Santa Monica, Cal. ..... Vol 3•512-514
American Tech. Ceramics, Huntington Sta., N.Y.
AVX Ceramics Corp., Myrtle Beach, S.C.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
ITT Jennings, Monrovia, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
Johanson Mfg. Corp., Boonton, N.J.
Mepco, Inc., Morristown, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
United Mineral & Chem. Corp., New York, N.Y.
USCC/Centralab, Elctrns. Div., Burbank, Cal.

Capacitors, Fixed, Mylar

ARCO Elctrns., Inc., Great Neck, N.Y. Vol 3•361
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Component Resch., Santa Monica, Cal. Vol 3•370
Del Electronics Corp., Mt. Vernon, N.Y. Vol 3•436
Electro Motive Mfg., Willimantic, Conn. Vol 3•441
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Chicago Condenser Corp., Chicago, Ill.
Condenser Prods. Corp., Brooksville, Fla.
Cornell-Dubilier Elctrns., Newark, N.J.
Electrocube, San Gabriel, Cal
Elctrn. Assocs., W. Long Branch, N.J.
Elctrn. Concepts, Inc., Eatontown, N.J.
Film Capacitors, Inc., Passaic, N.J.
Filtron Co., Flushing, N.Y.
General Instr. Corp., Capacitor Div., Chicopee, Mass.
Hipotronics, Inc., Brewster, N.Y.
Industrial Condenser Corp., Chicago, Ill.
Int'l. Components Corp., Farmingdale, N. Y.
Int'l. Elctrns. Corp., Melville, N.Y.
ITT Jennings, Monrovia, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
LectroMagnetics, Inc., Los Angeles, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Mepco, Inc., Morristown, N.J.
M.I.A.L. U.S.A., Inc., Nutley, N.J.
Nucleonic Prods., Canoga Pk, Cal.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Paktron Div., Vienna, Va.
Presin Co., Inc., Shelton, Conn.
RF Interonics, Bay Shore, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Sangamo Elec. Co., Pickens, S.C.
Seacor, Inc., Norwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Stettner-Trush Inc., Cazenovia, N.Y.
Texas Capacitor Co., Inc., Houston, Tex.
Tobe Deutschmann Labs., Inc., Canton, Mass.
United Mineral & Chem. Corp., New York, N.Y.

Capacitors, Fixed, Mylar, Metallized

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Engineered Components Co., Gardena, Cal.
Film Capacitors, Inc., Passaic, N.J.
Filtron Co., Flushing, N.Y.
Industrial Condenser Corp., Chicago, Ill.
Int'l. Components Corp., Farmingdale, N. Y.
Int'l. Elctrns. Corp., Melville, N.Y.
ITT Jennings, Monrovia, Cal.
LectroMagnetics, Inc., Los Angeles, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Mepco, Inc., Morristown, N.J.
Nucleonic Prods., Canoga Pk, Cal.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Paktron Div., Vienna, Va.
Plastic Capacitors, Inc., Chicago, Ill.
Presin Co., Inc., Shelton, Conn.
RF Interonics, Bay Shore, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
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Seacor, Inc., Norwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Soshin Elec. Co., Tokyo, Japan
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Stettner-Trush Inc., Cazenovia, N.Y.
Texas Capacitor Co., inc., Houston, Tex.
United Mineral & Chem. Corp., New York, N.Y.

Capacitors, Fixed, Oil

ARCO Elctrns., Inc., Great Neck, N.Y.
Chicago Condenser Corp., Chicago, Ill.
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Condenser Prods. Corp., Brooksville, Fla.
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Del Electronics Corp., Mt. Vernon, N.Y.
Film Capacitors, Inc., Passaic, N.J.
Filtron Co., Flushing, N.Y.
General Radio Co., Concord, Mass.
Gudeman Corp., Chicago, Ill.
Hipotronics, Inc., Brewster, N.Y.
Industrial Condenser Corp., Chicago, Ill.
ITT Jennings, Monrovia, Cal.
Mallory Capacitor Co., Indpls., Ind.
Maxwell Labs., Inc., San Diego, Calif.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
RF Interonics, Bay Shore, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Sangamo Elec. Co., Pickens, S.C.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
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Int'l. Elctrns. Corp., Melville, N.Y.
ITT Jennings, Monrovia, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
RF Interonics, Bay Shore, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Stettner-Trush Inc., Cazenovia, N.Y.
Wesco Elec. Co., Inc., Greenfield, Mass.

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Filtron Co., Flushing, N.Y.
Industrial Condenser Corp., Chicago, Ill.
Int'l. Components Corp., Farmingdale, N. Y.
Int'l. Elctrns. Corp., Melville, N.Y.
ITT Jennings, Monrovia, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Nytronics, Inc., Darlington Div., Darlington, S.C.
RF Interonics, Bay Shore, N.Y.
S & E I Mfg., Northridge, Cal.
San Fernando Elec. Mfg., San Fernando, Cal.
Sangamo Elec. Co., Pickens, S.C.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Stettner-Trush Inc., Cazenovia, N.Y.
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Capacitors, Fixed, Photoflash

General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. Vol 3•446,447
Cinefot International Corp., New York, N.Y.
Cornell-Dubilier Elctrns., Newark, N.J.
Del Electronics Corp., Mt. Vernon, N.Y.
Film Capacitors, Inc., Passaic, N.J.
ITT Jennings, Monrovia, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
Sprague Elec. Co., No. Adams, Mass.
Tobe Deutschmann Labs., Inc., Canton, Mass.
TRW Capacitors, Ogallala, Neb.
United Mineral & Chem. Corp., New York, N.Y.

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Components Specialties, Freeport, N.Y.
Condenser Prods. Corp., Brooksville, Fla.
Elctrn. Concepts, Inc., Eatontown, N.J.
Film Capacitors, Inc., Passaic, N.J.
Filtron Co., Flushing, N.Y.
Industrial Condenser Corp., Chicago, Ill.
Interelectronics Corp., Congers, N.Y.
Int'l. Components Corp., Farmingdale, N. Y.
Int'l. Elctrns., Melville, N.Y.
Int'l. Elctrns. Corp., Melville, N.Y.
ITT Jennings, Monrovia, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Mepco, Inc., Morristown, N.J.
M.I.A.L. U.S.A., Inc., Nutley, N.J.
Nucleonic Prods., Canoga Pk, Cal.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Paktron Div., Vienna, Va.
Plastic Capacitors, Inc., Chicago, Ill.
S & E I Mfg., Northridge, Cal.
San Fernando Elec. Mfg., San Fernando, Cal.
Seacor, Inc., Norwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Soshin Elec. Co., Tokyo, Japan
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Stettner-Trush Inc., Cazenovia, N.Y.
Texas Capacitor Co., Inc., Houston, Tex.
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United Mineral & Chem. Corp., New York, N.Y.

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Cornell-Dubilier Elctrns., Newark, N.J.
Electrocube, San Gabriel, Cal
Elctrn. Concepts, Inc., Eatontown, N.J.
Engineered Components Co., Gardena, Cal.
Film Capacitors, Inc., Passaic, N.J.
Filtron Co., Flushing, N.Y.
Industrial Condenser Corp., Chicago, Ill.
Interelectronics Corp., Congers, N.Y.
Int'l. Components Corp., Farmingdale, N. Y.
Int'l. Elctrns., Melville, N.Y.
Int'l. Elctrns. Corp., Melville, N.Y.
ITT Jennings, Monrovia, Cal.
Matsuo Elec. Co., Ltd., Toyonaka-shi, Osaka, Japan
Maxwell Labs., Inc., San Diego, Calif.
Mepco, Inc., Morristown, N.J.
Nucleonic Prods., Canoga Pk, Cal.
Nytronics, Inc., Darlington Div., Darlington, S.C.
San Fernando Elec. Mfg., San Fernando, Cal.
Sangamo Elec. Co., Pickens, S.C.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Stettner-Trush Inc., Cazenovia, N.Y.
Texas Capacitor Co., Inc., Houston, Tex.
United Mineral & Chem. Corp., New York, N.Y.
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Capacitors, Fixed, Polyester

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Del Electronics Corp., Mt. Vernon, N.Y. Vol 3•436
F-Dyne Elctrns., Bridgeport, Conn. Vol 3•444
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Electrocube, San Gabriel, Cal
Engineered Components Co., Gardena, Cal.
Film Capacitors, Inc., Passaic, N.J.
Int'l. Elctrns. Corp., Melville, N.Y.
ITT Jennings, Monrovia, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
Mepco, Inc., Morristown, N.J.
Nucleonic Prods., Canoga Pk, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Stettner-Trush Inc., Cazenovia, N.Y.
TRW Capacitors, Ogallala, Neb.
United Mineral & Chem. Corp., New York, N.Y.
Wesco Elec. Co., Inc., Greenfield, Mass.

Capacitors, Fixed, Polystyrene

ARCO Elctrns., Inc., Great Neck, N.Y. Vol 3•357-359
Balco Capacitors, Orange, N.J. Vol 3•362,363
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Centralab Elctrns Div., Milwaukee, Wisc
Chicago Condenser Corp., Chicago, Ill.
Condenser Prods. Corp., Brooksville, Fla.
Electrocube, San Gabriel, Cal
Elctrn. Assocs., W. Long Branch, N.J.
Elctrn. Concepts, Inc., Eatontown, N.J.
Engineered Components Co., Gardena, Cal.
Film Capacitors, Inc., Passaic, N.J.
Filtron Co., Flushing, N.Y.
Industrial Condenser Corp., Chicago, Ill.
Interelectronics Corp., Congers, N.Y.
Int'l. Components Corp., Farmingdale, N. Y.
Int'l. Elctrns., Melville, N.Y.
Int'l. Elctrns. Corp., Melville, N.Y.
ITT Jennings, Monrovia, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Mepco, Inc., Morristown, N.J.
M.I.A.L. U.S.A., Inc., Nutley, N.J.
Nucleonic Prods., Canoga Pk, Cal.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
Presin Co., Inc., Shelton, Conn.
San Fernando Elec. Mfg., San Fernando, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Texas Capacitor Co., Inc., Houston, Tex.
TRW Capacitors, Ogallala, Neb.
United Mineral & Chem. Corp., New York, N.Y.

Capacitors, Fixed, Polysulfone

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Film Capacitors, Inc., Passaic, N.J.
ITT Jennings-Monrovia, San Jose, Cal.
Shigoto Inds., Ltd., New York, N.Y.
TRW Capacitors, Ogallala, Neb.
Wesco Elec. Co., Inc., Greenfield, Mass.

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Electro-Science Labs., Pennsauken, N. J.
ITT Jennings, Monrovia, Cal.
JFD Elctrns., Bklyn., N.Y.
Johanson/Monolithic Dielectrics Div., Burbank, Cal.
Nytronics, Inc., Darlington Div., Darlington, S.C.
United Mineral & Chem. Corp., New York, N.Y.
Vitramon, Inc., Bridgeport, Conn.

Capacitors, Fixed, Power Factor Correction

Cinefot International Corp., New York, N.Y.
Condenser Prods. Corp., Brooksville, Fla.
Cornell-Dubilier Elctrns., Newark, N.J.
Del Electronics Corp., Mt. Vernon, N.Y.
Elctrn. Concepts, Inc., Eatontown, N.J.
Filtron Co., Flushing, N.Y.
Interelectronics Corp., Congers, N.Y.
ITT Jennings, Monrovia, Cal.
Nytronics, Inc., Darlington Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
RF Interonics, Bay Shore, N.Y.
S & E I Mfg., Northridge, Cal.
Sangamo Elec. Co., Pickens, S.C.
Sprague Elec. Co., No. Adams, Mass.
TRW Capacitors, Ogallala, Neb.
United Mineral & Chem. Corp., New York, N.Y.
Vitramon, Inc., Bridgeport, Conn.

Capacitors, Fixed, Pulse-Forming Network

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Amp Inc., Harrisburg, Pa.
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Cornell-Dubilier Elctrns., Newark, N.J.
Custom Elctrns., Oneonta, N.Y.
Del Electronics Corp., Mt. Vernon, N.Y.
EMC Technology Inc, Cherry Hill, N.J.
F-Dyne Elctrns., Bridgeport, Conn.
Filtron Co., Flushing, N.Y.
General Lab. Assocs., Norwich, N.Y.
Hipotronics, Inc., Brewster, N.Y.
ITT Jennings, Monrovia, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Nucleonic Prods., Canoga Pk, Cal.
Plastic Capacitors, Inc., Chicago, Ill.
San Fernando Elec. Mfg., San Fernando, Cal.
Soshin Elec. Co., Tokyo, Japan
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Metric Sys., Ft. Walton Beach, Fla.
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Singer Co., Little Falls, N.J.
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Scientific Measurements, Wilmette, Ill.
Signal Analysis Oper., Hauppauge, N.Y.
Singer Co., Little Falls, N.J.
Standard Logic, Santa Ana, Cal.
Stanford Applied Engrg., Santa Clara, Cal.
Struthers-Dunn, Inc., Pitman, N.J.
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Tenor Co., Inc., New Berlin, Wisc.
Transducer Controls Corp., Covina, Calif.
Wyle Computer Prods., Inc., El Segundo, Calif.
Xerox Data Sys., El Segundo, Cal

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PRD Elctrns., Inc., Westbury, N.Y.

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Bay Prods., Phila., Pa.
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Clean Room Prods., Farmingdale, N.Y.
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Equipto, Aurora, Ill.
General TV Network, Ferndale, Mich.
Labconco Corp., Kansas City, Mo.
Mann, Henry Inc., Feasterville, Pa.
Metropolitan Wire Goods, Wilkes-Barre, Pa.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Mobil Elctrns., Inc., Anderson, Ind.
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Optima Enclosures, Tucker, Ga.
Peerless Industries Inc., Chicago, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Stackbin Corp., Pawtucket, R.I.
Sturdilite Sci. Furniture Sys., Plainwell, Mich
Tektronix, Inc., Beaverton, Ore.
Titchener, E.H. & Co., Binghamton, N.Y.
Warwick Prods. Co., Independence, Ohio
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Bogen Div., Paramus, N.J.
Bud Radio, Willoughby, Ohio
Craig Sys. Corp., Lawrence, Mass.
Davies, Harry Molding Co., Chicago, Ill.
Dura Plastics N.Y., Inc., Westport, Conn.
E-Tronics, Sepulveda, Cal.
Edo Western Corp., Salt Lake City, Utah
El Instruments, Derby, Conn.
Electronic Enclosures, Los Angeles, Cal.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
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Jonard Inds. Corp., Bronx, N.Y.
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Kinetron Corp., Asbury Park, N.J.
Micrite Metal Mfg., Inc., Canoga Park, Cal.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Miller, W. A. Co., Oquossoc, Me.
M M Elctrn. Enclosures, Hicksville, N.Y.
Mobil Elctrns., Inc., Anderson, Ind.
Modpak, Waltham, Mass.
NVF Co., Yorklyn, Del.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Scientific-Atlanta, Inc., Atlanta, Ga.
Simpson Elec. Co., Chicago, Ill.
Skydyne A Brooks & Perkins Co., Port Jervis, N.Y.
South Shore Metal Prods., Inc., Farmingdale, N.Y.
TA Mfg. Corp., Los Angeles, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
Waldom Elctrns., Inc., Chicago, Ill.
Warwick Prods. Co., Independence, Ohio

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Bud Radio, Willoughby, Ohio
Cabtron Sys., Inc., Northbrook, Ill.
Craig Sys. Corp., Lawrence, Mass.
Douglas Electronics, Inc., San Leandro, Cal.
Dura Plastics N.Y., Inc., Westport, Conn.
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Falstrom Co., Passaic, N.J.
Formica Metal Prods. Co., Inc., Medford, Mass.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Honeywell Inc., Wabash, Ind.
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Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Kinetron Corp., Asbury Park, N.J.
Micrite Metal Mfg., Inc., Canoga Park, Cal.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Miller, W. A. Co., Oquossoc, Me.
M-M Elctrn. Enclosures, Hicksville, N.Y.
Mobil Elctrns., Inc., Anderson, Ind.
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Skydyne A Brooks & Perkins Co., Port Jervis, N.Y.
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Copperweld Bimetallics, Glassport, Pa.
Delta-Benco Ltd., Rexdale, Ont., Can.
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Environmental Communications Inc., Santa Ana, Cal.
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Kalart Victor Corp., Plainville, Conn.
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Technical Research & Mfg. Co., Manchester, N.H.
Terado Corp., St. Paul, Minn.
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Theta-Com CATV, Phoenix, Ariz
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Waveline, Inc., W. Caldwell, N.J.
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Collins Radio Co., Dallas, Tex.
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Frequency Engrg. Labs., Farmingdale, N.J.
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Malco, A Microdot Co., Inc., Chicago, Ill.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
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PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
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Advanced Dynamic Instrs. Div., Alexandria, Va.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
BLH Elctrns., Inc., Waltham, Mass.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Electro-Numerics, Santa Clara, Cal.
Kelk, George Ltd., Don Mills, Ont., Canada
Kistler Instr. Co., Redmond, Wash.
Kulite Semiconductor Prod., Ridgefield, N.J.
Orbit Instr. Corp., Syosset, N.Y.
Ormond Inc., Santa Fe Springs, Cal.
Revere Elctrn. Div., Wallingford, Conn.
Schaevitz Engrg., Pennsauken, N.J.
Sensotec, Inc., Columbus, Ohio
Standard Controls, Seattle, Wash.
Thwing-Albert Instr. Co., Philadelphia, Pa.
Toledo Scale, Toledo, Ohio
Transducer Controls Corp., Covina, Calif.
Transducers, Inc., Whittier, Ca.
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Intermatic, Spring Grove, Ill.
Mitsumi Elec. Co., Ltd., Kitatamagun, Tokyo, Japan
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Moririca Elctrns., Ltd., Tozuka-ku, Yokohama, Japan
Photomation, Inc., Mountain View, Calif.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
Quantrol Elctrns., Inc., El Paso, Tex.
Raytheon Co., Burlington, Mass.
Santa Barbara Resch. Ctr., Goleta, Calif.
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Moririca Elctrns., Ltd., Tozuka-ku, Yokohama, Japan
Santa Barbara Resch. Ctr., Goleta, Calif.
Spectronics, Inc., Richardson, Tex.
United Detector Technology Inc., Santa Monica, Cal.
Weston Instruments, Inc., Newark, N.J.

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Anchor Specialty Mfg., Teterboro, N.J.
Beckman Instrs., (AISSD), Fullerton, Cal.
Custom Sci. Instrs., Inc., Whippany, N.J.
Genisco Technology Corp., Instrument Div. (Test Equipment), Compton, Cal.
Lab-Line Instrs., Inc., Melrose Park, Ill.
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Hotpack Corp., Phila., Pa.
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T-M Vacuum Prods., Riverton, N.J.
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Elgin Elctrns. Inc., Waterford, Pa.
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Power Control Corp., Pittsburgh, Pa.
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RCA, Mobile Communications Sys., Meadow Lands, Pa.
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Solidstate Controls, Inc., Columbus, Ohio
Todd Products Corp., Farmingdale, N.Y.
Topaz Electronics, San Diego, Cal.
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E-Tronics, Sepulveda, Cal.
EI Instruments, Derby, Conn.
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Elctrn. Molding Corp., Woonsocket, R.I.
GC Electronics, Rockford, Ill.
GRM Corp., Medford, N.J.
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Mobil Elctrns., Inc., Anderson, Ind.
Modpak, Waltham, Mass.
Monitor Systems, Ft. Washington, Pa
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Par-Metal Prods. Div., Brooklyn, N.Y.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Re-el Circuits, Inc., Saddle Brook, N.J.
Titchener, E.H. & Co., Binghamton, N.Y.
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Vero Electronics, Inc., Hauppauge, N.Y.
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Circuit Structures Lab., Burbank, Calif.
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IFE Div., E. Providence, R. I.
Jade Corp., Huntingdon Valley, Pa.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Kinetron Corp., Asbury Park, N.J.
LMB Heeger, Inc., Los Angeles, Calif.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Micrite Metal Mfg., Inc., Canoga Park, Cal.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Mobil Elctrns., Inc., Anderson, Ind.
Mupac Corp., Brockton, Mass.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Robinson-Nugent, New Albany, Ind.
Stantron, No. Hollywood, Cal.
Titchener, E.H. & Co., Binghamton, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
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Allied Chemical Corp., Morristown, N.J.
Baker, J.T. Chemical Co., Phillipsburg, N.J.
Barco Chem. Prods. Co., Chicago, Ill.
Bariod Div., Houston, Tex.
Conversion Chem. Corp., Rockville, Conn.
Dow Chemical Co., Midland, Mich.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Fidelity Chem. Prods. Corp., Newark, N.J.
GAF Corp., New York, N.Y.
Goldsmith Precious Metals Div., Chicago, Ill.
Harshaw Chem. Co., Cleveland, Ohio
London Chemical Co., Bensenville, Ill.
M & T Chemicals Inc., Rahway, N.J.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Selectrons, Ltd., New York, N.Y.
Sifco Metachemical, Cleveland, Ohio
Technic, Inc., Providence, R.I.
Union Carbide, Chemicals & Plastics, New York, N.Y.
Uniroyal, Inc., New York, N.Y.
United Mineral & Chem. Corp., New York, N.Y.

Chemicals, Epoxy Stripping
Bariod Div., Houston, Tex.
Conversion Chem. Corp., Rockville, Conn.
Hardman Inc., Belleville, N.J.
Miller-Stephenson Chem. Co., Inc., Danbury, Conn.
Mona Inds., Inc., Paterson, N.J.
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Chemicals, Etching
Air Prods. & Chems., Inc., Allentown, Pa.
Allied Chemical Corp., Morristown, N.J.
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Baker, J.T. Chemical Co., Phillipsburg, N.J.
Chemplast, Inc., Wayne, N.J.
Conversion Chem. Corp., Rockville, Conn.
Dow Chemical Co., Midland, Mich.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Fidelity Chem. Prods. Corp., Newark, N.J.
GAF Corp., New York, N.Y.
Gates, Geo. W. & Co., Franklin Sq., N.Y.
GC Electronics, Rockford, Ill.
Gore, W.L. & Assocs., Inc., Newark, Del.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Matheson Gas Products, East Rutherford, N.J.
Mona Inds., Inc., Paterson, N.J.
Packaged Resins Div., Watertown, Mass.
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Black Light Corp. Amer., San Gabriel, Cal.
Cerac, Inc., Butler, Wisc.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
Shannon Luminous Mat'ls., Hollywood, Cal.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
United Mineral & Chem. Corp., New York, N.Y.

Chemicals, Metal Stripping
Allied Chemical Corp., Morristown, N.J.
Bariod Div., Houston, Tex.
Conversion Chem. Corp., Rockville, Conn.
Fidelity Chem. Prods. Corp., Newark, N.J.
GAF Corp., New York, N.Y.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Technic, Inc., Providence, R.I.

Chemicals, Photosensitive
Dow Chemical Co., Midland, Mich.
GC Electronics, Rockford, Ill.

General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
Goldsmith Precious Metals Div., Chicago, Ill.
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Vari-Light Corp., Cincinnati, Ohio

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CGS Units, Inc., Rochester, N.Y.
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Materials Resch. Corp., Orangeburg, N.Y.
Matheson Gas Products, East Rutherford, N.J.
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Ferrodyne Corp., Venice, Calif.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Huntington Elctrns. Corp., Van Nuys, Cal.
Mag-Con, Inc., New Brighton, Minn.
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Geo Space, Houston, Tex.
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Mag-Con, Inc., New Brighton, Minn.
Magnetic Circuit Elements, Monterey, Cal.
North Electric Co., Galion, Ohio
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Ohmite Mfg. Co., Skokie, Ill.
Pico Elctrns Inc., Mount Vernon, N.Y.
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Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
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Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Magnetic Circuit Elements, Monterey, Cal.
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Shallcross, Selma, N.C.
Shigoto Inds., Ltd., New York, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Stanford Applied Engrg., Santa Clara, Cal.
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Delevan Div., Coil Prods., E. Aurora, N.Y.
Dietz Design, Inc., Belton, Mo.
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Electrocube, San Gabriel, Cal
Elgin Elctrns. Inc., Waterford, Pa.
Ferrodyne Corp., Venice, Calif.
Freed Transformer Co., Bklyn., N.Y.
Geo Space, Houston, Tex.
Grand Transformers, Grand Haven, Mich.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
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Lambda Elctrns., Melville, N.Y.
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Torwico Elctrns., Inc., Lakewood, N.J.
Triad-Utrad Div., Huntington, Ind.
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Zaring Inds., Inc., Westfield, Ind.

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Co-Operative Inds., Inc., Chester, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
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Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Climatronics Corp., Hauppauge, N.Y.
Electro-Optical Inds., Inc., Santa Barbara, Cal.
Elctrn. Applications, S. El Monte, Cal.
Firing Circuits, Norwalk, Conn.
General Magnetics, Bloomfield, N.J.
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Guildline Instrs., Inc., Larchmont, N.Y.
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Ind'l. Control Co., Farmingdale, N.Y.
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James Elctrns., Inc., Chicago, Ill.
Oak Inds. Inc., Crystal Lake, Ill.
Philamon, Inc., Westbury, N.Y.
Power Control Corp., Pittsburgh, Pa.
Raytheon, Mt. View, Calif.
Singer Co., Little Falls, N.J.
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GTI Corp. (E), Pittsburgh, Pa.
Keystone Elctrns. Corp., New York, N.Y.
Lockheed Elctrns. Co., Watchung, N.J.
Methode Elctrns., Inc., Chicago, Ill.
Metric Sys., Ft. Walton Beach, Fla.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Midland Standard Inc., Elgin, Ill.
Pomona Elctrns. Co., Inc., Pomona, Cal.
Power/Mate, Hackensack, N.J.
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Croven, Ltd., Whitby, Ont., Can.
Curtis Dev. & Mfg., Milwaukee, Wisc.
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E-T-A Prods. Co. America, Chicago, Ill.
GC Electronics, Rockford, Ill.
GTE Sylvania Inc., Danvers, Mass.
Hartman Electrical Mfg., Mansfield, Ohio
Kessler-Ellis Prods., Atlantic Highlands, N.J.
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Square D Co., Park Ridge, Ill.
Texas Instruments, Attleboro, Mass.
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Wadsworth Elec. Mfg. Co., Inc., Covington, Ky.
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Bureau Engraving, Inc., Minneapolis, Minn.
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Cinch-Graphik, Oper. of TRW Elctrn. Comps., City of Industry, Cal.
Flex-Link Products, Inc., San Fernando, Cal.
Flexible Circuits, Inc., Warrington, Pa.
Gore, W.L. & Assocs., Inc., Newark, Del.
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ITT Cannon Electric, Santa Ana, Cal.
Lockheed Elctrns. Co., Watchung, N.J.
Methode Elctrns., Inc., Chicago, Ill.
Rogers Corp., Rogers, Conn.
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Micro Networks, Worcester, Mass.
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Mini-Systems, Inc, North Attleboro, Mass.
National Semiconductor, Santa Clara, Cal.
Norsal Industries, Inc., Brentwood, N.Y.
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R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Sprague Elec. Co., No. Adams, Mass.
Statek Corp., Orange, Cal.
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Teledyne Semiconductor, Mountain View, Cal.
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Lithic Systems, Inc., Cupertino, Cal.
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National Semiconductor, Santa Clara, Cal.
Precision Monolithics Inc., Santa Clara, Cal.
Raytheon, Mt. View, Calif.
Signetics. Corp., Sunnyvale, Calif.
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Sprague Elec. Co., No. Adams, Mass.
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Beckman Instrs., Helipot Div., Fullerton, Cal.
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Bureau Engraving, Inc., Minneapolis, Minn.
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Collins Radio Co., Dallas, Tex.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
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HRB-Singer, Inc., State College, Pa.
Hybrid Technology Corp., Arlington, Tex.,
ILC Data Device Corp., Hicksville, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
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Kates Scientific Instrs., Inc., Watertown, Mass.
Micropac Inds., Inc., Garland, Tex.
OPtimax Inc., Colmar, Pa.
Pulse Engrg., Inc., San Diego, Cal.
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Sensor Technology, Chatsworth, Cal.
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Hysol Div., Olean, N.Y.
Int'l. Elctrn. Resch., Burbank, Cal.
Krylon, Norristown, Pa.
Materials for Elctrns., Inc., Jamaica, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Merix Chem. Co., Chicago, Ill.
Methode Elctrns., Inc., Chicago, Ill.
Murata Mfg. Co. Ltd., Kyoto, Japan
Packaged Resins Div., Watertown, Mass.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Techni-Tool, Inc., Philadelphia, Pa.
Thin Film Services, Gile, Wisc.
Thomas & Betts Co., Elizabeth, N.J.
Triac Elctrn. Sys., Forest Hills, N. Y.
Union Carbide, San Diego, Cal.
Union Carbide, Indpls., Ind.
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Esco Products, Oak Ridge, NJ
Evaporated Coatings, Inc., Huntingdon Valley, Pa.
Hardman Inc., Belleville, N.J.
Krylon, Norristown, Pa.
M & T Chemicals Inc., Rahway, N.J.
N L Inds., Inc., Paint Div., New York, N. Y.
Optics International, Tenafly, N.J.
Oriel Corp. of America, Stamford, Conn.
Pennsylvania Ind'l. Chem. Corp., Clairton, Pa.
Photo Chemical Prods. Cal., Santa Monica, Cal.
SWS Silicones Div., Adrian, Mich.
Thin Film Services, Gile, Wisc.
3M Co., St. Paul, Minn.
Union Carbide, Chemicals & Plastics, New York, N.Y.
Western Coating Co., Royal Oak, Mich.

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Alpha Metals, Inc., Jersey City, N.J.
Conversion Chem. Corp., Rockville, Conn.
Heliotek, Sylmar, Calif.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Krylon, Norristown, Pa.
London Chemical Co., Bensenville, Ill.
Materials Resch. Corp., Orangeburg, N.Y.
Naz-Dar Int'l., Chicago, Ill.
Randolph Prods. Co., Carlstadt, N.J.
Thin Film Services, Gile, Wisc.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Union Carbide, Chemicals & Plastics, New York, N.Y.

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Conap, Inc., Allegany, N.Y.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Krylon, Norristown, Pa.
N L Inds., Inc., Paint Div., New York, N. Y.
Randolph Prods. Co., Carlstadt, N.J.
Shannon Luminous Mat'ls., Hollywood, Cal.
3M Co., St. Paul, Minn.

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Dolph, John C. Co., Monmouth Junction, N.J.
Dow Chemical Co., Midland, Mich.
E.I. DuPont DeNemours & Co., Wilmington, Del.
GAF Corp., New York, N.Y.
GC Electronics, Rockford, Ill.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Millen, James Mfg., Malden, Mass.
Miller-Stephenson Chem. Co., Inc., Danbury, Conn.
N L Inds., Inc., Paint Div., New York, N. Y.
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Dow Corning Corp., Midland, Mich.
Electro Mats. Corp. Amer., Mamaroneck, N.Y.
Electro-Science Labs., Pennsauken, N. J.
Emerson & Cuming, Inc., Canton, Mass.
Epoxy Technology, Watertown, Mass.
GAF Corp., New York, N.Y.
GC Electronics, Rockford, Ill.
General Elec. Co., Waterford, N.Y.
Hardman Inc., Belleville, N.J.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
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Loctite Corp., Newington, Conn.
LPS Research Labs., Los Angeles, Cal.
MacDonald & Co., Glendale, Calif.
Materials Resch. Corp., Orangeburg, N.Y.
Merix Chem. Co., Chicago, Ill.
National Beryllia Corp., Haskell, N.J.
Packaged Resins Div., Watertown, Mass.
Randolph Prods. Co., Carlstadt, N.J.
Sprayon Prods., Inc., Bedford Hgts., Ohio
Stock Drive Prods., New Hyde Pk., N.Y.
SWS Silicones Div., Adrian, Mich.
Tech Spray, Amarillo, Tex.
Thermalloy Co., Inc., Dallas, Tex.
3M Co., St. Paul, Minn.
Union Carbide, Chemicals & Plastics, New York, N.Y.
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Epoxy Technology, Watertown, Mass.
Epoxylite Corp., Anaheim, Calif.
Evaporated Coatings, Inc., Huntingdon Valley, Pa.
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Tech Spray, Amarillo, Tex.
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3M Co., St. Paul, Minn.
Union Carbide, Chemicals & Plastics, New York, N.Y.
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Merix Chem. Co., Chicago, Ill.
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Solder Removal Co., Covina, Cal.
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Sterling, Sewickley, Pa.
SWS Silicones Div., Adrian, Mich.
Tech Spray, Amarillo, Tex.
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Tempil Div., So. Plainfield, N.J.
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EWC, Inc., Kenilworth, N.J.
GC Electronics, Rockford, Ill.
Grayhill Inc., LaGrange, Ill.
Grayhill Moldtronics, Inc., Downers Grove, Ill.
Gries Reproducer Co., New Rochelle, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Harbison Ind'l. Prods., Inc., Levittown, Pa.
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Chesterfield Prods. Inc., Saddle Brook, N. J.
Coil Craft Inc., Bronxville, N.Y.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Computer Comps., Jamaica, N.Y.
Dietz Design, Inc., Belton, Mo.
Freed Transformer Co., Bklyn., N.Y.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Magnetico, Inc., E. Northport, N.Y.
Microtran Co. Inc., Valley Stream, N.Y.
Phoenix Transformer Co., Phoenix, Ariz.
Pulse Engrg., Inc., San Diego, Cal.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Torotel, Inc., Grandview, Mo.
TRW Elctrnc. Functions, Candem, N.J.
United Prods. Co., New Hyde Pk., N.Y.

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Millen, James Mfg., Malden, Mass. Vol 3•527
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ADC Prods., Minneapolis, Minn.
Aladdin Elctrns., Nashville, Tenn.
Allen Avionics, Mineola, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
Automatic Coil, New Hyde Pk., N.Y.
Bicron Elctrns. Co., Canaan, Conn.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Clippard Instr., Inc., Cincinnati, Ohio
Coil Craft Inc., Bronxville, N.Y.
Coil Specialty Co., Boalsburg, Pa.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Components Specialties, Freeport, N.Y.
Computer Comps., Jamaica, N.Y.
Dale Elctrns., Inc., Yankton, S.D.
Dietz Design, Inc., Belton, Mo.
E-Systems, Inc., Memcor Div., Huntington, Ind.
El-Rad Mfg. Co., Chicago, Ill.
Endicott Coil Co., Binghamton, N.Y.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Microtran Co. Inc., Valley Stream, N.Y.
Mitsumi Elec. Co., Ltd., Kitatamagun, Tokyo, Japan
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Piconics Inc., Tyngsboro, Mass.
Pulse Engrg., Inc., San Diego, Cal.
San Fernando Elec. Mfg., San Fernando, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Syscon Int'l., Inc., So. Bend, Ind.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
Torwico Elctrns., Inc., Lakewood, N.J.
TRW Elctrnc. Functions, Candem, N.J.
United Prods. Co., New Hyde Pk., N.Y.

Coils, Metallized Glass

Dale Elctrns., Inc., Yankton, S.D. Vol 3•524,525
Dale Elctrns. Canada, Ltd., Scarborough, Ont., Can. Vol 3•524,525
American Trans-Coil Corp., Richmond Hill, N.Y.
GTE Sylvania Inc., Danvers, Mass.
JFD Elctrns., Bklyn., N.Y.
United Prods. Co., New Hyde Pk., N.Y.

Coils, Molded

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Douglas Randall Div., Pawcatuck, Conn. Vol 3•1252
Hisonic, Inc., Olathe, Kans. .... Vol 3•1257
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American Trans-Coil Corp., Richmond Hill, N.Y.
Arcidy Assocs., Manchester, N. H.
Automation Services Div., Windsor, N. Y.
Bell Industries, Compton, Cal.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Cambridge Thermionic, Cambridge, Mass
Coast Coil Co., Los Angeles, Calif.
Component Specialties, Temple City, Cal.
Cosmo Plastics Co., Cleveland, Ohio
Coto-Coil Co., Inc., Providence, R.I.
Dale Elctrns., Inc., Yankton, S.D.
Elctrn. Assocs., W. Long Branch, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
Endicott Coil Co., Binghamton, N.Y.
EWC, Inc., Kenilworth, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Kates Scientific Instrs., Inc., Watertown, Mass.
K.G.S. Elctrns., Pasadena, Cal.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Sag Harbor Inds., Inc., Sag Harbor, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Torotron, Mt. Vernon, N.Y.
United Prods. Co., New Hyde Pk., N.Y.

Coils, Oscillator

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Vari-L Co., Inc., Denver, Colo. Vol 3• 1310
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Coil Craft Inc., Bronxville, N.Y.
Coil Specialty Co., Boalsburg, Pa.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Solid State Elctrns. Corp., Sepulveda, Cal.

Coils, Relay

American Magnetics Corp., Carterville, Ill.
American Trans-Coil Corp., Richmond Hill, N.Y.
Artisan Elctrns. Corp., Parsippany, N.J.
Automation Services Div., Windsor, N. Y.
Coil Co. of Amer., Northvale, N.J.
Coil Specialty Co., Boalsburg, Pa.
Component Specialties, Temple City, Cal.
Computer Comps., Jamaica, N.Y.
Coto-Coil Co., Inc., Providence, R.I.
Custom Coil & Transformer Co., Zanesville, Ohio
Dale Elctrns., Inc., Yankton, S.D.
Dormeyer Inds., Chicago, Ill.
Douglas Randall Div., Pawcatuck, Conn.
El-Rad Mfg. Co., Chicago, Ill.
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Coil Corp., Plainville, Conn.
Endicott Coil Co., Binghamton, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Grand Transformers, Grand Haven, Mich.
Guardian California, Culver City, Cal.
Guardian Elec. Mfg. Co., Chicago, Ill.
James Elctrns., Inc., Chicago, Ill.
Kilovac Corp., Santa Barbara, Cal.
Liberty Controls, Inc., Shorewood, Ill.
Oeco Corp., Portland, Ore.
Relay Service Co., Chicago, Ill.
Sag Harbor Inds., Inc., Sag Harbor, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Shigoto Inds., Ltd., New York, N.Y.
United Prods. Co., New Hyde Pk., N.Y.
U.S. Elctrns., Long Branch, N.J.

Coils, R-F

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Vari-L Co., Inc., Denver, Colo. Vol 3•1310
ADC Prods., Minneapolis, Minn.
Aladdin Elctrns., Nashville, Tenn.
Allen Avionics, Mineola, N.Y.
American Time Products, Woodside, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
Arcidy Assocs., Manchester, N. H.
Automatic Coil, New Hyde Pk., N.Y.
Barker & Williamson, Inc., Bristol, Pa.
Bicron Elctrns. Co., Canaan, Conn.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Cambridge Thermionic, Cambridge, Mass
Clippard Instr., Inc., Cincinnati, Ohio
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Coil Craft Inc., Bronxville, N.Y.
Coil Specialty Co., Boalsburg, Pa.
Collins Radio Co., Dallas, Tex.
Computer Comps., Jamaica, N.Y.
Dietz Design, Inc., Belton, Mo.
E-Systems, Inc., Memcor Div., Huntington, Ind.
El-Rad Mfg. Co., Chicago, Ill.
Endicott Coil Co., Binghamton, N.Y.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Helix Spring Corp., Long Island City, N.Y.
Johnson E. F. Co., Waseca, Minn.
Kappa Networks, Inc., Carteret, N.J.
Lenox-Fugle Elctrns., Inc., S. Plainfield, N.J.
Mitsumi Elec. Co., Ltd., Kitatamagun, Tokyo, Japan
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Ohmite Mfg. Co., Skokie, Ill.
Piconics Inc., Tyngsboro, Mass.
Pulse Engrg., Inc., San Diego, Cal.
RF Interonics, Bay Shore, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Syscon Int'l., Inc., So. Bend, Ind.
TRW Elctrnc. Functions, Candem, N.J.
United Prods. Co., New Hyde Pk., N.Y.

Coils, Saturable Reactor

ADC Prods., Minneapolis, Minn.
Aladdin Elctrns., Nashville, Tenn.
Altec Div., Anaheim, Calif.
American Magnetics Corp., Carterville, Ill.
American Trans-Coil Corp., Richmond Hill, N.Y.
Bell Industries, Compton, Cal.
Bicron Elctrns. Co., Canaan, Conn.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Cross Electronics Inc., Warrendale, Pa.
Dale Elctrns., Inc., Yankton, S.D.
Del Electronics Corp., Mt. Vernon, N.Y.
Dietz Design, Inc., Belton, Mo.
Electro-Pacific, Inc., Goleta, Calif.
Electrocom Inds., So. Bend, Indiana
Electrocube, San Gabriel, Cal
Elctrn. Assocs., W. Long Branch, N.J.
EWC, Inc., Kenilworth, N.J.
Ferrodyne Corp., Venice, Calif.
Freed Transformer Co., Bklyn., N.Y.
Geo Space, Houston, Tex.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Hisonic, Inc., Olathe, Kans.
Huntington Elctrns. Corp., Van Nuys, Cal.
Ind'l. Control Co., Farmingdale, N.Y.
JB Elctrn. Transformers, Inc., Chicago, Ill.
K.G.S. Elctrns., Pasadena, Cal.
Mag-Con, Inc., New Brighton, Minn.
Magnetico, Inc., E. Northport, N.Y.
Microtran Co. Inc., Valley Stream, N.Y.
Neshaminy Transformer, Furlong, Pa.
NWL Transformers, Trenton, N.J.
Oeco Corp., Portland, Ore.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Phoenix Transformer Co., Phoenix, Ariz.
RtroN Corp., Skokie, Ill.
Sterling Transformer Corp., Brooklyn, N.Y.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Torotel, Inc., Grandview, Mo.
Torotron, Mt. Vernon, N.Y.
Torwico Elctrns., Inc., Lakewood, N.J.
United Prods. Co., New Hyde Pk., N.Y.

Coils, Shielded

Airco Speer Elctrns, Div. Airco, Inc., Bradford, Pa. ..... Vol 3•519
Bell Industries, Compton, Cal. Vol 3•532
Delevan Div. American Precision Ind., E. Aurora, N.Y. ..... Vol 3•526
Delevan Div., Coil Prods., E. Aurora, N.Y. ..... Vol 3•526
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ADC Prods., Minneapolis, Minn.
Aladdin Elctrns., Nashville, Tenn.
American Trans-Coil Corp., Richmond Hill, N.Y.
Automatic Coil, New Hyde Pk., N.Y.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Cambridge Thermionic, Cambridge, Mass
Coil Craft Inc., Bronxville, N.Y.
Coil Specialty Co., Boalsburg, Pa.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Computer Comps., Jamaica, N.Y.
Dale Elctrns., Inc., Yankton, S.D.
Data Delay Devices, Clifton, N.J.
Dietz Design, Inc., Belton, Mo.
E-Systems, Inc., Memcor Div., Huntington, Ind.
Endicott Coil Co., Binghamton, N.Y.
Lenox-Fugle Elctrns., Inc., S. Plainfield, N.J.
NWL Transformers, Trenton, N.J.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Piconics Inc., Tyngsboro, Mass.
Syscon Int'l., Inc., So. Bend, Ind.
Torwico Elctrns., Inc., Lakewood, N.J.
TRW Elctrnc. Functions, Candem, N.J.
United Prods. Co., New Hyde Pk., N.Y.

Coils, Solenoid

Advanced Kinetics, Costa Mesa, Calif.
American Magnetics Corp., Carterville, Ill.
American Magnetics, Oak Ridge, Tenn.
American Trans-Coil Corp., Richmond Hill, N.Y.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Coil, New Hyde Pk., N.Y.
Automation Services Div., Windsor, N. Y.
Bicron Elctrns. Co., Canaan, Conn.
Cambridge Thermionic, Cambridge, Mass
Coil Co. of Amer., Northvale, N.J.
Coil Specialty Co., Boalsburg, Pa.
Component Specialties, Temple City, Cal.
Computer Comps., Jamaica, N.Y.
Coto-Coil Co., Inc., Providence, R.I.
Custom Coil & Transformer Co., Zanesville, Ohio
Dale Elctrns., Inc., Yankton, S.D.
De Soto Elec. Prods., De Soto, Mo.
Delevan Div., Coil Prods., E. Aurora, N.Y.
Dietz Design, Inc., Belton, Mo.
Dormeyer Inds., Chicago, Ill.
Douglas Randall Div., Pawcatuck, Conn.
Electrocom Inds., So. Bend, Indiana
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Coil Corp., Plainville, Conn.
Endicott Coil Co., Binghamton, N.Y.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Geo Space, Houston, Tex.
Grand Transformers, Grand Haven, Mich.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
James Elctrns., Inc., Chicago, Ill.
Ledex, Inc., Dayton, Ohio
Liberty Controls, Inc., Shorewood, Ill.
Lisk, G.W. Co., Clifton Springs, N.Y.
Mag-Con, Inc., New Brighton, Minn.
NWL Transformers, Trenton, N.J.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Phoenix Transformer Co., Phoenix, Ariz.
Piconics Inc., Tyngsboro, Mass.
Sag Harbor Inds., Inc., Sag Harbor, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Staco, Inc., Dayton, Ohio
Torwico Elctrns., Inc., Lakewood, N.J.
United Prods. Co., New Hyde Pk., N.Y.
U.S. Elctrns., Long Branch, N.J.
O. S. Walker Co., Worcester, Mass.
Zaring Inds., Inc., Westfield, Ind.

Coils, Telephone

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Microtran Co. Inc., Valley Stream, N.Y. Vol 4•562*
ADC Prods., Minneapolis, Minn.
American Trans-Coil Corp., Richmond Hill, N.Y.
Coil Co. of Amer., Northvale, N.J.
Coil Craft Inc., Bronxville, N.Y.
Computer Comps., Jamaica, N.Y.
Corcom Inc., Chicago, Ill.
Dale Elctrns., Inc., Yankton, S.D.
Electrocom Inds., So. Bend, Indiana
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Coil Corp., Plainville, Conn.
Endicott Coil Co., Binghamton, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Torotel, Inc., Grandview, Mo.
United Prods. Co., New Hyde Pk., N.Y.
U.S. Elctrns., Long Branch, N.J.

Coils, Telephone Pickup (For Recording)—See Pickups, Telephone

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Bell Industries, Compton, Cal. Vol 3•528
Coil Winders Div. Caddell-Burns, Mineola, N. Y. ..... Vol 3•522,523
Dale Elctrns., Inc., Yankton, S.D. Vol 3•525
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ADC Prods., Minneapolis, Minn.
Aladdin Elctrns., Nashville, Tenn.
Allen Avionics, Mineola, N.Y.
Allen Elctrns. Div., Macungie, Pa.
Altec Div., Anaheim, Calif.
American Trans-Coil Corp., Richmond Hill, N.Y.
Automatic Coil, New Hyde Pk., N.Y.
Barker & Williamson, Inc., Bristol, Pa.
Bicron Elctrns. Co., Canaan, Conn.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Cambridge Thermionic, Cambridge, Mass
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Coil Craft Inc., Bronxville, N.Y.
Collins Radio Co., Dallas, Tex.
Corcom Inc., Chicago, Ill.
Cross Electronics Inc., Warrendale, Pa.
De Coursey Engrg. Lab., Culver City, Cal.
Dietz Design, Inc., Belton, Mo.
El-Rad Mfg. Co., Chicago, Ill.
Electro-Pacific, Inc., Goleta, Calif.
Electrocom Inds., So. Bend, Indiana
Electrocube, San Gabriel, Cal
EWC, Inc., Kenilworth, N.J.
Ferrodyne Corp., Venice, Calif.
Flight Sys., Inc., Mechanicsburg, Pa.
Freed Transformer Co., Bklyn., N.Y.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Geo Space, Houston, Tex.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Harder, Donald C. Co., Inc., San Diego, Calif.
Huntington Elctrns. Corp., Van Nuys, Cal.
Ind'l. Control Co., Farmingdale, N.Y.
James Elctrns., Inc., Chicago, Ill.
JB Elctrn. Transformers, Inc., Chicago, Ill.
Kappa Networks, Inc., Carteret, N.J.
K.G.S. Elctrns., Pasadena, Cal.
Mag-Con, Inc., New Brighton, Minn.
Magnetic Circuit Elements, Monterey, Cal.
Magnetico, Inc., E. Northport, N.Y.
Midwec Corp., Scottsbluff, Neb.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Pulse Engrg., Inc., San Diego, Cal.
Raytheon Co., Waltham, Mass.
RF Interonics, Bay Shore, N.Y.
RtroN Corp., Skokie, Ill.
Sag Harbor Inds., Inc., Sag Harbor, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Shallco, Inc., Smithfield, N.C.
Shigoto Inds., Ltd., New York, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Stancor, Chicago, Ill.
Stanford Applied Engrg., Santa Clara, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
Syscon Int'l., Inc., So. Bend, Ind.
Torotron, Mt. Vernon, N.Y.
Torwico Elctrns., Inc., Lakewood, N.J.
Triad-Utrad Div., Huntington, Ind.
TRW Elctrnc. Functions, Candem, N.J.
United Prods. Co., New Hyde Pk., N.Y.
Unitron Inc., Garland, Tex.
White Instrs., Inc., Austin, Tex.
Zaring Inds., Inc., Westfield, Ind.

Coils, Transducer

Altec Div., Anaheim, Calif.
American Trans-Coil Corp., Richmond Hill, N.Y.
Ametek/Instrs. & Controls, Feasterville, Pa.
Bicron Elctrns. Co., Canaan, Conn.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Coto-Coil Co., Inc., Providence, R.I.
Dale Elctrns., Inc., Yankton, S.D.
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Coil Corp., Plainville, Conn.
Endicott Coil Co., Binghamton, N.Y.
Flow Technology, Inc., Tempe, Ariz.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Geo Space, Houston, Tex.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
LDJ Electronics, Troy, Mich.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Sag Harbor Inds., Inc., Sag Harbor, N.Y.
Sensor Corp., Scottsdale, Pa.
Torwico Elctrns., Inc., Lakewood, N.J.
United Prods. Co., New Hyde Pk., N.Y.
Waldom Elctrns., Inc., Chicago, Ill.
Zaring Inds., Inc., Westfield, Ind.

Coils, Transformer

ADC Prods., Minneapolis, Minn.
Aladdin Elctrns., Nashville, Tenn.
American Trans-Coil Corp., Richmond Hill, N.Y.
Bell Industries, Compton, Cal.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Coast Coil Co., Los Angeles, Calif.
Coil Craft Inc., Bronxville, N.Y.
Coil Specialty Co., Boalsburg, Pa.
Component Specialties, Temple City, Cal.
Computer Comps., Jamaica, N.Y.
Cross Electronics Inc., Warrendale, Pa.
Custom Coil & Transformer Co., Zanesville, Ohio
Dale Elctrns., Inc., Yankton, S.D.
Del Electronics Corp., Mt. Vernon, N.Y.
Delevan Div., Coil Prods., E. Aurora, N.Y.
Dietz Design, Inc., Belton, Mo.
Douglas Randall Div., Pawcatuck, Conn.
Electro-Pacific, Inc., Goleta, Calif.
Electrocom Inds., So. Bend, Indiana
Electrocube, San Gabriel, Cal
Electronic Coil Corp., Plainville, Conn.
Endicott Coil Co., Binghamton, N.Y.
EWC, Inc., Kenilworth, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Geo Space, Houston, Tex.
Grand Transformers, Grand Haven, Mich.
Huntington Elctrns. Corp., Van Nuys, Cal.
James Elctrns., Inc., Chicago, Ill.
JB Elctrn. Transformers, Inc., Chicago, Ill.
K.G.S. Elctrns., Pasadena, Cal.
Mag-Con, Inc., New Brighton, Minn.
Magnetico, Inc., E. Northport, N.Y.
Microtran Co. Inc., Valley Stream, N.Y.
Midwec Corp., Scottsbluff, Neb.
NWL Transformers, Trenton, N.J.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Permaluster, Inc., Burbank, Calif.
Peschel Instrs., Cape Coral, Fla.
Sag Harbor Inds., Inc., Sag Harbor, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Staco, Inc., Dayton, Ohio
Syscon Int'l., Inc., So. Bend, Ind.
Torotron, Mt. Vernon, N.Y.
Torwico Elctrns., Inc., Lakewood, N.J.
TRW Elctrnc. Functions, Candem, N.J.
United Prods. Co., New Hyde Pk., N.Y.
U.S. Elctrns., Long Branch, N.J.
O. S. Walker Co., Worcester, Mass.
Zaring Inds., Inc., Westfield, Ind.

Coils, TV (All Types)

Amperex Electronic Corp., Hicksville, N.Y. ..... Vol 3•521
Bell Industries, Compton, Cal. Vol 3•532
Allen Avionics, Mineola, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
Automatic Coil, New Hyde Pk., N.Y.
Clippard Instr., Inc., Cincinnati, Ohio
Coil Specialty Co., Boalsburg, Pa.
Dale Elctrns., Inc., Yankton, S.D.
Douglas Randall Div., Pawcatuck, Conn.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Mitsumi Elec. Co., Ltd., Kitatamagun, Tokyo, Japan
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Shigoto Inds., Ltd., New York, N.Y.
Syntronic Instrs., Inc., Addison, Ill.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
United Prods. Co., New Hyde Pk., N.Y.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Coils, Variable

Aladdin Elctrns., Nashville, Tenn. Vol 3•1249
Bell Industries, Compton, Cal. Vol 3•532
Data Delay Devices, Clifton, N.J. Vol 3•998
Delevan Div. American Precision Ind., E. Aurora, N.Y. ..... Vol 3•526
Delevan Div., Coil Prods., E. Aurora, N.Y. ..... Vol 3•526
Hisonic, Inc., Olathe, Kans. .... Vol 3•1257
Millen, James Mfg., Malden, Mass. Vol 3•527
North Hills Elctrns., Inc., Glen Cove, N.Y. ..... Vol 3•533
Sangamo Elec. Co., Pickens, S.C. Vol 3•498
TRW/UTC Transformers, New York, N.Y. ..... Vol 3•543
Vari-L Co., Inc., Denver, Colo. Vol 3•1310
Allen Avionics, Mineola, N.Y.
Altec Div., Anaheim, Calif.
American Trans-Coil Corp., Richmond Hill, N.Y.
Automatic Coil, New Hyde Pk., N.Y.
Bicron Elctrns. Co., Canaan, Conn.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Cambridge Thermionic, Cambridge, Mass
Chesterfield Prods. Inc., Saddle Brook, N. J.
Clippard Instr., Inc., Cincinnati, Ohio
Coil Craft Inc., Bronxville, N.Y.
Coil Specialty Co., Boalsburg, Pa.

Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Component Specialties, Temple City, Cal.
Computer Comps., Jamaica, N.Y.
Corcom Inc., Chicago, Ill.
Dale Elctrns., Inc., Yankton, S.D.
Dietz Design, Inc., Belton, Mo.
E-Systems, Inc., Memcor Div., Huntington, Ind.
El-Rad Mfg. Co., Chicago, Ill.
Electrocom Inds., So. Bend, Indiana
Freed Transformer Co., Bklyn., N.Y.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
JFD Elctrns., Bklyn., N.Y.
Johnson E. F. Co., Waseca, Minn.
Kappa Networks, Inc., Carteret, N.J.
Microtran Co. Inc., Valley Stream, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Piconics Inc., Tyngsboro, Mass.
Pulse Engrg., Inc., San Diego, Cal.
San Fernando Elec. Mfg., San Fernando, Cal.
Stanford Applied Engrg., Santa Clara, Cal.
Syscon Int'l., Inc., So. Bend, Ind.
TRW Elctrnc. Functions, Candem, N.J.
United Prods. Co., New Hyde Pk., N.Y.
O. S. Walker Co., Worcester, Mass.

Coils, Vidicon Alignment

American Trans-Coil Corp., Richmond Hill, N.Y.
Amperex Elctronic Corp., Slatersville, R.I.
CELCO, Mahwah, N.J.
Cleveland Elctrns., Inc., Cleveland, Ohio
Syntronic Instrs., Inc., Addison, Ill.

Coincidence Analyzers—See Analyzers, Coincidence

Cold-Cathode Readout Tubes —See Tubes, Readout

Comm. Systems, Carrier Current

CCA Elctrns. Corp., Gloucester, N.J.
Demex, Inc., Kansas City, Mo.
General Devices, Inc., Princeton, N.J.
GTE Lenkurt Inc., San Carlos, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
RFL Inds., Comms. Div., Boonton, N.J.
Talk-A-Phone Co., Chicago, Ill.

Comm. Systems, Data

Metric Sys., Ft. Walton Beach, Fla. Vol 1•356,357
Sangamo Elec. Co., Springfield, Ill. Vol 1•371
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
A. D. Data Sys., Inc., Rochester, N.Y.
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Analogic, Wakefield, Mass.
Austron, Inc., Austin, Tex.
Autocon Inds., Inc., Minneapolis, Minn.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
Bramco Controls, Piqua, Ohio
Bunker-Ramo Corp., Westlake Village, Cal
Burroughs Corp., Pasadena, Cal.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Codex Corp., Newton, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., East Northport, N.Y.
Conrac Corp., Fairfield, N.J.
Continental Data Sys., Dayton, Ohio
Cubic Corp., San Diego, Cal.
Data General Corp. (E), Southboro, Ma.
Dataprobe, Inc., So. Hackensack, N.J.
Datex Div., Duarte, Cal.
Demex, Inc., Kansas City, Mo.
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitronics Corp., Albertson, N.Y.
E-Systems Inc., Dallas, Tex.
Electrac, Inc., Anaheim, Calif.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Foxboro Co., Foxboro, Mass.
Frederick Electronics Corp., Frederick, Md.
General Data Inds. Inc. Inc., Wilton, Conn.
General Devices, Inc., Princeton, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hathaway Instruments, Inc., Denver, Colo.
Honeywell Information Systems, Waltham, Mass.
Instrumentation Tech. Corp., Northbridge, Cal.
Integrated Systems, Inc., Norcross, Ga.
International Communications Corp., A Milgo Co., Miami, Fla.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Leeds & Northrup Corp., No. Wales, Pa.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Microdata Corp., Irvine, Cal.
NES, Inc., Itasca, Ill.
North Electric Co., Galion, Ohio
Pacific Communications, Santa Ana, Cal.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
Princeton Elctrn. Prods., New Brunswick, N.J.
Raytheon Data Systems Co., Norwood, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
RCA Service Co., Camden, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Singer Co., Little Falls, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
T-Bar Inc., Wilton, Conn.
Tasker Systems, Chatsworth, Cal.
Teletype Corp., Skokie, Ill.
Texas Instruments, Inc., Houston, Tex.
Theta Instr. Corp., Fairfield, N.J.
Varian Data Machines, Irvine, Cal.
Victor Comptometer Corp., Chicago, Ill.
Vidar Corp., Mountain View, Cal.
Video Research Corp., Gaithersburg, Md.
Warren G-V Communications, Livingston, N.J.
Western Telematic, Inc., Costa Mesa, Cal.

Comm. Systems, F-M

Emergency Beacon Corp., New Rochelle, N. Y. ..... Vol 1•936
Arvin Sys., Inc., Dayton, Ohio
Astro Comm. Lab., Gaithersburg, Md.
Bendix Corp., Ft. Lauderdale, Fla.
Bendix Corp, Towson, Md.
BF Elctrns., Solana Beach, Calif.
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Conic Corp., San Diego, Calif.
Drake, R.L., Co., Miamisburg, Ohio
Elctrn. Comm., Inc., St. Petersburg, Fla.
Electrospace Systems Inc., Richardson, Tex.
Environmental Communications Inc., Santa Ana, Cal.
Farinon Electric, San Carlos, Calif.
General Devices, Inc., Princeton, N.J.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
IEC Electronics Corp., E. Rochester, N.Y.
Integrated Systems, Inc., Norcross, Ga.
ITT Mackay Marine, Elizabeth, N.J.
Johnson E. F. Co., Waseca, Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Mu-Del Elctrns., Silver Spring, Md.
Pace Div., Harbor City, Calif.
Pacific Communications, Santa Ana, Cal.
Pearce-Simpson, Miami, Fla.
Rank Precision Inds., Des Plaines, Ill.
Raytheon Data Systems Co., Norwood, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
Regency Elctrns., Inc., Indianapolis, Ind.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Video Research Corp., Gaithersburg, Md.
Watkins Johnson Co., Palo Alto, Cal.

Comm. Systems, Facsimile

Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Cardion Elctrns., Woodbury, N.Y.
Datalog Div., Litton Sys., Melville, N. Y.
Dranetz Engrg. Labs., So. Plainfield, N.J.
EG&G, Inc., Bedford, Mass.
Frederick Electronics Corp., Frederick, Md.
GTE Lenkurt Inc., San Carlos, Calif.
ITT Mackay Marine, Elizabeth, N.J.
3M Co., St. Paul, Minn.
Victor Comptometer Corp., Chicago, Ill.

Comm. Systems, Frequency Shift

A.R.F. Products, Inc., Boulder, Colo.
Arvin Sys., Inc., Dayton, Ohio
Autocon Inds., Inc., Minneapolis, Minn.
Bramco Controls, Piqua, Ohio
Cardion Elctrns., Woodbury, N.Y.
Collins Radio Co., Dallas, Tex.
Electrocom Inds., So. Bend, Indiana
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Frederick Electronics Corp., Frederick, Md.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Integrated Systems, Inc., Norcross, Ga.
ITT Mackay Marine, Elizabeth, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Video Research Corp., Gaithersburg, Md.

Comm. Systems, Intercom—See Intercom Systems

Comm. Systems, Laser

GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
ITT Gilfillan Div. of ITT, Van Nuys, Calif.
Optical Communications, Inc., Orlando, Fla.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Union Carbide, San Diego, Cal.

Comm. Systems, Microwave

Vari-L Co., Inc., Denver, Colo. Vol 2•585
Andrew Corp., Orland Pk., Ill.
Applied Research Inc., Port Washington, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
Avantek, Inc., Santa Clara, Cal.
Camusat Gueguen Telecom. Int'l., White Plains, N.Y.
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
Cubic Corp., San Diego, Cal.
Energy Systems, Palo Alto, Cal.
Environmental Communications Inc., Santa Ana, Cal.
Farinon Electric, San Carlos, Calif.
Frequency Engrg. Labs., Farmingdale, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Jerrold Electronics Corp., Philadelphia, Pa.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Melpar, Falls Church, Va.
Microwave Assocs., Inc., Burlington, Mass.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Narda Microwave Corp., Plainview, N.Y.
OPtimax Inc., Colmar, Pa.
Pacific Communications, Santa Ana, Cal.
Raytheon Data Systems Co., Norwood, Mass.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Scientific Communications, Garland, Tex.
Tasker Systems, Chatsworth, Cal.
Terado Corp., St. Paul, Minn.
Vega Precision Labs., Vienna, Va.
Watkins Johnson Co., Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Comm. Systems, Multiplex

Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Applied Research Inc., Port Washington, N.Y.
Autocon Inds., Inc., Minneapolis, Minn.
Bendix Corp., N. Hollywood, Calif.
Bramco Controls, Piqua, Ohio
Bristol Div, Waterbury, Conn
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Cubic Corp., San Diego, Cal.
Data-Control Systems, Danbury, Conn.
Electrocom Inds., So. Bend, Indiana
Elctrn. Comm., Inc., St. Petersburg, Fla.
Farinon Electric, San Carlos, Calif.
Fifth Dimension, Princeton, N.J.
General Data Inds. Inc. Inc., Wilton, Conn.
General Devices, Inc., Princeton, N.J.
GTE Lenkurt Inc., San Carlos, Calif.
Hathaway Instruments, Inc., Denver, Colo.
Henry Prods. Co., Inc., Inwood, N.Y.
Integrated Systems, Inc., Norcross, Ga.
ISC/Telephonics Div, Huntington, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
NES, Inc., Itasca, Ill.
Raytheon Data Systems Co., Norwood, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Service Co., Camden, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Singer Co., Little Falls, N.J.
T-Bar Inc., Wilton, Conn.
Varian Data Machines, Irvine, Cal.
Video Research Corp., Gaithersburg, Md.

Comm. Systems, Radiotelephone

Bowmar Instr. Corp., Ft. Wayne, Ind.
Brelonix, Inc., Seattle, Wash
Collins Radio Co., Dallas, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Electrospace Systems Inc., Richardson, Tex.
Emergency Beacon Corp., New Rochelle, N. Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Henry Prods. Co., Inc., Inwood, N.Y.
Intech, Santa Clara, Cal.
Intricate Circuit Corp., Port Chester, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Linear Sys., Inc., Watsonville, Calif.
Mobil Elctrns., Inc., Anderson, Ind.
Pace Div., Harbor City, Calif.
Pearce-Simpson, Miami, Fla.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
RCA Service Co., Camden, N.J.

Comm. Systems, Selective Paging

Altec Div., Anaheim, Calif.
Bogen Div., Paramus, N.J.
Bramco Controls, Piqua, Ohio
Dukane Corp., St. Charles, Ill.
Emergency Beacon Corp., New Rochelle, N. Y.
Executone, Inc., Long Island City, N.Y.
Intricate Circuit Corp., Port Chester, N.Y.
Johnson E. F. Co., Waseca, Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Mobil Elctrns., Inc., Anderson, Ind.
North Electric Co., Galion, Ohio
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
Talk-A-Phone Co., Chicago, Ill.
University Sound, Anaheim, Cal.
Webster Elec. Co., Inc., Racine, Wisc.

Comm. Systems, Single-Sideband

Arvin Sys., Inc., Dayton, Ohio
Barker & Williamson, Inc., Bristol, Pa.
Bendix Corp, Towson, Md.
Brelonix, Inc., Seattle, Wash
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Drake, R.L., Co., Miamisburg, Ohio
Electrac, Inc., Anaheim, Calif.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Henry Prods. Co., Inc., Inwood, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Johnson E. F. Co., Waseca, Minn.
Linear Sys., Inc., Watsonville, Calif.
Micro-Tel Corp., Baltimore, Md.
Pace Div., Harbor City, Calif.
Pearce-Simpson, Miami, Fla.
Raytheon Data Systems Co., Norwood, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Technical Mat'l., Mamaroneck, N.Y.
Watkins Johnson Co., Palo Alto, Cal.

Comm. Systems, Telemetering

Emergency Beacon Corp., New Rochelle, N. Y. ..... Vol 1•936
GRM Corp., Medford, N.J. ..... Vol 1•319
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Analogic, Wakefield, Mass.
Andrew Corp., Orland Pk., Ill.
Applied Research Inc., Port Washington, N.Y.
Astro Comm. Lab., Gaithersburg, Md.
Autocon Inds., Inc., Minneapolis, Minn.
Baganoff Assocs., Inc., St. Louis, Mo.
BF Elctrns., Solana Beach, Calif.
Biocom, Inc., Culver City, Cal.
Bramco Controls, Piqua, Ohio
Bristol Div, Waterbury, Conn
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
Continental Data Sys., Dayton, Ohio
Data-Control Systems, Danbury, Conn.
Dataprobe, Inc., So. Hackensack, N.J.
Electrac, Inc., Anaheim, Calif.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Fairchild Space & Defense Sys., Syosset, N.Y.
Fifth Dimension, Princeton, N.J.
General Devices, Inc., Princeton, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Lenkurt Inc., San Carlos, Calif.
Hathaway Instruments, Inc., Denver, Colo.
Integrated Systems, Inc., Norcross, Ga.
Leeds & Northrup Corp., No. Wales, Pa.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Monitor Systems, Ft. Washington, Pa
NES, Inc., Itasca, Ill.
Pacific Communications, Santa Ana, Cal.
Phoenix Data Inc., Phoenix, Ariz.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Solid State Elctrns. Corp., Sepulveda, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Tasker Systems, Chatsworth, Cal.
3M Co., St. Paul, Minn.
Vega Precision Labs., Vienna, Va.
Video Research Corp., Gaithersburg, Md.
Watkins Johnson Co., Palo Alto, Cal.

Comm. Systems, Telephone

GRM Corp., Medford, N.J. ..... Vol 1•319
ADC Prods., Minneapolis, Minn.
Altec Div., Anaheim, Calif.
BECO, Inc., Salem, Va.
Bogen Div., Paramus, N.J.
Communications Equip. Co., Indianapolis, Ind.
Continental Data Sys., Dayton, Ohio
Digitronics Corp., Albertson, N.Y.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dukane Corp., St. Charles, Ill.
Electrospace Systems Inc., Richardson, Tex.
Elgin Elctrns. Inc., Waterford, Pa.
Encom Prods. Co., Inc., Oxford, Pa.
Executone, Inc., Long Island City, N.Y.
Farinon Electric, San Carlos, Calif.
GTE Automatic Elec., Northlake, Ill.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
International Communications Corp., A Milgo Co., Miami, Fla.
ITT Telecommunications, Corinth, Miss.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Mobil Elctrns., Inc., Anderson, Ind.
North Electric Co., Galion, Ohio
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Service Co., Camden, N.J.
Re-el Circuits, Inc., Saddle Brook, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Singer Co., Little Falls, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
T-Bar Inc., Wilton, Conn.
Tasker Systems, Chatsworth, Cal.
Terado Corp., St. Paul, Minn.
Warren G-V Communications, Livingston, N.J.
Webster Elec. Co., Inc., Racine, Wisc.

Comm. Systems, Teletype

Re-el Circuits, Inc., Saddle Brook, N.J. Vol 1•320
Collins Radio Co., Dallas, Tex.
Computer Terminal Sys., Plainview, N.Y.
Continental Data Sys., Dayton, Ohio
Demex, Inc., Kansas City, Mo.
Digitech Data Inds., Inc., Ridgefield, Conn.
Electrocom Inds., So. Bend, Indiana
Frederick Electronics Corp., Frederick, Md.
GRM Corp., Medford, N.J.
GTE Lenkurt Inc., San Carlos, Calif.
ITT Mackay Marine, Elizabeth, N.J.
Lear Siegler, Anaheim, Cal.
NES, Inc., Itasca, Ill.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Service Co., Camden, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Teletype Corp., Skokie, Ill.

Commutators

Airflyte Elctrns. Co., Bayonne, N.J.
Nippert Co., Delaware, Ohio
Phoenix Data Inc., Phoenix, Ariz.

Comparators, Analog—See Comparators, Voltage

Comparators, Attenuation

Alford Mfg. Co., Winchester, Mass.
General Microwave Corp., Farmingdale, N.Y.
Inservco, Inc., La Grange, Ohio
Mann, David W. Co., Burlington, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Narda Microwave Corp., Plainview, N.Y.
Struthers-Dunn, Inc., Bettendorf, Iowa
Vari-L Co., Inc., Denver, Colo.
Weinschel Engrg. Co., Gaithersburg, Md.
Wide Band Engrg. Co., Phoenix, Ariz.

Comparators, Capacitance—See Bridges, Capacitance

Comparators, Density—See Densitometers, Electronic

Comparators, Digital

NES, Inc., Itasca, Ill. ..... Vol 1•363
Anadex Instrs., Inc., Van Nuys, Calif.
Automated Meas., Oakland, Calif.
Automation Dynamics, Northvale, N.J.
Chemical Etching Equip. & Supply, Alexandria, Va.
Consolidated Controls Corp., Bethel, Conn.
Datacom, Inc., Ft. Walton Bch., Fla.
Datascan, Inc., Clifton, N.J.
Digilin, Inc., Glendale, Cal.
Digital Equip. Corp., Maynard, Mass.
Digitron Corp., Norristown, Pa.
Dytro Corp., Hicksville, N.Y.
E-H Resch. Labs., Inc., Oakland, Cal.
Electronic Research Co., Shawnee Mission, Kan.
Gap Instr. Corp., Hauppauge, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
IEC Electronics Corp., E. Rochester, N.Y.
Innovatek Enterprise, Millerton, N.Y.
Instrumentation Tech. Corp., Northbridge, Cal.
Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa.
Keltron Corp., Waltham, Mass.
LFE Corp., Waltham,, Mass.
Micro Instr. Co., Hawthorne, Cal.
Midland Standard Inc., Elgin, Ill.
Minnetech Labs, Minneapolis, Minn.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
MSI Electronics, Inc., Woodside, N.Y.
Newport Labs., Inc., Santa Ana, Cal.
Norden Div., Norwalk, Conn.
Northern Precision Labs., Inc., Fairfield, N.J.
Olympus Corp. America, New Hyde Park, N.Y.
Precision Dynamics Corp., Burbank, Cal.
Rohde & Schwarz Sls., Passaic, N.J.
Signetics. Corp., Sunnyvale, Calif.
Singer - Tele-Signal, Woodbury, N.Y.
Spatial Data Systems, Inc., Goleta, Cal.
Specific Products, Monrovia, Cal.
SRC Div., Newport Bch., Cal.
Struthers-Dunn, Inc., Pitman, N.J.
Struthers-Dunn, Inc., Bettendorf, Iowa
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Texas Instruments, Dallas, Tex.
Theta Instr. Corp., Fairfield, N.J.
Thiem Industries, Inc., Torrance, Cal.
United Sys. Corp., Dayton, Ohio

Comparators, Frequency

Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Anaren Microwave, Inc., Syracuse, N.Y.
Collins Radio Co., Dallas, Tex.
Engelmann Microwave, Montville, N.J.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Geo Space Sys., Tampa, Fla.
Hi-G, Windsor Locks, Conn.
Rohde & Schwarz Sls., Passaic, N.J.
Signal Analysis Oper., Hauppauge, N.Y.
Signetics. Corp., Sunnyvale, Calif.
Tracor, Inc., Austin, Tex.
Weston Instruments, Inc., Newark, N.J.

Comparators, Impedance—See Bridges, Impedance

Comparators, Inductance—See Bridges, Inductance

Comparators, Phase

Anaren Microwave, Inc., Syracuse, N.Y. Vol 4•438*
Hi-G, Windsor Locks, Conn. .... Vol 2•796
Lorch Elctrns. Corp., Englewood, N.J. Vol 2•615
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Alford Mfg. Co., Winchester, Mass.
American Nucleonics Corp., Woodland Hills, Cal
Collins Radio Co., Dallas, Tex.
Diversified Elctrns., Evansville, Ind
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynalab Corp., Van Nuys, Cal.
Dytronics Co., Columbus, Ohio
Engelmann Microwave, Montville, N.J.
Frequency Elctrns., New Hyde Pk., N.Y.
Geo Space Sys., Tampa, Fla.
Ind'l. Control Co., Farmingdale, N.Y.
Ind'l. Test Equip., Clifton, NJ
Merrimac Inds., Inc., West Caldwell, N.J.
Microwave Development Labs., Inc., Needham Hgts., Mass.
North Atlantic Inds., Plainview, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Rantec Div., Calabasas, Calif.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
Struthers-Dunn, Inc., Bettendorf, Iowa
Theta Instr. Corp., Fairfield, N.J.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Vari-L Co., Inc., Denver, Colo.
Varian Assocs., Palo Alto, Cal.
Vibration Instrs. Co., Anaheim, Cal.
Wiltron Co., Palo Alto, Calif.

Comparators, Q

Dranetz Engrg. Labs., So. Plainfield, N.J.
J-Omega Co., Mountain View, Calif.

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Hi-G, Windsor Locks, Conn. .... Vol 2•796
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Syntronic Instrs., Inc., Addison, Ill. Vol 3•535
Applied Control Co., Fairfield, N.J.
Beckman Instrs., Cedar Grove, N.J.
Boonton Electronics Corp., Parsippany, N.J.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Constant Voltage Co., Chicago, Ill.
Control Technology Co., L.I.C., N.Y.
Diversified Elctrns., Evansville, Ind
Doric Sci. Corp., San Diego, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Dytro Corp., Hicksville, N.Y.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro Sci. Inds., Portland, Ore.
General Magnetics, Bloomfield, N.J.
GPS Corp., Framingham, Mass.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Holt Instr. Labs., Oconto, Wisc.
ILC Data Device Corp., Hicksville, N.Y.
Intech, Santa Clara, Cal.
J-Omega Co., Mountain View, Calif.
Jerrold Electronics Corp., Philadelphia, Pa.
Julie Research Lab., New York, N.Y.
LDJ Electronics, Troy, Mich.
Leeds & Northrup Corp., No. Wales, Pa.
Luft Instrs., Inc., Lincoln, Mass.
Midland Standard Inc., Elgin, Ill.
Mini-Systems, Inc, North Attleboro, Mass.
Natel Engrg. Co., Canoga Pk., Cal.
NES, Inc., Itasca, Ill.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Optimized Devices Inc., Pleasantville, N.Y.
Precision Monolithics Inc., Santa Clara, Cal.
Raytheon, Mt. View, Calif.
Scientific Measurements, Wilmette, Ill.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
Struthers-Dunn, Inc., Pitman, N.J.
Tektronix, Inc., Beaverton, Ore.
Tempo Instrument, Inc., Plainview, N.Y.
Weston Instruments, Inc., Newark, N.J.

Zeltex, Inc., Concord, Calif.
Zi-Tech Div., Palo Alto, Cal.

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3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn. ..... Vol 3•1082-1087
Acme Chemical & Insulation Co., New Haven, Conn.
Adhesive Prods. Corp., Bronx, N.Y.
Allaco Prods Div., Watertown, Mass.
Amicon Corp., Lexington, Mass.
Amphenol Cadre Div., Endicott, N.Y.
Anchor Alloys, Inc., Brooklyn, N.Y.
Armstrong Cork Co., Lancaster, Pa.
Armstrong Prods. Co., Warsaw, Ind.
Bacon Inds., Watertown, Mass.
Brand Dielectrics, Inc., N. Windham, Conn.
Chemical Prods. Corp., E. Providence, R.I.
Chemtronics, Inc., Brooklyn, N.Y.
Communications Technology Corp., Los Angeles, Cal.
Conap, Inc., Allegany, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Dolph, John C. Co., Monmouth Junction, N.J.
Dow Chemical Co., Midland, Mich.
Dow Corning Corp., Midland, Mich.
Eastman Chem. Prods., Kingsport, Tenn.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Electro-Science Labs., Pennsauken, N. J.
Emerson & Cuming, Inc., Canton, Mass.
Epoxy Technology, Watertown, Mass.
Epoxylite Corp., Anaheim, Calif.
General Elec., Insulating Matl's., Schenectady, N.Y.
General Elec. Co., Waterford, N.Y.
Glastic Corp., Cleveland, Ohio
Hardman Inc., Belleville, N.J.
Hightemp Resins, Inc., Stamford, Conn.
Hysol Div., Olean, N.Y.
MacDonald & Co., Glendale, Calif.
Miller-Stephenson Chem. Co., Inc., Danbury, Conn.
National Beryllia Corp., Haskell, N.J.
Packaged Resins Div., Watertown, Mass.
Pennsylvania Ind'l. Chem. Corp., Clairton, Pa.
Ram Chems., Gardena, Calif.
Rostone Corp., Lafayette, Ind.
Seal-Peel, Inc., Troy, Mich.
Semicon Assoc., Inc., Lexington, Ky.
Sterling, Sewickley, Pa.
SWS Silicones Div., Adrian, Mich.
Teledyne Penn-Union Elec., Edinboro, Pa.
Thiokol Chemical Div., Trenton, N.J.
3M Co., St. Paul, Minn.
Tra-Con, Inc., Medford, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
Union Carbide, Chemicals & Plastics, New York, N.Y.
Uniroyal, Inc., New York, N.Y.
Western Coating Co., Royal Oak, Mich.
Westinghouse Elec., W. Mifflin, Pa.

Compressors, Data

Analogic, Wakefield, Mass.
NES, Inc., Itasca, Ill.

Computer Logic Circuits—See Cards, Logic; Circuits, Hybrid; Circuits, Integrated; Modules, Logic

Computer Memory Testers—See Testers, Computer Memory

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Computers, Analog

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AMF Electical Prods., Alexandria, Va.
Austin Elctrns., Roselle, N.J.
Aviation Elec., Ltd., Montreal 379, Que., Can.
Baganoff Assocs., Inc., St. Louis, Mo.
Bailey Meter Co., Wickliffe, Ohio
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bristol Div, Waterbury, Conn
C & A Products, Inc., Woodside, N. Y.
Datron Systems, Chatsworth, Cal.
Foxboro Co., Foxboro, Mass.
Gap Instr. Corp., Hauppauge, N.Y.
General Computers, Inc., Los Angeles, Calif.
General Magnetics, Bloomfield, N.J.
Heath Co., Benton Harbor, Mich.
Honeywell, Ft. Washington, Pa.
Hybrid Sys. Corp., Burlington, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Lear Siegler, Grand Rapids, Mich.
Leeds & Northrup Corp., No. Wales, Pa.
RCA Missile & Surface Radar Div., Moorestown, N.J.
Reliance Elec. Co., Cleveland, Ohio
Scientific Measurements, Wilmette, Ill.
Singer Co., Little Falls, N.J.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Systron Donner Computer Systems Div., Concord, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Telectro Sys. Corp., Corona, N.Y.
Toledo Scale, Toledo, Ohio

Computers, Desk Top (Digital)

Beckman Instrs., (AISSD), Fullerton, Cal.
Burroughs Corp., Pasadena, Cal.
Computer Automation, Inc., Irvine, Cal.
Digital Equip. Corp., Maynard, Mass.
Eldorado Electrodata, Concord, Cal.
Microdata Corp., Irvine, Cal.
Monroe, Calculator Co., Orange, N.J.
NES, Inc., Itasca, Ill.
Texas Instruments, Dallas, Tex.
Toledo Scale, Toledo, Ohio
Varian Assocs., Palo Alto, Cal.
Varian Data Machines, Irvine, Cal.
Wang Labs., Inc., Tewksbury, Mass.

Computers, Digital (General Purpose)

Bailey Meter Co., Wickliffe, Ohio
Bendix Aerospace-Elctrns., Teterboro, N.J.
Burroughs Corp., Pasadena, Cal.
Cincinnati Milacron, Lebanon, Ohio
Computer Automation, Inc., Irvine, Cal.
Data General Corp. (E), Southboro, Ma.
Digital Equip. Corp., Maynard, Mass.
Eldorado Electrodata, Concord, Cal.
GRI Computer Corporation, Newton, Mass.
Honeywell Information Systems, Waltham, Mass.
Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Hughes Aircraft Co., Ground Systems Grp., Fullerton, Cal.
Interdata, Oceanport, N.J.
Lear Siegler, Grand Rapids, Mich.
Lockheed Elctrns. Co., Watchung, N.J.
Lockheed Elctrns. Co., Los Angeles, Cal.
Microdata Corp., Irvine, Cal.
NES, Inc., Itasca, Ill.
Nuclear Data, Palatine, Ill.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Republic Advanced System Technology Group, Chatsworth, Calif.
Singer Co., Little Falls, N.J.
Texas Instruments, Inc., Houston, Tex.
Toledo Scale, Toledo, Ohio
Varian Assocs., Palo Alto, Cal.
Varian Data Machines, Irvine, Cal.
Victor Comptometer Corp., Chicago, Ill.
Wang Labs., Inc., Tewksbury, Mass.
Xerox Data Sys., El Segundo, Cal

Computers, Digital (Special Purpose)

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Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., (AISSD), Fullerton, Cal.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Beukers Labs., Inc., Hauppauge, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bunker-Ramo Corp., Westlake Village, Cal
Collins Radio Co., Cedar Rapids, Iowa
Computer Automation, Inc., Irvine, Cal.
Control Equip. Corp., Lowell, Mass.
Counterscan Systems, Sutton, Neb.
Data Technology Inc., Watertown, Mass.
Datascan, Inc., Clifton, N.J.
Datum, Inc., Anaheim, Calif.
Davidson Elctrn. Dev. Co., Erie, Pa.
Delco Elctrns. Div., Kokomo, Ind.
Design Automation, Inc., Lexington, Mass.
Design Elements, Columbus, Ohio
Di/An Controls, Inc., Boston, Mass.
Digiac Corp., Plainview, N.Y.
Dynapar Corp., Gurnee, Ill.
Dytro Corp., Hicksville, N.Y.
Eldorado Electrodata, Concord, Cal.
Fairchild Space & Defense Sys., Syosset, N.Y.
Foxboro Co., Foxboro, Mass.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Minneapolis, Minn.
Honeywell Information Systems, Waltham, Mass.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Instrumentation Tech. Corp., Northbridge, Cal.
Interdata, Oceanport, N.J.
Keuffel & Esser Co., Morristown, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Lear Siegler, Grand Rapids, Mich.
Leeds & Northrup Corp., No. Wales, Pa.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Major Data Corp., Costa Mesa, Cal.
Microdata Corp., Irvine, Cal.
Nicolet Instr. Corp., Madison, Wisc.
Nuclear Data, Palatine, Ill.
Perkin-Elmer Corp., Instr. Div., Norwalk, Conn.
Raytheon Data Systems Co., Norwood, Mass.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Missile & Surface Radar Div., Moorestown, N.J.
Republic Advanced System Technology Group, Chatsworth, Calif.
Scientific Measurements, Wilmette, Ill.
Signal Analysis Oper., Hauppauge, N.Y.
Singer Co., Little Falls, N.J.
Singer Co., Glendale, Cal.
Spatial Data Systems, Inc., Goleta, Cal.
SSR Instrs. Co., Santa Monica, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tech Serv., Inc., Fogelsville, Pa.
Texas Instruments, Inc., Houston, Tex.
Theta Instr. Corp., Fairfield, N.J.
Toledo Scale, Toledo, Ohio
Varian Assocs., Palo Alto, Cal.
Varian Data Machines, Irvine, Cal.
Veeder-Root, Hartford, Conn.
Victor Comptometer Corp., Chicago, Ill.
Wang Labs., Inc., Tewksbury, Mass.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.
Wyle Computer Prods., Inc., El Segundo, Calif.

Computers, Hybrid, Analog-Digital

Austin Elctrns., Roselle, N.J.
Bailey Meter Co., Wickliffe, Ohio
Bowmar Instr. Corp., Ft. Wayne, Ind.
Davidson Elctrn. Dev. Co., Erie, Pa.
Design Automation, Inc., Lexington, Mass.
Dytro Corp., Hicksville, N.Y.
General Computers, Inc., Los Angeles, Calif.
Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Hybrid Sys. Corp., Burlington, Mass.
Lear Siegler, Grand Rapids, Mich.
NES, Inc., Itasca, Ill.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Singer Co., Little Falls, N.J.
Systron Donner Computer Systems Div., Concord, Cal.
Toledo Scale, Toledo, Ohio
Xerox Data Sys., El Segundo, Cal

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Conductive Plastic Materials

Acme Chemical & Insulation Co., New Haven, Conn.
Chomerics, Inc., Woburn, Mass.
Electro Mats. Corp. Amer., Mamaroneck, N.Y.
Epoxy Technology, Watertown, Mass.
Merix Chem. Co., Chicago, Ill.
Triac Elctrn. Sys., Forest Hills, N. Y.
Zippertubing Co., Los Angeles, Calif.

Conduit, Electrical

Anaconda American Brass Co., Waterbury, Conn.
Co-Operative Inds., Inc., Chester, N.J.
Ideal Industries, Inc., Sycamore, Ill.
Reynolds Metals Co., Richmond, Va.
Wiremold Co., W. Hartford, Conn.
Zippertubing Co., Los Angeles, Calif.

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Air-O-Tronics Prods., Morrisville, N.Y.
Alford Mfg. Co., Winchester, Mass.
American Microwave Inds., Inc., Waltham, Mass.
Amp Inc., Harrisburg, Pa.
Amphenol Ind'l. Div., Chicago, Ill.
APM-Hexseal, Englewood, N.J.
Ark-Les Switch Corp., Watertown, Mass.
Barker Prods. Co., Saugus, Mass.
Beman Mfg., Inc., New Cumberland, Pa.
Bendix Corp., Sidney, N.Y.
Bird Elctrn., Cleveland, Ohio
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Burndy Corp., Norwalk, Conn.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Chromalloy-Alcon Inc., Chicago, Ill.
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill.
Connector Corp., Chicago, Ill.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Elctrn. Molding Corp., Woonsocket, R.I.
General Elec. Company, Providence, R.I.
General Radio Co., Concord, Mass.
GTE Sylvania Inc., Warren, Pa.
Henry Prods. Co., Inc., Inwood, N.Y.
Hughes Aircraft Co., Connecting Devices, Newport Beach, Cal.
Hypertronics Corp., Watertown, Mass.
ITT Cannon Electric, Santa Ana, Cal.
Jettron Prods., Hanover, N.J.
Kistler Instr. Co., Redmond, Wash.
Lemosa, Inc., San Francisco, Cal.
Malco, A Microdot Co., Inc., Chicago, Ill.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
National Tel-Tronics, Meadville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Phelps Dodge Comm., North Haven, Conn.
Reynolds Inds., Inc., Marina Del Rey, Cal.
Rohde & Schwarz Sls., Passaic, N.J.

Rowe Inds., Div., Toledo, Ohio
Samarius, Inc., Derby, Conn.
Sealectro Corp., Mamaroneck, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., Bklyn., N.Y.
Specialty Connector, Indpls., Ind.
Stanford Applied Engrg., Inc., Santa Ana, Cal.
Superior Elec., Bristol, Conn.
Switchcraft, Inc., Chicago, Ill.
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Viking Inds., Inc., Chatsworth, Calif.
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Accurate Elctrns. Corp., Elyria, Ohio
Americon Microwave Inds., Inc., Waltham, Mass.
Amp Inc., Harrisburg, Pa.
Amphenol Connector Div., Broadview, Ill.
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Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Ark-Les Switch Corp., Watertown, Mass.
Associated Engrg. & Mfg. Corp., Upper Montclair, N. J.
Avibank Mfg. Inc., Burbank, Calif.
Bead Elctrns., Bridgeport, Conn.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Burndy Corp., Norwalk, Conn.
Cambridge Thermionic, Cambridge, Mass
Ceramaseal, Inc., New Lebanon Center, N.Y.
Concord Elctrns., New York, N.Y.
Control Data, Westlake Village, Cal.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
GC Electronics, Rockford, Ill.
General Radio Co., Concord, Mass.
Geo Space, Houston, Tex.
Glenair, Inc., Glendale, Calif.
GTE Sylvania Inc., Warren, Pa.
Gulton Inds., Newport Bch., Cal.
Henry Prods. Co., Inc., Inwood, N.Y.
Hoffman Industrial Prods., Farmingdale, N.Y.
Hollingsworth Solderless Terminal, Phoenixville, Pa.
Hypertronics Corp., Watertown, Mass.
Ico/Rally, Palo Alto, Cal.
IFE Div., E. Providence, R. I.
ITT Cannon Electric, Santa Ana, Cal.
Keystone Elctrns. Corp., New York, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lemosa, Inc., San Francisco, Cal.
Magnum Elec. Corp., Erie, Mich.
Malco, A Microdot Co., Inc., Chicago, Ill.
Molex Inc., Lisle, Ill.
National Tel-Tronics, Meadville, Pa.
North Electric Co., Galion, Ohio
Program Data Co., Carson, Cal.
Robinson-Nugent, New Albany, Ind.
Shigoto Inds., Ltd., New York, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Sjoberg, C. & Son, Inc., Cranston, R.I.
Smith, Herman H., Inc., Bklyn., N.Y.
Specialty Connector, Indpls., Ind.
Teledyne Penn-Union Elec., Edinboro, Pa.
Thomas & Betts Co., Elizabeth, N.J.
3M Co. Electro Prods. Div., St. Paul, Minn.
3M Co., St. Paul, Minn.
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Underwriters Safety Device Co., Chicago, Ill.
Useco Div., Van Nuys, Cal.
Vernitron Elec. Comps., Laconia, N.H.
Viking Inds., Inc., Chatsworth, Calif.
Winchester Elctrns., Oakville, Conn.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

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Elco, Willow Grove, Pa.
Keystone Elctrns. Corp., New York, N.Y.
National Tel-Tronics, Meadville, Pa.
Priority Services, Burbank, Cal.
Robins Ind's. Corp., Consumer Products Div., Commack, N.Y.
Saxton Prods., Congers, N.Y.
Sennheiser Elctrn. Corp., New York, NY
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GC Electronics, Rockford, Ill.
Keystone Elctrns. Corp., New York, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Smith, Herman H., Inc., Bklyn., N.Y.
Teledyne Penn-Union Elec., Edinboro, Pa.
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Burndy Corp., Norwalk, Conn.
Collins Radio Co., Cedar Rapids, Iowa
Concord Elctrns., New York, N.Y.
Control Data, Westlake Village, Cal.
Dale Elctrns., Inc., Yankton, S.D.
Elco, Willow Grove, Pa.
Elctrn. Molding Corp., Woonsocket, R.I.
ETC, Div. ITT, Cleveland, Ohio
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Accurate Elctrns. Corp., Elyria, Ohio
Airborn, Inc., Dallas, Tex.
Airflyte Elctrns. Co., Bayonne, N.J.
American Zettler, Irvine, Ca.
Amp Inc., Harrisburg, Pa.
Amphenol Cadre Div., Endicott, N.Y.
Amphenol Ind'l. Div., Chicago, Ill.
Augat Inc., Attleboro, Mass.
Bead Elctrns., Bridgeport, Conn.
Burndy Corp., Norwalk, Conn.
Cal-Metex Corp., Inglewood, Cal.
Carbone Corp., Boonton, N.J.
Chicago Switch, Chicago, Ill.
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill.
Cleveland Refractory Metals Div., Solon, Ohio
Concord Elctrns., New York, N.Y.
Control Data, Westlake Village, Cal.
CRM, Div. Consolidated Refining Co., Mamaroneck, N.Y.
D-Cemco, Inc., Burbank, Calif.
Deringer Mfg. Co., Mundelein, Ill.
Eaton Corp., Engired. Fasteners Div., Cleveland, Ohio
Elco, Willow Grove, Pa.
Elctrn. Molding Corp., Woonsocket, R.I.
Fansteel Inc., N Chicago, Ill.
Flex-Link Products, Inc., San Fernando, Cal.
GTE Sylvania Inc., Delmont, Pa.
GTE Sylvania Inc., Warren, Pa.
Hughes Aircraft Co., Connecting Devices, Newport Beach, Cal.
ITT Cannon Electric, Santa Ana, Cal.
Hiram Jones Elctrns., No. Hollywood, Cal.
Keystone Elctrns. Corp., New York, N.Y.
Malco, A Microdot Co., Inc., Chicago, Ill.
Mallory Metallurgical, Indianapolis, Ind.
Metex Corp., Edison, N.J.
Methode Elctrns., Inc., Chicago, Ill.
Molex Inc., Lisle, Ill.
Ohio Carbon Co., Cleveland, Ohio
Ostby & Barton Co., Providence, R.I.
Philips Elmet Corp., Lewiston, Me.
Precision Metal Prods. Co., Stoneham, Mass.
Pure Carbon Co., Inc., St. Marys, Pa.
Pylon Co., Inc., Attleboro, Mass.
Servometer Corp., Clifton, N.J.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Stackpole Carbon Co., Carbon Div., St. Marys, Pa.
Stanford Applied Engrg., Inc., Santa Ana, Cal.
Superior Carbon Prods., Inc., Cleveland, Ohio
Texas Instruments, Attleboro, Mass.
Union Carbide, Carbon Prods. Div., New York, N.Y.
Useco Div., Van Nuys, Cal.
Veeder-Root, Hartford, Conn.
Viking Inds., Inc., Chatsworth, Calif.
Waldom Elctrns., Inc., Chicago, Ill.

Containers, Shielded (All Types)

Micrite Metal Mfg., Inc., Canoga Park, Cal. ..... Vol 3•1036
Pomona Elctrns. Co., Inc., Pomona, Cal. Vol 3•740-750
Cal-Metex Corp., Inglewood, Cal.
Calabro Unitrack, Upper Darby, Pa.
Craig Sys. Corp., Lawrence, Mass.
Estes Engrg. Co., Gardena, Calif.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Kinetron Corp., Asbury Park, N.J.
LectroMagnetics, Inc., Los Angeles, Cal.
Magnetic Metals Co., Camden, N.J.
Metex Corp., Edison, N.J.
M M Elctrn. Enclosures, Hicksville, N.Y.
Modpak, Waltham, Mass.
Perfection Mica Co., Bensenville, Ill.
Precision Paper Tube Co., Wheeling, Ill.
Skydyne A Brooks & Perkins Co., Port Jervis, N.Y.
South Shore Metal Prods., Inc., Farmingdale, N.Y.
TA Mfg. Corp., Los Angeles, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Warwick Prods. Co., Independence, Ohio
Zero Mfg. Co., Burbank, Cal.

Containers, Shipping, Metal & Fiberglass (Reusable)-Also See Transit Cases

American Aluminum Co., Mountainside, N.J.
Lewis G. B. Co, Watertown, Wisc
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
M M Elctrn. Enclosures, Hicksville, N.Y.
N L Inds., Inc., Granite City, Ill.
NVF Co., Yorklyn, Del.
Parabam, Inc., Compton, Cal.
Perfection Mica Co., Bensenville, Ill.
Skydyne A Brooks & Perkins Co., Port Jervis, N.Y.
TA Mfg. Corp., Los Angeles, Cal.
Zero Mfg. Co., Burbank, Cal.

Containers, Storage

Akro-Mils, Inc., Akron, Ohio
Althor Prods., Brooklyn, N.Y.
American Aluminum Co., Mountainside, N.J.
Bay Prods., Phila., Pa.
Lewis G. B. Co, Watertown, Wisc
Lyon Metal Prod., Inc., Aurora, Ill.
Metropolitan Wire Goods, Wilkes-Barre, Pa.
M M Elctrn. Enclosures, Hicksville, N.Y.
N L Inds., Inc., Granite City, Ill.
NVF Co., Yorklyn, Del.
Parabam, Inc., Compton, Cal.
Perfection Mica Co., Bensenville, Ill.
Skydyne A Brooks & Perkins Co., Port Jervis, N.Y.
Stackbin Corp., Pawtucket, R.I.
TA Mfg. Corp., Los Angeles, Cal.
Uniroyal, Inc., New York, N.Y.
Vlchek Plastics Co., Middlefield, Ohio
Zero Mfg. Co., Burbank, Cal.

Containers, Transit—See Transit Cases

Controllers, Programmable

Slaughter Co., Ardmore, Okla. Vol 1•505
Square D Co., Park Ridge, Ill.. Vol 2•367
Luft Instrs., Inc., Lincoln, Mass.

Control Panels & Systems, Computer—See Boards, Programming

Controls, Capacitance Operated

Automatic Timing & Controls, Inc., King of Prussia, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Davidson Elctrn. Dev. Co., Erie, Pa.
Delavan Electronics, Scottsdale, Ariz.
Dynamic Data Corp., Columbus, Ohio
Electron-Machine Corp., Umatilla, Fla.
Foxboro Co., Foxboro, Mass.
Lion Precision Corp, Newton, Mass.
Micro Instr. Co., Hawthorne, Cal.
Photobell Co., Inc., New York, N.Y.
Robertshaw Controls Co., Richmond, Va.
Sensor Corp., Scottsdale, Pa.

Controls, Carbon—See Potentiometers; Rheostats

Controls, Constant Impedance—See Attenuators

Controls, Counting and Sorting

Abrams Instr., Lansing, Mich.
Applied Control Co., Fairfield, N.J.
Control Technology Co., L.I.C., N.Y.
Controlcraft Corp., West Chicago, Ill.
Dynapar Corp., Gurnee, Ill. .
Luft Instrs., Inc., Lincoln, Mass.
Micro Switch, Freeport, Ill.
Photobell Co., Inc., New York, N.Y.
Presin Co., Inc., Shelton, Conn.
Scientific Technology, Mountain View, Cal.
Tenor Co., Inc., New Berlin, Wisc.
Triac Elctrn. Sys., Forest Hills, N. Y.

Controls, Density

Davidson Elctrn. Dev. Co., Erie, Pa.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Electron-Machine Corp., Umatilla, Fla.
Foxboro Co., Foxboro, Mass.
Heitz, Karl, Inc., New York, N.Y.
Luft Instrs., Inc., Lincoln, Mass.
National Sonics, Farmingdale, N.Y.

Nuclear Resch. Corp., Southampton, Pa.
NUSonics, Inc., Paramus, N.J.
Photomation, Inc., Mountain View, Calif.
Princo Instrs., Southampton, Pa.
RIL Elctrns., Inc., Southampton, Pa.
Robertshaw Controls Co., Richmond, Va.
Scientronics, Barrington, N.J.
Spatial Data Systems, Inc., Goleta, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Triac Elctrn. Sys., Forest Hills, N. Y.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Dimension

Int'l. Electro-Magnetics, Palatine, Ill. Vol 1•313
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., Danville, Ill.
Columbia Resch. Labs., Woodlyn, Pa.
Data Technology Inc., Watertown, Mass.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dynamic Data Corp., Columbus, Ohio
Dynapar Corp., Gurnee, Ill.
Electron-Machine Corp., Umatilla, Fla.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Lion Precision Corp, Newton, Mass.
Luft Instrs., Inc., Lincoln, Mass.
Midland Standard Inc., Elgin, Ill.
Minnetech Labs, Minneapolis, Minn.
Schaevitz Engrg., Pennsauken, N.J.
Scientific Technology, Mountain View, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Tempo Instrument, Inc., Plainview, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Veeder-Root, Hartford, Conn.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Door Opening & Closing (Industrial)

A.R.F. Products, Inc., Boulder, Colo.
Innovation Industries Inc., Roswell, N.M.
Instrumentation Tech. Corp., Northbridge, Cal.
Micro Switch, Freeport, Ill.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Scientific Technology, Mountain View, Cal.

Controls, Environmental Test Equipment

Unholtz-Dickie Corp., Hamden, Conn. Vol 1•530
American Instr. Co., Silver Spring, Md.
Artisan Elctrns. Corp., Parsippany, N.J.
Bafco, Inc., Warminster, Pa.
Bell & Howell Co., Pasadena, Calif.
Blue M Engrg. Co., Blue Island, Ill.
Chadwick-Helmuth Co., Inc., Monrovia, Calif.
Control Technology Co., L.I.C., N.Y.
Delta Design, San Diego, Cal
Elctrn. Control Co., Dresher, Pa.
Erdco Engrg. Corp., Addison, Ill.
Foxboro Co., Foxboro, Mass.
Honeywell, Ft. Washington, Pa.
Honeywell, Mpls., Minn.
Hotpack Corp., Phila., Pa.
Jade Corp., Huntingdon Valley, Pa.
Lab-Line Instrs., Inc., Melrose Park, Ill.
L.A.B. Corp., Skaneateles, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Luft Instrs., Inc., Lincoln, Mass.
NES, Inc., Itasca, Ill.
OAL Assocs., Inc., Westbury, N.Y.
Oven Industries, Inc., Mechanicsburg, Pa.
Precision Timer Co., Westbrook, Conn.
Research, Inc., Minneapolis, Minn.
Sealectro Corp., Mamaroneck, N.Y.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tech Serv., Inc., Fogelsville, Pa.
Tenney Engrg., Inc., Union, N.J.
Torr Labs., Los Angeles, Cal.
United Elec. Controls Co., Watertown, Mass.
Varian Assocs., Vacuum Div., Palo Alto, Cal.
Vibration Instrs. Co., Anaheim, Cal.
Warren G-V Communications, Livingston, N.J.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Whittaker Corp., Los Angeles, Cal.

Controls, Fluid Conductivity

Applied Control Co., Fairfield, N.J.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Cedar Grove, N.J.
Foxboro Co., Foxboro, Mass.
Leeds & Northrup Corp., No. Wales, Pa.
Mag-Con, Inc., New Brighton, Minn.
NUSonics, Inc., Paramus, N.J.
Robertshaw Controls Co., Richmond, Va.
Scientronics, Barrington, N.J.
Tempo Instrument, Inc., Plainview, N.Y.
Triac Elctrn. Sys., Forest Hills, N. Y.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.

Controls, Fluid Flow

Square D Co., Park Ridge, Ill.. Vol 2•367
Triac Elctrn. Sys., Forest Hills, N. Y. Vol 2•371,377
Anderson, W.E., Inc., Kansas City, Mo.
Autocon Inds., Inc., Minneapolis, Minn.
Bailey Meter Co., Wickliffe, Ohio
Bell & Howell Co., Pasadena, Calif.
Bendix Corp., N. Hollywood, Calif.
Bendix Corp., Davenport, Iowa
Brooks Instr. Div., Hatfield, Pa.
Computer Instrs., Hempstead, N.Y.
Consolidated Controls Corp., Bethel, Conn.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Durant Digital Instrs., Watertown, Wisc.
Erdco Engrg. Corp., Addison, Ill.
Fenwal Elctrns., Framingham, Mass.
Flow Technology, Inc., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
Gems Sensors Div., Farmington, Conn.
General Valve Corp., E. Hanover, N.J.
Harwil Co., Santa Monica, Calif.
Hills-McCanna Co., Carpentersville, Ill.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Johnson Corp., Three Rivers, Mich.
Kidde, Walter & Co., Belleville, N.J.
Lear Siegler, Inc., Elyria, Ohio
Leeds & Northrup Corp., No. Wales, Pa.
Lion Precision Corp, Newton, Mass.
Luft Instrs., Inc., Lincoln, Mass.
Matheson Gas Products, East Rutherford, N.J.
Midland Standard Inc., Elgin, Ill.
Precision Dynamics Corp., Burbank, Cal.
Robertshaw Controls Co., Richmond, Va.
Rosemount Inc., Minneapolis, Minn.
Seco Elctrns. Corp., Hopkins, Minn.
Skinner Elec. Valve Div., New Britain, Conn.
Taylor Instr. Process Control Div., Rochester, N.Y.
Trans-Sonics, Inc., Lexington, Mass.
Tylan Corp., Torrance, Calif.
United Elec. Controls Co., Watertown, Mass.
Veeder-Root, Hartford, Conn.
West Coast Resch. Corp., Los Angeles, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Whittaker Corp., Los Angeles, Cal.

Controls, Frequency

Active Control Instrumentation, E. Northport, NY..... Vol 2•326,327
Autronics Corp., Pasadena, Calif. Vol 2•333
Accutronics, Geneva, Ill.
Allis, Louis Div., Milwaukee, Wisc.
American Elctrns., Inc., Fullerton, Cal.
American Time Products, Woodside, N.Y.
AMF Electical Prods., Alexandria, Va.
Amtron Inc., Midlothian, Ill.
Anadex Instrs., Inc., Van Nuys, Calif.
Avtron Mfg., Inc., Cleveland, Ohio
Bramco Controls, Piqua, Ohio
CML-Macarr, Inc., Edison, N.J.
Control Technology Co., L.I.C., N.Y.
Davidson Elctrn. Dev. Co., Erie, Pa.
Douglas Randall Div., Pawcatuck, Conn.
Dynapar Corp., Gurnee, Ill.
Electro Corp., Sarasota, Fla.
Electronic Research Co., Shawnee Mission, Kan.
Fork Standards, W. Chicago, Ill.
Frequency Elctrns., New Hyde Pk., N.Y.
Geo Space Sys., Tampa, Fla.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Hi-G, Windsor Locks, Conn.
Leeds & Northrup Corp., No. Wales, Pa.
Logiconcepts Inc., Los Alamitos, Cal.
Logitek, Inc., Farmingdale, N.Y.
Meloy Laboratories Inc., Springfield, Va.
Midland Standard Inc., Elgin, Ill.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
Philamon, Inc., Westbury, N.Y.
Riverbank Labs., Geneva, Ill.
Scientific Technology, Mountain View, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Tempo Instrument, Inc., Plainview, N.Y.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Controls, Gas

Air Prods. & Chems., Inc., Allentown, Pa.
Bailey Meter Co., Wickliffe, Ohio
Bristol Div, Waterbury, Conn
Devco Engrg., W. Caldwell, N.J.
Fenwal Elctrns., Framingham, Mass.
Honeywell, Ft. Washington, Pa.
Lektra Labs., Inc., College Point, N.Y.
Matheson Gas Products, East Rutherford, N.J.
Singer Co., Philadelphia, Pa.
Teledyne Geotech, Dallas, Tex.
Triac Elctrn. Sys., Forest Hills, N. Y.
Tylan Corp., Torrance, Calif.
United Elec. Controls Co., Watertown, Mass.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.

Controls, Hardware, Shafts & Accessories—See Shafts; Dials;etc.

Controls, Humidity

American Instr. Co., Silver Spring, Md.
Applied Control Co., Fairfield, N.J.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Blue M Engrg. Co., Blue Island, Ill.
Bristol Div, Waterbury, Conn
Climatronics Corp., Hauppauge, N.Y.
Davidson Elctrn. Dev. Co., Erie, Pa.
Foxboro Co., Foxboro, Mass.
Harrel, Inc., E. Norwalk, Conn.
Honeywell, Ft. Washington, Pa.
Honeywell, Mpls., Minn.
Hotpack Corp., Phila., Pa.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Lear Siegler, Inc., Elyria, Ohio
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.

Controls, Ignitron Firing

Triac Elctrn. Sys., Forest Hills, N. Y. Vol 2•371,373
Advanced Kinetics, Costa Mesa, Calif.
Autronics Corp., Pasadena, Calif.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Essex Int'l., Logansport, Ind.
Ledex, Inc., Dayton, Ohio
Precision Timer Co., Westbrook, Conn.
Research, Inc., Minneapolis, Minn.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.

Controls, Joystick

Bowmar Instr. Corp., Ft. Wayne, Ind. Vol 2•334

Controls, Lamp Dimming, Flashing

Autronics Corp., Pasadena, Calif. Vol 2• 333
Accurate Elctrns. Corp., Elyria, Ohio
Bell Industries, Compton, Cal.
Cross Electronics Inc., Warrendale, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Hunt Electronics Co., Dallas, Tex.
IEC Electronics Corp., E. Rochester, N.Y.
Ledex, Inc., Dayton, Ohio
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Precision Dynamics Corp., Burbank, Cal.
Tempo Instrument, Inc., Plainview, N.Y.
Triac Elctrn. Sys., Forest Hills, N. Y.
W-F Products, Inc., Denver, Co.
W.V. Industries Inc., Franklin Lakes, N.J.
Warren G-V Communications, Livingston, N.J.

Controls, Level, Dry Material

Amtron Inc., Midlothian, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Devices, Inc., Fairview, Pa.
Autotron, Inc., Danville, Ill.
Control Technology Co., L.I.C., N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cross Electronics Inc., Warrendale, Pa.
Delavan Electronics, Scottsdale, Ariz.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Innovation Industries Inc., Roswell, N.M.
Mag-Con, Inc., New Brighton, Minn.
Micro Switch, Freeport, Ill.
National Sonics, Farmingdale, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
PECO Corp., Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Princo Instrs., Southampton, Pa.
RIL Elctrns., Inc., Southampton, Pa.
Robertshaw Controls Co., Richmond, Va.
Scientific Technology, Mountain View, Cal.
Skan-A-Matic Corp., Elbridge, N. Y.
Taylor Instr. Process Control Div., Rochester, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
Triac Elctrn. Sys., Forest Hills, N. Y.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Level, Liquid

Triac Elctrn. Sys., Forest Hills, N. Y. Vol 2•377
Air-O-Tronics Prods., Morrisville, N.Y.
Ametek/Instrs. & Controls, Feasterville, Pa.
Amtron Inc., Midlothian, Ill.
Autocon Inds., Inc., Minneapolis, Minn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., Danville, Ill.
Bailey Meter Co., Wickliffe, Ohio
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp., Davenport, Iowa
Bristol Div, Waterbury, Conn
Brooks Instr. Div., Hatfield, Pa.
Coil Co. of Amer., Northvale, N.J.
Cole-Parmer Instr. Co., Chicago, Ill.
Computer Instrs., Hempstead, N.Y.
Conrac Corp., Fairfield, N.J.
Consolidated Controls Corp., Bethel, Conn.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Cutler-Hammer, Milwaukee, Wisc.
Delavan Electronics, Scottsdale, Ariz.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., Batavia, Ill.
Gagne Assocs., Inc., Binghamton, N.Y.
Gems Sensors Div., Farmington, Conn.
Guardian Elec. Mfg. Co., Chicago, Ill.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Ind'l. Control Co., Farmingdale, N.Y.
Innovation Industries Inc., Roswell, N.M.
Johnson Corp., Three Rivers, Mich.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Leeds & Northrup Corp., No. Wales, Pa.
Luft Instrs., Inc., Lincoln, Mass.
Mag-Con, Inc., New Brighton, Minn.

Master Elctrn. Controls, Santa Monica, Cal.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
National Sonics, Farmingdale, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Oxford Instr. Corp., Annapolis, Md.
PECO Corp., Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Power Instrs., Skokie, Ill.
Princo Instrs., Southampton, Pa.
RIL Elctrns., Inc., Southampton, Pa.
Robertshaw Controls Co., Richmond, Va.
Scientific Technology, Mountain View, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Square D Co., Park Ridge, Ill.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Thermometrics, Inc., Edison, N.J.
Torr Labs., Los Angeles, Cal.
Trans-Sonics, Inc., Lexington, Mass.
Transducer Controls Corp., Covina, Calif.
Ultrasonic Corp., Pipestone, Minn.
United Elec. Controls Co., Watertown, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Worner Elctrn. Devices, Rankin, Ill.
Zi-Tech Div., Palo Alto, Cal.

Controls, Machine Tool

Measurement Sys., Inc., Norwalk, Conn. Vol 2•356
Square D Co., Park Ridge, Ill.. Vol 2•367
Allen-Bradley Co., Milwaukee, Wisc.
Allen-Bradley, Highland Hgts., Ohio
Allis-Chalmers, Milwaukee, Wisc.
Amtron Inc., Midlothian, Ill.
Applied Control Co., Fairfield, N.J.
Arrow-Hart, Inc., Hartford, Conn.
Astrosystems, Inc., Lake Success, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Devices, Inc., Fairview, Pa.
Baldwin Elctrns., Little Rock, Ark.
Bendix Corp., Detroit, Mich.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Cincinnati Milacron, Lebanon, Ohio
Coil Co. of Amer., Northvale, N.J.
Computer Conversions Corp., East Northport, N.Y.
Conrac Corp., Westminister, Cal.
Control Technology Co., L.I.C., N.Y.
Controls Div., Elizabeth, N.J.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Data Technology Inc., Watertown, Mass.
Datascan, Inc., Clifton, N.J.
Datex Div., Duarte, Cal.
Davidson Elctrn. Dev. Co., Erie, Pa.
De Soto Elec. Prods., De Soto, Mo.
Delco Elctrns. Div., Kokomo, Ind.
Devco Engrg., W. Caldwell, N.J.
Digital Equip. Corp., Maynard, Mass.
Durant Digital Instrs., Watertown, Wisc.
Dynamic Data Corp., Columbus, Ohio
Dynapar Corp., Gurnee, Ill.
Electro Corp., Sarasota, Fla.
Farrand Controls, Inc., Valhalla, N.Y.
Fincor Div., York, Pa.
Flight Sys., Inc., Mechanicsburg, Pa.
Furnas Elec. Co., Batavia, Ill.
Guardian California, Culver City, Cal.
Hoagland Instr., Dayton, N.J.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Icon Corp., Sub of U.S.M. Corp., Cambridge, Mass.
Landis & Gyr, Inc., Elmsford, N.Y.
LVC Inds. Inc., Flushing, N.Y.
Major Data Corp., Costa Mesa, Cal.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Midwest Controls Co., Lincoln, Neb.
Minnetech Labs, Minneapolis, Minn.
NES, Inc., Itasca, Ill.
North American Philips Controls Corp., Cheshire, Conn.
Parametrics, Inc., Orange, Conn.
PECO Corp., Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Precision Timer Co., Westbrook, Conn.
Proto Matic Co., Cincinnati,, Ohio
Raymond Controls Corp., Middletown, Conn.
Robicon Corp., Pittsburgh, Pa.
Scientific Technology, Mountain View, Cal.
Seco Elctrns. Corp., Hopkins, Minn.
Struthers-Dunn, Inc., Pitman, N.J.
Struthers-Dunn, Inc., Bettendorf, Iowa
Summit Engrg. Corp., Bozeman, Mont.
Superior Elec., Bristol, Conn.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Taylor-Winfield Corp., Warren, Ohio
Tektronix, Inc., Beaverton, Ore.
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Theta Instr. Corp., Fairfield, N.J.
Torque Systems, Waltham, Mass.
Transducer Controls Corp., Covina, Calif.
Triac Elctrn. Sys., Forest Hills, N. Y.
W.V. Industries Inc., Franklin Lakes, N.J.
Westamp, Inc., Santa Monica, Cal.
Westinghouse Elec., Buffalo, N. Y.
Westinghouse Elec. Corp., Ind'l. Systems Div., Pittsburgh, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Controls, Moisture—See Controls, Humidity

Controls, Motor Speed

Autronics Corp., Pasadena, Calif. Vol 2•333
Bodine Elec. Co., Chicago, Ill. Vol 2•634
Carter Motor Co., Chicago, Ill. Vol 2•635
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AMF Electical Prods., Alexandria, Va.
Amtron Inc., Midlothian, Ill.
Applied Control Co., Fairfield, N.J.
Arnold Magnetics, Culver City, Cal.
Autocon Inds., Inc., Minneapolis, Minn.
Avtron Mfg., Inc., Cleveland, Ohio
B & B Motor & Control, New York, NY
Basler Elec. Co., Highland, Ill.
Beckman Instrs., Helipot Div., Fullerton, Cal.
BECO, Inc., Salem, Va.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Carson Mfg. Co., Indianapolis, Ind.
Cherry Electrical Prods., Waukegan, Ill
CML-Macarr, Inc., Edison, N.J.
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Control Technology Co., L.I.C., N.Y.
Cross Electronics Inc., Warrendale, Pa.
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Electro-Pacific, Inc., Goleta, Calif.
Electrol Co., Inc., York, Pa.
Elctrn. Control Co., Dresher, Pa.
Fincor Div., York, Pa.
Firing Circuits, Norwalk, Conn.
Foxboro Co., Foxboro, Mass.
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Gems Sensors Div., Farmington, Conn.
General Devices, Inc., Princeton, N.J.
Glentek, Inc., Santa Monica, Calif.
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Hamlin, Inc., Lake Mills, Wisc.
Honeywell, Ft. Washington, Pa.
Hope Elctrns., Clifton, N.J.
Hunt Electronics Co., Dallas, Tex.
Icon Corp., Sub of U.S.M. Corp., Cambridge, Mass.
IEC Electronics Corp., E. Rochester, N.Y.
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Inservco, Inc., La Grange, Ohio
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International Rectifier, El Segundo, Cal.
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Lear Siegler, Inc., Santa Monica, Calif.
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Luft Instrs., Inc., Lincoln, Mass.
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Mag-Con, Inc., New Brighton, Minn.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Master Elctrn. Controls, Santa Monica, Cal.
Meltronics Inc., Leeds, Ala.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
MKC Elctrns. Corp., Kansas City, Kans.
Ohmite Mfg. Co., Skokie, Ill.
Opad Elec. Co., Inc., New York, N.Y.
Parametrics, Inc., Orange, Conn.
PECO Corp., Milpitas, Cal.
Power Control Corp., Pittsburgh, Pa.
Power Technology, Inc., Little Rock, Ark.
Precision Dynamics Corp., Burbank, Cal.
Quadrastat Controls Corp., Glendale, Cal.
Ratelco, Inc., Seattle, Wash.
Reliance Elec. Co., Cleveland, Ohio
Research, Inc., Minneapolis, Minn.
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Sawyer Inds., Arcadia, Cal.
Schaevitz Engrg., Pennsauken, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
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Sensor Corp., Scottsdale, Pa.
Sequential Information Systems, Elmsford, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
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Struthers-Dunn, Inc., Bettendorf, Iowa
Summit Engrg. Corp., Bozeman, Mont.
Superior Elec., Bristol, Conn.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
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Transducer Controls Corp., Covina, Calif.
Transicoil, Inc., Worcester, Pa.
Unitron Inc., Garland, Tex.
Vectrol, Inc., Rockville, Md.
Voltex Co., Inc., Farmingdale, N.Y.
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Electronic Research Co., Shawnee Mission, Kan.
Fork Standards, W. Chicago, Ill.
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J-B-T Instrs., Inc., New Haven, Conn.
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Controlcraft Corp., West Chicago, Ill.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Hughey & Phillips, Inc., Burbank, Cal.
IEC Electronics Corp., E. Rochester, N.Y.
Innovation Industries Inc., Roswell, N.M.
International Rectifier, El Segundo, Cal.
Kates Scientific Instrs., Inc., Watertown, Mass.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Luft Instrs., Inc., Lincoln, Mass.
Master Elctrn. Controls, Santa Monica, Cal.
NES, Inc., Itasca, Ill.
PECO Corp., Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Precision Dynamics Corp., Burbank, Cal.
Ripley Co., Inc., Middletown, Conn.
Scientific Technology, Mountain View, Cal.
Sensor Technology, Chatsworth, Cal.
Sigma Instrs., Inc., Braintree, Mass.
Skan-A-Matic Corp., Elbridge, N. Y.
Spectronics, Inc., Richardson, Tex.
Tri-Tronics Co., Oak Brook, Ill.
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American Time Products, Woodside, N.Y.
Ametek/Instrs. & Controls, Feasterville, Pa.
Applied Control Co., Fairfield, N.J.
Astrosystems, Inc., Lake Success, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avtron Mfg., Inc., Cleveland, Ohio
Bailey Meter Co., Wickliffe, Ohio
Baldwin Elctrns., Little Rock, Ark.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bendix Corp., N. Hollywood, Calif.
Bendix Corp., Detroit, Mich.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bristol Div, Waterbury, Conn
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C & A Products, Inc., Woodside, N. Y.
Cherry Electrical Prods., Waukegan, Ill
Columbia Resch. Labs., Woodlyn, Pa.
Computer Conversions Corp., East Northport, N.Y.
Computer Devices of Calif., Santa Fe Springs, Cal.
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Consolidated Controls Corp., Bethel, Conn.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cross Electronics Inc., Warrendale, Pa.
Data Technology Inc., Watertown, Mass.
Datex Div., Duarte, Cal.
Datron Systems, Chatsworth, Cal.
Delco Elctrns. Div., Kokomo, Ind.
Dynamic Data Corp., Columbus, Ohio
Dynapar Corp., Gurnee, Ill.
Electro Corp., Sarasota, Fla.
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Electrol Co., Inc., York, Pa.
Farrand Controls, Inc., Valhalla, N.Y.
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Foxboro Co., Foxboro, Mass.
Gap Instr. Corp., Hauppauge, N.Y.
Gems Sensors Div., Farmington, Conn.
General Scanning, Watertown, Mass.
Geo Space Sys., Tampa, Fla.
Glentek, Inc., Santa Monica, Calif.
HEI, Inc., Chaska, Minn.
Hills-McCanna Co., Carpentersville, Ill.
Honeywell, Minneapolis, Minn.
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Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Icon Corp., Sub of U.S.M. Corp., Cambridge, Mass.
IEC Electronics Corp., E. Rochester, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Int'l. Electro-Magnetics, Palatine, Ill.
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Minnetech Labs, Minneapolis, Minn.
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National Sonics, Farmingdale, N.Y.
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Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Precision Mechanisms Corp., Westbury, N.Y.
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Quadrastat Controls Corp., Glendale, Cal.
Robicon Corp., Pittsburgh, Pa.
Schaevitz Engrg., Pennsauken, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Scientific Technology, Mountain View, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Seco Elctrns. Corp., Hopkins, Minn.
Sensor Corp., Scottsdale, Pa.
Sequential Information Systems, Elmsford, N.Y.
Singer Co., Glendale, Cal.
Skan-A-Matic Corp., Elbridge, N. Y.
Speed Detectors, Bedford, Ohio
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Texas Instruments, Control Prods. Div., Attleboro, Mass.
Theta Instr. Corp., Fairfield, N.J.
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Veeder-Root, Hartford, Conn.
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Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westamp, Inc., Santa Monica, Cal.
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Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bailey Meter Co., Wickliffe, Ohio
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Bell & Howell Co., Pasadena, Calif.
Bendix Corp., Davenport, Iowa
Bristol Div, Waterbury, Conn
Columbus Elec. Mfg. Co., Columbus, Ohio
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Conrac Corp., Duarte, Cal.
Consolidated Controls Corp., Bethel, Conn.
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Control Technology Co., L.I.C., N.Y.
Cook Elec. Co., Morton Grove, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Dynamic Controls Corp., S. Windsor, Conn.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., Batavia, Ill.
Gagne Assocs., Inc., Binghamton, N.Y.
Gems Sensors Div., Farmington, Conn.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Honeywell, Mpls., Minn.
Kidde, Walter & Co., Belleville, N.J.
Lear Siegler, Inc., Elyria, Ohio
Leeds & Northrup Corp., No. Wales, Pa.
Lion Precision Corp, Newton, Mass.
Luft Instrs., Inc., Lincoln, Mass.
Matheson Gas Products, East Rutherford, N.J.
MKS Instrs., Inc., Burlington, Mass.
Precision Dynamics Corp., Burbank, Cal.
Robertshaw Controls Co., Richmond, Va.
Rosemount Inc., Minneapolis, Minn.
Schaevitz Engrg., Pennsauken, N.J.
Seco Elctrns. Corp., Hopkins, Minn.
Sensotec, Inc., Columbus, Ohio
Singer Co., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Texas Instruments, Inc., Houston, Tex.
Transducer Controls Corp., Covina, Calif.
United Elec. Controls Co., Watertown, Mass.
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Ametek/Instrs. & Controls, Feasterville, Pa.
Amtron Inc., Midlothian, Ill.
Applied Control Co., Fairfield, N.J.
Avtron Mfg., Inc., Cleveland, Ohio
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bendix Corp., N. Hollywood, Calif.
Blue M Engrg. Co., Blue Island, Ill.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bristol Div, Waterbury, Conn
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Cole-Parmer Instr. Co., Chicago, Ill.
Control Technology Co., L.I.C., N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cox & Co., Inc., New York, N.Y.
Cross Electronics Inc., Warrendale, Pa.
Durant Digital Instrs., Watertown, Wisc.
Dynapar Corp., Gurnee, Ill.
Electrol Co., Inc., York, Pa.
Elctrn. Control Co., Dresher, Pa.
Foxboro Co., Foxboro, Mass.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Guardian California, Culver City, Cal.
Hills-McCanna Co., Carpentersville, Ill.
Honeywell, Ft. Washington, Pa.
Ind'l. Control Co., Farmingdale, N.Y.
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Leeds & Northrup Corp., No. Wales, Pa.
LFE Corp., Waltham,, Mass.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Matheson Gas Products, East Rutherford, N.J.
Measurement Sys., Inc., Norwalk, Conn.
MKC Elctrns. Corp., Kansas City, Kans.
NES, Inc., Itasca, Ill.
Oven Industries, Inc., Mechanicsburg, Pa.
Power Control Corp., Pittsburgh, Pa.
Research, Inc., Minneapolis, Minn.
Robertshaw Controls Co., Richmond, Va.
Robicon Corp., Pittsburgh, Pa.
Schaevitz Engrg., Pennsauken, N.J.
Seco Elctrns. Corp., Hopkins, Minn.
Solid State Elctrns. Corp., Sepulveda, Cal.
Summit Engrg. Corp., Bozeman, Mont.
Taylor Instr. Process Control Div., Rochester, N.Y.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Theta Instr. Corp., Fairfield, N.J.
3M Co., St. Paul, Minn.
Transducer Controls Corp., Covina, Calif.
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Vectrol, Inc., Rockville, Md.
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Ametek/Instrs. & Controls, Feasterville, Pa.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Services Div., Windsor, N. Y.
Autotron, Inc., Danville, Ill.
Coil Co. of Amer., Northvale, N.J.
Cole Instrument Corp., Costa Mesa, Cal.
Controlcraft Corp., West Chicago, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Delavan Electronics, Scottsdale, Ariz.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Electro Corp., Sarasota, Fla.
Electrol Co., Inc., York, Pa.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
HEI, Inc., Chaska, Minn.
Honeywell, Minneapolis, Minn.
IEC Electronics Corp., E. Rochester, N.Y.
Licon Div., Chicago, Ill.
Lion Precision Corp, Newton, Mass.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
PECO Corp., Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Precision Dynamics Corp., Burbank, Cal.
Reed Switch Dev. Co., Greenwich, Conn.
Robertshaw Controls Co., Richmond, Va.
Schaevitz Engrg., Pennsauken, N.J.
Scientific Technology, Mountain View, Cal.
Sensor Corp., Scottsdale, Pa.
Skan-A-Matic Corp., Elbridge, N. Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
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Bramco Controls, Piqua, Ohio
Carson Mfg. Co., Indianapolis, Ind.
Cole Instrument Corp., Costa Mesa, Cal.
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Dale Elctrns., Inc., Yankton, S.D.
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General Elec. Company, Providence, R.I.
Geo Space Sys., Tampa, Fla.
Hathaway Instruments, Inc., Denver, Colo.
Heitz, Karl, Inc., New York, N.Y.
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Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
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RCA Corp., Camden, N.J.
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Texas Instruments, Attleboro, Mass.
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Applied Control Co., Fairfield, N.J.
B & B Motor & Control, New York, NY
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Basler Elec. Co., Highland, Ill.
Blue M Engrg. Co., Blue Island, Ill.
Bristol Div, Waterbury, Conn
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Caig Labs., Inc., Westbury, N.Y.
Cal-Power Corp., El Segundo, Calif.
Carson Mfg. Co., Indianapolis, Ind.
Coil Co. of Amer., Northvale, N.J.
Constant Voltage Co., Chicago, Ill.
Cox & Co., Inc., New York, N.Y.

Cross Electronics Inc., Warrendale, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Datron Systems, Chatsworth, Cal.
De Soto Elec. Prods., De Soto, Mo.
Despatch Oven Co., Minneapolis, Minn.
Digitron Corp., Norristown, Pa.
Dynamic Controls Corp., S. Windsor, Conn.
Electro-Devices, Inc., Paterson, N.J.
Electro-Pacific, Inc., Goleta, Calif.
Electrol Co., Inc., York, Pa.
Elctrn. Control Co., Dresher, Pa.
Fincor Div., York, Pa.
Firing Circuits, Norwalk, Conn.
Flight Sys., Inc., Mechanicsburg, Pa.
General Instr. Corp., Semiconductor Comps. Div., Hicksville, N.Y.
Glentek, Inc., Santa Monica, Calif.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
GRM Corp., Medford, N.J.
Halmar Elctrns., Inc., Columbus, Ohio
Honeywell, Ft. Washington, Pa.
Hotpack Corp., Phila., Pa.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Int'l. Instrs., Orange, Conn.
International Rectifier, El Segundo, Cal.
Jordan Controls, Milwaukee, Wisc.
LFE Corp., Waltham,, Mass.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Master Elctrn. Controls, Santa Monica, Cal.
Midland Standard Inc., Elgin, Ill.
Motorola Semiconductor Prods., Phoenix, Ariz.
Ohmite Mfg. Co., Skokie, Ill.
Parametrics, Inc., Orange, Conn.
Power Control Corp., Pittsburgh, Pa.
Reliance Elec. Co., Cleveland, Ohio
Research, Inc., Minneapolis, Minn.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Robicon Corp., Pittsburgh, Pa.
Rosemount Inc., Minneapolis, Minn.
Schaevitz Engrg., Pennsauken, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Seco Elctrns. Corp., Hopkins, Minn.
Sensor Corp., Scottsdale, Pa.
Signalite, Neptune, N.J.
Texas Instruments, Dallas, Tex.
Texas Instruments, Attleboro, Mass.
Vectrol, Inc., Rockville, Md.
Veeder-Root, Hartford, Conn.
Voltex Co., Inc., Farmingdale, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
WER Industrial, Grand Island, N.Y.
Westamp, Inc., Santa Monica, Cal.
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Hartman Electrical Mfg., Mansfield, Ohio
Luft Instrs., Inc., Lincoln, Mass.
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Bendix Corp., N. Hollywood, Calif.
Bodine Elec. Co., Chicago, Ill.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C & A Products, Inc., Woodside, N. Y.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
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Digiac Corp., Plainview, N.Y.
Dynapar Corp., Gurnee, Ill.
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Hills-McCanna Co., Carpentersville, Ill.
Honeywell, Ft. Washington, Pa.
Innovatek Enterprise, Millerton, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Meltronics Inc., Leeds, Ala.
Micro Switch, Freeport, Ill.
Robicon Corp., Pittsburgh, Pa.
Scientific-Atlanta, Inc., Atlanta, Ga.
Scientific Technology, Mountain View, Cal.
Sequential Information Systems, Elmsford, N.Y.
Singer Co., Little Falls, N.J.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transicoil, Inc., Worcester, Pa.
Vernitech, Deer Pk., N.Y.
Vibra-Metrics, Inc., E. Haven, Conn.
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Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
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Automatic Timing & Controls, Inc., King of Prussia, Pa.
B & B Motor & Control, New York, NY
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Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Clifton Precision, Clifton Hgts., Pa.
Computer Devices of Calif., Santa Fe Springs, Cal.
Conrac Corp., Fairfield, N.J.
Control Data Corp., Minneapolis, Minn.
Datron Systems, Chatsworth, Cal.
Dynapar Corp., Gurnee, Ill.
Furnas Elec. Co., Batavia, Ill.
Gap Instr. Corp., Hauppauge, N.Y.
Glentek, Inc., Santa Monica, Calif.
Harowe Servo Controls, W. Chester, Pa.
Honeywell, Ft. Washington, Pa.
Icon Corp., Sub of U.S.M. Corp., Cambridge, Mass.
IMC Magnetics Corp., Westbury, N.Y.
IMC Magnetics Corp., Rochester, N.H.
IMC Magnetics Corp., Maywood, Cal.
Ledex, Inc., Dayton, Ohio
Measurement Sys., Inc., Norwalk, Conn.
North American Philips Controls Corp., Cheshire, Conn.
Precision Dynamics Corp., Burbank, Cal.
Precision Timer Co., Westbrook, Conn.
Proto Matic Co., Cincinnati,, Ohio
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Sealectro Corp., Mamaroneck, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Singer Co., Little Falls, N.J.
Summit Engrg. Corp., Bozeman, Mont.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Texas Instruments, Attleboro, Mass.
Theta Instr. Corp., Fairfield, N.J.
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AMF Electical Prods., Alexandria, Va.
Andersen Labs. Inc., Bloomfield, Conn.
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Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barnes Engrg. Co., Stamford, Conn.
BECO, Inc., Salem, Va!
Beede Electrical Instr. Co., Inc., Penacook, N.H.
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Caig Labs., Inc., Westbury, N.Y.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Cambridge Thermionic, Cambridge, Mass
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Columbus Elec. Mfg. Co., Columbus, Ohio
Consolidated Controls Corp., Bethel, Conn.
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Cross Electronics Inc., Warrendale, Pa.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Davidson Elctrn. Dev. Co., Erie, Pa.
Devco Engrg., W. Caldwell, N.J.
Dohrmann Div., Mountain View, Cal.
Dynamic Controls Corp., S. Windsor, Conn.
Eagle Signal, Davenport, Iowa
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Elcom Sys., Deer Pk., N.Y.
Electro-Pacific, Inc., Goleta, Calif.
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Elctrn. Control Co., Dresher, Pa.
Electronic Research Co., Shawnee Mission, Kan.
Elmwood Sensors, Inc., Cranston, R.I.
Essex International, Mansfield, Ohio
Fenwal, Inc., Ashland, Mass.
Fisher Sci. Co., Pittsburgh, Pa.
Forma Scientific, Marietta, Ohio
Foxboro Co., Foxboro, Mass.
General Electric, Shelbyville, Ind.
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Glentek, Inc., Santa Monica, Calif.
Guardian California, Culver City, Cal.
Guildline Instrs., Inc., Larchmont, N.Y.
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Hexacon Elec. Co., Roselle Park, N.J.
Hoagland Instr., Dayton, N.J.
Honeywell, Ft. Washington, Pa.
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Hope Elctrns., Clifton, N.J.
Hunt Electronics Co., Dallas, Tex.
Hy-Cal Engrg., Santa Fe Springs, Cal.
IEC Electronics Corp., E. Rochester, N.Y.
Int'l. Instrs., Orange, Conn.
Jade Corp., Huntingdon Valley, Pa.
James Elctrns., Inc., Chicago, Ill.
Keystone Carbon Co., St. Marys, Pa.
Kidde, Walter & Co., Belleville, N.J.
Kistler Instr. Co., Redmond, Wash.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
LFE Corp., Waltham,, Mass.
Luft Instrs., Inc., Lincoln, Mass.
Mag-Con, Inc., New Brighton, Minn.
Master Elctrn. Controls, Santa Monica, Cal.
Matheson Gas Products, East Rutherford, N.J.
Matrix Corp., Beech Grove, Ind.
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Mikron Instr. Co., Ridgewood, N.J.
MKC Elctrns. Corp., Kansas City, Kans.
NES, Inc., Itasca, Ill.
NH Research, Inc., Santa Ana, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
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Oxford Instr. Corp., Annapolis, Md.
P.E.T., Inc., Pittsburgh, Pa.
Pioneer/Instrumentation, Cleveland, Ohio
Precision Dynamics Corp., Burbank, Cal.
Precision Sci. Co., Chicago, Ill.
Princeton Applied Resch. Corp., Princeton, N.J.
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Procedyne Corp., New Brunswick, N.J.
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Raytek, Inc., Mountain View, Cal.
RDF Corp., Hudson, N.H.
Relco Prods., Denver, Colo.
Research, Inc., Minneapolis, Minn.
RIL Elctrns., Inc., Southampton, Pa.
Robertshaw Controls Co., Richmond, Va.
Robicon Corp., Pittsburgh, Pa.
Rosemount Inc., Minneapolis, Minn.
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Recorder Systems Div., E. Greenwich, R.I.
Scientronics, Barrington, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Signet Scientific Co., Burbank, Cal.
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Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
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Taylor Instr. Process Control Div., Rochester, N.Y.
Tempil Div., So. Plainfield, N.J.
Tempo Instrument, Inc., Plainview, N.Y.
Temptronix Inc., Newton, Mass.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Thermal Sys., Los Angeles, Cal.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
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Tohoku Metal Inds., Ltd., Tokyo, Japan
Trans-Met Engrg., La Habra, Cal.
Transducer Controls Corp., Covina, Calif.
Tylan Corp., Torrance, Calif.
United Elec. Controls Co., Watertown, Mass.
Varian Assocs., Vacuum Div., Palo Alto, Cal.
Vectrol, Inc., Rockville, Md.
Victory Engrg. Corp., Springfield, N.J.
VirTis Co., Gardiner, N.Y.
Voltex Co., Inc., Farmingdale, N.Y.
Warren G-V Communications, Livingston, N.J.
Watlow Elec. Mfg. Co., St. Louis, Mo.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

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Del Electronics Corp., Mt. Vernon, N.Y.
Firing Circuits, Norwalk, Conn.
Hope Elctrns., Clifton, N.J.
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Ametek/Instrs. & Controls, Feasterville, Pa.
B & B Motor & Control, New York, NY
Bodine Elec. Co., Chicago, Ill.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Control Technology Co., L.I.C., N.Y.
Cross Electronics Inc., Warrendale, Pa.
Electrol Co., Inc., York, Pa.
Fincor Div., York, Pa.
General Time Corp., Thomaston, Conn.
Himmelstein, S. & Co., Elk Grove Village, Ill.
Honeywell, Ft. Washington, Pa.
Ledex, Inc., Dayton, Ohio
McFadden Elctrns. Co., South Gate, Calif.
Minnetech Labs, Minneapolis, Minn.
Robicon Corp., Pittsburgh, Pa.
Sensotec, Inc., Columbus, Ohio
Sigma Instrs., Inc., Braintree, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
Vibrac Corp., Chelmsford, Mass.
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Astrosystems, Inc., Lake Success, N.Y.
Austin Elctrns., Roselle, N.J.
Automated Meas., Oakland, Calif.
Baganoff Assocs., Inc., St. Louis, Mo.
Baldwin Elctrns., Little Rock, Ark.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Biomation Corp., Cupertino, Calif.
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C & A Products, Inc., Woodside, N. Y.
Computer Prods., Ft. Lauderdale, Fla.
Conrac Corp., Fairfield, N.J.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
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Data General Corp. (E), Southboro, Ma.
Data Technology, Santa Ana, Cal.
Datametrics Inc., Wilmington, Mass.
Datascan, Inc., Clifton, N.J.
Datum, Inc., Anaheim, Calif.
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Digilin, Inc., Glendale, Cal.
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Heath Co., Benton Harbor, Mich.
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IEC Electronics Corp., E. Rochester, N.Y.
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Innovatek Enterprise, Millerton, N.Y.
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SSR Instrs. Co., Santa Monica, Cal.
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Systron-Donner Concord Instr. Div., Concord, Cal.
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Tektronix, Inc., Beaverton, Ore.
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Conrac Corp., Fairfield, N.J.
Control Technology Co., L.I.C., N.Y.
Datum, Inc., Anaheim, Calif.
Digilin, Inc., Glendale, Cal.
Digital Equip. Corp., Maynard, Mass.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electro-Numerics, Santa Clara, Cal.
Foxboro Co., Foxboro, Mass.
Junction Modules, Inc., Irvine, Cal.
General Microwave Corp., Farmingdale, N.Y.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hybrid Sys. Corp., Burlington, Mass.
Lear Siegler, Grand Rapids, Mich.
Matrix Corp., Beech Grove, Ind.
Measurement Sys., Inc., Norwalk, Conn.
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Airflyte Elctrns. Co., Bayonne, N.J.
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Bowmar Instr. Corp., Ft. Wayne, Ind.
CGS Units, Inc., Rochester, N.Y.
Computer Conversions Corp., East Northport, N.Y.
Conrac Corp., Fairfield, N.J.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Data Technology Inc., Watertown, Mass.
Datametrics Inc., Wilmington, Mass.
Datascan, Inc., Clifton, N.J.
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Digital Equip. Corp., Maynard, Mass.
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Dynamic Measurements Corp., Winchester, Ma.
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Honeywell Information Systems, Waltham, Mass.
Instrumentation Tech. Corp., Northbridge, Cal.
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Lecroy Resch. Sys. Corp., West Nyack, N.Y.
Matrix Systems Corp., Chatsworth, Calif.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Midland Standard Inc., Elgin, Ill.
Monitor Systems, Ft. Washington, Pa
NES, Inc., Itasca, Ill.
Norden Div., Norwalk, Conn.
Phoenix Data Inc., Phoenix, Ariz.
Pinlites, Fairfield, N.J.
Precision Dynamics Corp., Burbank, Cal.
Republic Advanced System Technology Group, Chatsworth, Calif.
Rohde & Schwarz Sls., Passaic, N.J.
Singer Co., Little Falls, N.J.
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TEC, Inc., Tucson, Ariz.
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Texas Instruments, Dallas, Tex.
Theta Instr. Corp., Fairfield, N.J.
3M Co., St. Paul, Minn.
Veeder-Root, Hartford, Conn.
Vernitech, Deer Pk., N.Y.
Wyle Computer Prods., Inc., El Segundo, Calif.
Xerox Data Sys., El Segundo, Cal

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Data Graphics, San Antonio, Tex.
Datum, Inc., Anaheim, Calif.
Demex, Inc., Kansas City, Mo.
Frequency Engrg. Labs., Farmingdale, N.J.
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GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
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Bowmar Instr. Corp., Ft. Wayne, Ind.
Burr-Brown Resch. Corp., Tucson, Ariz.
Conrac Div., Covina, Calif.
Data Disc, Inc., Sunnyvale, Cal.
Datum, Inc., Anaheim, Calif.
Del Electronics Corp., Mt. Vernon, N.Y.
Digital Equip. Corp., Maynard, Mass.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynamic Measurements Corp., Winchester, Ma.
ILC Data Device Corp., Hicksville, N.Y.
Information Displays, Inc., Mt. Kisco, N.Y.
Integrated Systems, Inc., Norcross, Ga.
Lear Siegler, Grand Rapids, Mich.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Monitor Systems, Ft. Washington, Pa
Natel Engrg. Co., Canoga Pk., Cal.
NES, Inc., Itasca, Ill.
Pacific Meas., Inc., Palo Alto, Calif.
Powercube Corp, Waltham, Mass.
Precision Dynamics Corp., Burbank, Cal.
Princeton Elctrn. Prods., New Brunswick, N.J.
Sierra Sys., Mountain View, Cal.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
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Tecnetics, Inc., Boulder, Colo.
Tektronix, Inc., Beaverton, Ore.
Venus Scientific, Farmingdale, N.Y.

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Amtron Inc., Midlothian, Ill.
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Astrosystems, Inc., Lake Success, N.Y.
Austin Elctrns., Roselle, N.J.
Berkeley Nucleonics Corp., Berkeley, Calif.
C & A Products, Inc., Woodside, N. Y.
Components Corp., Denville, N.J.
Computer Conversions Corp., East Northport, N.Y.
Computer Prods., Ft. Lauderdale, Fla.
Conrac Corp., Fairfield, N.J.
Control Technology Co., L.I.C., N.Y.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Data General Corp. (E), Southboro, Ma.
Data Technology, Santa Ana, Cal.
Datametrics Inc., Wilmington, Mass.
Datex Div., Duarte, Cal.
Datum, Inc., Anaheim, Calif.
Digiac Corp., Plainview, N.Y.
Digital Equip. Corp., Maynard, Mass.
Digitron Corp., Norristown, Pa.
Dynamic Measurements Corp., Winchester, Ma.
Dynapar Corp., Gurnee, Ill.
E-H Resch. Labs., Inc., Oakland, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Fairchild Space & Defense Sys., Syosset, N.Y.
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Foxboro Co., Foxboro, Mass.
Junction Modules, Inc., Irvine, Cal.
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General Data Inds. Inc. Inc., Wilton, Conn.
General Devices, Inc., Princeton, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Geo Space Sys., Tampa, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Heath Co., Benton Harbor, Mich.
Honeywell Information Systems, Waltham, Mass.
HyComp Inc., Maynard, Mass.
ILC Data Device Corp., Hicksville, N.Y.
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Information Displays, Inc., Mt. Kisco, N.Y.
Intech, Santa Clara, Cal.
Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa.
Kepco, Inc., Flushing, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
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Leeds & Northrup Corp., No. Wales, Pa.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Micro Networks, Worcester, Mass.
Monitor Labs, Inc., San Diego, Cal.
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Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
MPC Prods. Corp., Chicago, Ill.
NES, Inc., Itasca, Ill.
Norden Div., Norwalk, Conn.
North Atlantic Inds., Plainview, N.Y.
Novatronics, Inc., Pompano Beach, Fla.
Perkin-Elmer Corp., Electronic Prods. Dept., Norwalk, Conn.
Phoenix Data Inc., Phoenix, Ariz.
Precision Monolithics Inc., Santa Clara, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Measurements, Wilmette, Ill.
Signal Analysis Oper., Hauppauge, N.Y.
Signetics. Corp., Sunnyvale, Calif.
Singer Co., Little Falls, N.J.
Solid State Elctrns. Corp., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
SSR Instrs. Co., Santa Monica, Cal.
Struthers-Dunn, Inc., Pitman, N.J.
Struthers-Dunn, Inc., Bettendorf, Iowa
Superior Elec., Bristol, Conn.
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Systron Donner Trygon Elctrns. Sub., Westbury, N.Y.
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Teledyne Philbrick, Dedham, Mass.
3M Co., St. Paul, Minn.
Varian Assocs., Palo Alto, Cal.
Varian Data Machines, Irvine, Cal.
Varian Data Machines, Palo Alto, Cal.
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Weston Instruments, Inc., Newark, N.J.
Wyle Computer Prods., Inc., El Segundo, Calif.
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A. D. Data Sys., Inc., Rochester, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
Data Graphics, San Antonio, Tex.
Datametrics Inc., Wilmington, Mass.
Datum, Inc., Anaheim, Calif.
Demex, Inc., Kansas City, Mo.
Digital Equip. Corp., Maynard, Mass.
Digitron Corp., Norristown, Pa.
Dytro Corp., Hicksville, N.Y.
Eldorado Electrodata, Concord, Cal.
Epsco, Inc., Westwood, Mass.
Instrumentation Tech. Corp., Northbridge, Cal.
Matrix Corp., Beech Grove, Ind.
Monitor Labs, Inc., San Diego, Cal.
NES, Inc., Itasca, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
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Control Sciences, Inc., Granada Hills, Cal.
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Fairchild Space & Defense Sys., Syosset, N.Y.
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NES, Inc., Itasca, Ill.
Perkin-Elmer Corp., Electronic Prods. Dept., Norwalk, Conn.
Republic Advanced System Technology Group, Chatsworth, Calif.
Singer Co., Little Falls, N.J.
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Hybrid Sys. Corp., Burlington, Mass.
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Natel Engrg. Co., Canoga Pk., Cal.
NES, Inc., Itasca, Ill.
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R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Republic Advanced System Technology Group, Chatsworth, Calif.
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Instrumentation Tech. Corp., Northbridge, Cal.
Novatronics, Inc., Pompano Beach, Fla.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
T-F Electronics, Inc., Austin, Tex.

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Advanced Energy Conversion, Belmont, Cal.
Aerospace Avionics, Inc., Bohemia, N.Y.
Astrosystems, Inc., Lake Success, N.Y.
Basler Elec. Co., Highland, Ill.
Behlman Div., California Instrs., San Diego, Cal
Behlman Engrg. Corp., Santa Barbara, Cal.
Calico Div., San Diego, Cal.
California Instrs. Co., San Diego, Cal.
CML-Macarr, Inc., Edison, N.J.
Elcom Sys., Deer Pk., N.Y.
Elgar Corp., San Diego, Cal.
Elin Div., San Diego, Cal.
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Meloy Laboratories Inc., Springfield, Va.
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Almond Instrs. Co., Covina, Cal
American Elctrns., Inc., Fullerton, Cal.
American Time Products, Woodside, N.Y.
AMF Electical Prods., Alexandria, Va.
AMP Capitron Div./AMP Incorporated, Elizabethtown, Pa.
Amp Inc., Harrisburg, Pa.
Anadex Instrs., Inc., Van Nuys, Calif.
Analogic, Wakefield, Mass.
Astrosystems, Inc., Lake Success, N.Y.
ATR Elctrns., Inc., St. Paul, Minn.
Autronics Corp., Pasadena, Calif.
Avtel Corp., Covina, Cal.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Basler Elec. Co., Highland, Ill.
Bicron Elctrns. Co., Canaan, Conn.
C & A Products, Inc., Woodside, N. Y.
Cal-Power Corp., El Segundo, Calif.
Christie Elec., Los Angeles, Cal.
CML-Macarr, Inc., Edison, N.J.
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Del Electronics Corp., Mt. Vernon, N.Y.
Digital Equip. Corp., Maynard, Mass.
Electric Indicator Co., Inc., Norwalk, Conn.
Electro Corp., Sarasota, Fla.
Flow Technology, Inc., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
Freed Transformer Co., Bklyn., N.Y.
Gap Instr. Corp., Hauppauge, N.Y.
Georator Corporation, Manassas, Va.
Glentronics, Div. Sawyer Inds., Glendora, Cal.
Hybrid Sys. Corp., Burlington, Mass.
Interelectronics Corp., Congers, N.Y.
International Rectifier, El Segundo, Cal.
Kato Engrg. Co., Mankato, Minn.
Kratos, Pasadena, Cal
Lorch Elctrns. Corp., Englewood, N.J.
Matrix Corp., Beech Grove, Ind.
Natel Engrg. Co., Canoga Pk., Cal.
North Atlantic Inds., Plainview, N.Y.
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Oeco Corp., Portland, Ore.
Pioneer Magnetics, Santa Monica, Cal.
Powercube Corp, Waltham, Mass.
POWERTEC INC., Chatsworth, Cal.
PPM, Inc., Bedford, Ohio
Price & Rutzebeck, Hayward, Calif.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Sawyer Inds., Arcadia, Cal.
Scientific Columbus, Columbus, Ohio
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
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Singer - Tele-Signal, Woodbury, N.Y.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tele-Dynamics/Wanlass, Fort Washington, Pa.
Teledyne Philbrick, Dedham, Mass.
Telmar, Inc., Columbus, Ohio
Terado Corp., St. Paul, Minn.
Transmagnetics Inc., Farmingdale, N. Y.
Unitron Inc., Garland, Tex.
Varian Assocs., Palo Alto, Cal.
Vibrac Corp., Chelmsford, Mass.
Vibration Instrs. Co., Anaheim, Cal.
Vidar Corp., Mountain View, Cal.
Watkins Johnson Co., Palo Alto, Cal.

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Data Graphics, San Antonio, Tex.
Information Displays, Inc., Mt. Kisco, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Measurement Sys., Inc., Norwalk, Conn.
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American Time Products, Woodside, N.Y.
Anaren Microwave, Inc., Syracuse, N.Y.
Anzac Elctrns., Waltham, Mass.
Astro-Metrix, Burbank, Cal.
Avtel Corp., Covina, Cal.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cal-Power Corp., El Segundo, Calif.
CML-Macarr, Inc., Edison, N.J.
Elcom Sys., Deer Pk., N.Y.
Georator Corporation, Manassas, Va.
Holt Instr. Labs., Oconto, Wisc.
HRB-Singer, Inc., State College, Pa.
Interelectronics Corp., Congers, N.Y.
Jerrold Electronics Corp., Philadelphia, Pa.
Kato Engrg. Co., Mankato, Minn.
Lorch Elctrns. Corp., Englewood, N.J.
Microphase Corp., Cos Cob, Conn.
Miteq Inc., Hauppauge, N.Y.
Mobil Elctrns., Inc., Anderson, Ind.
OPtimax Inc., Colmar, Pa.
Powercube Corp, Waltham, Mass.

R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Signal Analysis Oper., Hauppauge, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tele-Dynamics/Wanlass, Fort Washington, Pa.
Unitron Inc., Garland, Tex.
Vari-L Co., Inc., Denver, Colo.
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Behlman Div., California Instrs., San Diego, Cal
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Burr-Brown Resch. Corp., Tucson, Ariz.
Cal-Power Corp., El Segundo, Calif.
Calico Div., San Diego, Cal.
California Instrs. Co., San Diego, Cal.
CML-Macarr, Inc., Edison, N.J.
Del Electronics Corp., Mt. Vernon, N.Y.
Elcom Sys., Deer Pk., N.Y.
Elgar Corp., San Diego, Cal.
Elin Div., San Diego, Cal.
Georator Corporation, Manassas, Va.
Guardian California, Culver City, Cal.
Interelectronics Corp., Congers, N.Y.
Kato Engrg. Co., Mankato, Minn.
Lorch Elctrns. Corp., Englewood, N.J.
Meloy Laboratories Inc., Springfield, Va.
Microphase Corp., Cos Cob, Conn.
Mobil Elctrns., Inc., Anderson, Ind.
Natel Engrg. Co., Canoga Pk., Cal.
Oeco Corp., Portland, Ore.
Polyphase Instr. Co., Bridgeport, Pa.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Riverbank Labs., Geneva, Ill.
Solid State Elctrns. Corp., Sepulveda, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Systron-Donner Concord Instr. Div., Concord, Cal.
Tele-Dynamics/Wanlass, Fort Washington, Pa.
Vari-L Co., Inc., Denver, Colo.
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AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Anaren Microwave, Inc., Syracuse, N.Y.
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Electrac, Inc., Anaheim, Calif.
Environmental Communications Inc., Santa Ana, Cal.
Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
Greenray Inds., Inc., Mechanicsburg, Pa.
Lorch Elctrns. Corp., Englewood, N.J.
Micro-Tel Corp., Baltimore, Md.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Narda Microwave Corp., Plainview, N.Y.
OPtimax Inc., Colmar, Pa.
Premier Microwave, Port Chester, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rodelco, Deer Park, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
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Ind'l. Control Co., Farmingdale, N.Y.
Kato Engrg. Co., Mankato, Minn.
NH Research, Inc., Santa Ana, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
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AMF Electical Prods., Alexandria, Va.
AMP Capitron Div./AMP Incorporated, Elizabethtown, Pa.
Amp Inc., Harrisburg, Pa.
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Basler Elec. Co., Highland, Ill.
Behlman Div., California Instrs., San Diego, Cal
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Biometrics Instrument Corp., Garland, Tex.
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Cycle-Dyne, Inc., Jamaica, N.Y.
Elasco-Div. Buchbinder Corp., Bloomfield, Conn.
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Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
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C & A Products, Inc., Woodside, N. Y.
Computer Conversions Corp., East Northport, N.Y.
Control Technology Co., L.I.C., N.Y.
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TDK Elctrns. Corp., Long Island City, N.Y.
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Baldwin Elctrns., Little Rock, Ark.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
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Keltron Corp., Waltham, Mass.
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Keltron Corp., Waltham, Mass.
Planet Instr., Gardena, Cal.
Precision Dynamics Corp., Burbank, Cal.
Signetics. Corp., Sunnyvale, Calif.
Struthers-Dunn, Inc., Bettendorf, Iowa
Systron-Donner Concord Instr. Div., Concord, Cal.
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Cramer Division, Old Saybrook, Conn.
Durant Digital Instrs., Watertown, Wisc.
Dytro Corp., Hicksville, N.Y.
Electric Tachometer Corp., Philadelphia, Pa.
ENM Co., Chicago, Ill.
ITT General Controls, Glendale, Cal.
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Practical Automation, Inc., Shelton, Conn.
Precision Timer Co., Westbrook, Conn.
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Redington Counters, Inc., Windsor, Conn.
Relay Specialties Inc., Fair Lawn, N.J.
Shigoto Inds., Ltd., New York, N.Y.
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Chrono-log Corp., Broomall, Pa.
Controlcraft Corp., West Chicago, Ill.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Data Graphics, San Antonio, Tex.
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Di/An Controls, Inc., Boston, Mass.
Disc Instruments, Inc., Costa Mesa, Ca.
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Eagle Signal, Davenport, Iowa
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ENM Co., Chicago, Ill.
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Farmer Elec. Prods. Co., Inc., Natick, Mass.
Fork Standards, W. Chicago, Ill.
Foxboro Co., Foxboro, Mass.
Harrel, Inc., E. Norwalk, Conn.
Icon Corp., Sub of U.S.M. Corp., Cambridge, Mass.
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Keltron Corp., Waltham, Mass.
Midland Standard Inc., Elgin, Ill.
Milletron, Inc., Pittsburgh, Pa.
MKC Elctrns. Corp., Kansas City, Kans.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
NES, Inc., Itasca, Ill.
North American Philips Controls Corp., Cheshire, Conn.
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Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
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Curtis Instrs., Inc., Mt. Kisco, N.Y.
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Triac Elctrn. Sys., Forest Hills, N. Y.
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Astro Comm. Lab., Gaithersburg, Md.
Barker & Williamson, Inc., Bristol, Pa.
Beukers Labs., Inc., Hauppauge, N.Y.
Brelonix, Inc., Seattle, Wash
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Continental Elctrns. Mfg. Co., Dallas, Tex.
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Maury Microwave Corp., Cucamonga, Calif.
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Microphase Corp., Cos Cob, Conn.
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National Beryllia Corp., Haskell, N.J.
Phelps Dodge Comm., North Haven, Conn.
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Radiation Devices Co., Baltimore, Md.
RCA Corp., Camden, N.J.
RCA Parts & Accessories, Deptford, N.J.

Resdel Engrg. Corp., Arcadia, Cal.
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Rowe Inds., Div., Toledo, Ohio
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Technical Mat'l., Mamaroneck, N.Y.
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Anzac Elctrns., Waltham, Mass.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
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Coil Craft Inc., Bronxville, N.Y.
E & M Laboratories, Inc., Westlake Village, Cal.
Electro Impulse, Inc., Red Bank, N.J.
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Engelmann Microwave, Montville, N.J.
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GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Jerrold Electronics Corp., Philadelphia, Pa.
Johnson E. F. Co., Waseca, Minn.
Maury Microwave Corp., Cucamonga, Calif.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
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Microwave/Sys., Inc., E. Syracuse, N.Y.
Narda Microwave Corp., Plainview, N.Y.
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Co-Operative Inds., Inc., Chester, N.J.
E & M Laboratories, Inc., Westlake Village, Cal.
Elcom Sys., Deer Pk., N.Y.
Engelmann Microwave, Montville, N.J.
Environmental Communications Inc., Santa Ana, Cal.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
HRB-Singer, Inc., State College, Pa.
Litton Inds., San Carlos, Calif.
Lorch Elctrns. Corp., Englewood, N.J.
Maury Microwave Corp., Cucamonga, Calif.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
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Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
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Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
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Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
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Edwards High Vacuum, Grand Island, N.Y.
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Lear Siegler, Inc., Santa Monica, Calif.
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Bell & Howell Co., Pasadena, Calif.
Bendix Corp., N. Hollywood, Calif.
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Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
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Struthers-Dunn, Inc., Pitman, N.J.
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General Microwave Corp., Farmingdale, N.Y.
Kappa Networks, Inc., Carteret, N.J.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Teledyne Mec., Palo Alto, Cal.

Delay Lines, Cable

Allen Avionics, Mineola, N.Y. Vol 3•979,980
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Americon Microwave Inds., Inc., Waltham, Mass.
Andrew Corp., Orland Pk., Ill.
Chronetics, Inc., Mt. Vernon, N.Y.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Data Delay Devices, Clifton, N.J.
General Microwave Corp., Farmingdale, N.Y.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Millen, James Mfg., Malden, Mass.
Phelps Dodge Comm., North Haven, Conn.
Precision Tube, No. Wales, Pa.
RCL Elctrns., Inc., Irvington, N.J.
Stanford Applied Engrg., Santa Clara, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Mec., Palo Alto, Cal.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Victor Wire & Cable, L.A., Cal.

Delay Lines, Distributed, Constant (Fixed)

Allen Avionics, Mineola, N.Y. Vol 3•980,981
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Kappa Networks, Inc., Carteret, N.J. Vol 3•1000,1001
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Arcidy Assocs., Manchester, N. H.
Edison Elctrns. Div., Manchester, N.H.
El-Rad Mfg. Co., Chicago, Ill.
General Instr. Corp., Entertainment Elctrns. Prods. Grp., F.W. Sickles Div., Chicopee, Mass.
Millen, James Mfg., Malden, Mass.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
PCA Elctrns., Inc., Sepulveda, Calif.
Pulse Engrg., Inc., San Diego, Cal.
Stanford Applied Engrg., Santa Clara, Cal.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Varian Assocs., Palo Alto, Cal.

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ESC Elctrns. Corp., Palisades Pk., N.J. Vol 3•999
Andersen Labs. Inc., Bloomfield, Conn.
Arcidy Assocs., Manchester, N. H.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Columbia Components, Hempstead, N.Y.
Computer Instrs., Hempstead, N.Y.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Kappa Networks, Inc., Carteret, N.J.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
PCA Elctrns., Inc., Sepulveda, Calif.
Pulse Engrg., Inc., San Diego, Cal.
RCL Elctrns., Inc., Irvington, N.J.
Stanford Applied Engrg., Santa Clara, Cal.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Varian Assocs., Palo Alto, Cal.
Wiltron Co., Palo Alto, Calif.

Delay Lines, Glass & Quartz

Amperex Electronic Corp., Hicksville, N.Y. ..... Vol 3•521
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Bliley Electric, Erie, Pa. ..... Vol 3•985
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Corning Glass Works, Raleigh, N.C.
Damon Corp., Westwood, Mass.
Esco Products, Oak Ridge, NJ
Microsonics, Inc., Weymouth, Mass.
Teledyne Mec., Palo Alto, Cal.
Television Microtime, Inc., Bloomfield, Conn.
Valpey Corp., Holliston, Mass.

Delay Lines, Liquid

Control Elctrns. Co., Inc., Farmingdale, N.Y.
Microsonics, Inc., Weymouth, Mass.

Delay Lines, Lumped-Constant (Electrically Variable)

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Artronic Instr. Co., Silver Spring, Md.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Dietz Design, Inc., Belton, Mo.
Edison Elctrns. Div., Manchester, N.H.
PCA Elctrns., Inc., Sepulveda, Calif.
Rohde & Schwarz Sls., Passaic, N.J.
TDK Elctrns. Corp., Long Island City, N.Y.
Television Microtime, Inc., Bloomfield, Conn.
Varian Assocs., Palo Alto, Cal.

Delay Lines, Lumped-Constant (Fixed)

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Andersen Labs. Inc., Bloomfield, Conn. Vol 3•982,983
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RCL Elctrns., Inc., Irvington, N.J. Vol 3•1002
Torotel, Inc., Grandview, Mo. .. Vol 2•453
Arcidy Assocs., Manchester, N. H.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Chesterfield Prods. Inc., Saddle Brook, N. J.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Dietz Design, Inc., Belton, Mo.
Edison Elctrns. Div., Manchester, N.H.
El-Rad Mfg. Co., Chicago, Ill.
Engineered Components Co., Gardena, Cal.
Hisonic, Inc., Olathe, Kans.
Millen, James Mfg., Malden, Mass.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
PCA Elctrns., Inc., Sepulveda, Calif.
Pulse Engrg., Inc., San Diego, Cal.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Shallco, Inc., Smithfield, N.C.
Sprague Elec. Co., No. Adams, Mass.
Stanford Applied Engrg., Santa Clara, Cal.
TDK Elctrns. Corp., Long Island City, N.Y.
Television Microtime, Inc., Bloomfield, Conn.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Varian Assocs., Palo Alto, Cal.

Delay Lines, Lumped-Constant (Mechanically Variable)

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Bel Fuse, Inc., Jersey City, N.J.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Kappa Networks, Inc., Carteret, N.J.
PCA Elctrns., Inc., Sepulveda, Calif.
Shallco, Inc., Smithfield, N.C.
Television Microtime, Inc., Bloomfield, Conn.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Wiltron Co., Palo Alto, Calif.

Delay Lines, Magnetostrictive

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Baganoff Assocs., Inc., St. Louis, Mo.
Microsonics, Inc., Weymouth, Mass.
RCL Elctrns., Inc., Irvington, N.J.
TDK Elctrns. Corp., Long Island City, N.Y.

Delay Lines, Miniature & Subminiature-Also See Specific Types Of Delay Lines

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ESC Elctrns. Corp., Palisades Pk., N.J. Vol 3•999
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Uniform Tubes, Collegeville, Pa. Vol 3•1415
Arcidy Assocs., Manchester, N. H.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Edison Elctrns. Div., Manchester, N.H.
El-Rad Mfg. Co., Chicago, Ill.
Engineered Components Co., Gardena, Cal.
Hisonic, Inc., Olathe, Kans.
Microsonics, Inc., Weymouth, Mass.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
PCA Elctrns., Inc., Sepulveda, Calif.
Phelps Dodge Comm., North Haven, Conn.
Precision Tube, No. Wales, Pa.
Pulse Engrg., Inc., San Diego, Cal.
Shallco, Inc., Smithfield, N.C.
Sprague Elec. Co., No. Adams, Mass.
Stanford Applied Engrg., Santa Clara, Cal.
TDK Elctrns. Corp., Long Island City, N.Y.
Teledyne Mec., Palo Alto, Cal.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.

Delay Lines, Solid Blank

Bliley Electric, Erie, Pa. ..... Vol 3•985
Amersil, Inc., Hillside, N.J.
Andersen Labs. Inc., Bloomfield, Conn.
Bel Fuse, Inc., Jersey City, N.J.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Corning Glass Works, Raleigh, N.C.
Damon Corp., Westwood, Mass.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
Microsonics, Inc., Weymouth, Mass.
Valpey Corp., Holliston, Mass.

Delay Lines, Strip

Bel Fuse, Inc., Jersey City, N.J. Vol 3•986
Control Elctrns. Co., Inc., Farmingdale, N.Y. ..... Vol 3•992
Andersen Labs. Inc., Bloomfield, Conn.
Bliley Electric, Erie, Pa.
ESC Elctrns. Corp., Palisades Pk., N.J.
Microsonics, Inc., Weymouth, Mass.
Pulse Engrg., Inc., San Diego, Cal.
RCL Elctrns., Inc., Irvington, N.J.
Solitron/Microwave, Port Salerno, Fla.

Delay Lines, Trimmer

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Bel Fuse, Inc., Jersey City, N.J. Vol 3•986,989
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Kappa Networks, Inc., Carteret, N.J. Vol 3•1000
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Engineered Components Co., Gardena, Cal.
ESC Elctrns. Corp., Palisades Pk., N.J.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.

Delay Lines, Ultrasonic

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Corning Glass Works, Raleigh, N.C.
Microsonics, Inc.; Weymouth, Mass.
TDK Elctrns. Corp., Long Island City, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.

Delay Lines, Waveguide

Aircom, Inc., Union, N.H.
Andersen Labs. Inc., Bloomfield, Conn.
Datalight Inc., Bloomfield, Conn.
Maury Microwave Corp., Cucamonga, Calif.
Premier Microwave, Port Chester, N.Y.
Standard Wire & Cable, Los Angeles, Cal.
TRG Prods., E. Boston, Mass.
Uniform Tubes, Collegeville, Pa.

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Andersen Labs. Inc., Bloomfield, Conn. Vol 3•982
Allen Avionics, Mineola, N.Y.
Bel Fuse, Inc., Jersey City, N.J.
Computer Devices, Commack, N.Y.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Hamilton Technology, Inc., Lancaster, Pa.
Microsonics, Inc., Weymouth, Mass.
Victor Wire & Cable, L.A., Cal.

Delays, Time (Excluding Delay Lines, Timers, Delay & Relays-Time Delay)

General Time Corp., Thomaston, Conn. Vol 2•344
Adams & Westlake, Elkhart, Ind.
Allen Avionics, Mineola, N.Y.
Artisan Elctrns. Corp., Parsippany, N.J.
Artronic Instr. Co., Silver Spring, Md.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autronics Corp., Pasadena, Calif.
Bristol Saybrook Co., Old Saybrook, Conn.
Bulova Watch Co., Flushing, N.Y.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Diversified Elctrns., Evansville, Ind
Eagle Signal, Davenport, Iowa
Electro-Module, Inc., Pomona, Cal.
Gems Sensors Div., Farmington, Conn.
Gibbs Mfg. & Resch., Janesville, Wisc.
Guardian California, Culver City, Cal.
Hi-G, Windsor Locks, Conn.
Hoagland Instr., Dayton, N.J.
Intermatic, Spring Grove, Ill.
Jay-El Prods., Gardena, Calif.
North American Philips Controls Corp., Cheshire, Conn.
PECO Corp., Milpitas, Cal.
Precision Timer Co., Westbrook, Conn.
Princeton Elctrn. Prods., New Brunswick, N.J.
Sealectro Corp., Mamaroneck, N.Y.
Sensor Corp., Scottsdale, Pa.
TRW Instrs., El Segundo, Cal.
Warren G-V Communications, Livingston, N.J.
Worner Elctrn. Devices, Rankin, Ill.
Zenith Controls Inc., Chicago, Ill.

Demagnetizers

RFL Inds., Instr. Div., Boonton, N.J. Vol 1•497
Advanced Kinetics, Costa Mesa, Calif.
Ampex Corp., Redwood City, Calif.
Barnes & Reinecke, Inc., Chicago, Ill.
Coil Co. of Amer., Northvale, N.J.
Eastern Delta Corp., Fair Lawn, N.J.
GC Electronics, Rockford, Ill.
Ideal Industries, Inc., Sycamore, Ill.
LDJ Electronics, Troy, Mich.
Mag-Con, Inc., New Brighton, Minn.
Magnaflux Corp., Chicago, Ill.
Mann, Henry Inc., Feasterville, Pa.
Microtran Co. Inc., Valley Stream, N.Y.
Robins Ind's. Corp., Consumer Products Div., Commack, N.Y.
Schonstedt Instr. Co., Reston, Va.
Shigoto Inds., Ltd., New York, N.Y.
Stancor, Chicago, Ill.
Stearns Magnetics Inc., Cudahy, Wisc.
Techni-Tool, Inc., Philadelphia, Pa.
Thomas & Skinner, Inc., Indianapolis, Ind.

Demodulators

Control Technology Co., L.I.C., N.Y. Vol 2•986
Natel Engrg. Co., Canoga Pk., Cal. Vol 1•360
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Transmagnetics Inc., Farmingdale, N. Y. Vol 1•379
Ametek/Instrs. & Controls, Feasterville, Pa.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Biocom, Inc., Culver City, Cal.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C & A Products, Inc., Woodside, N. Y.
Cermetek, Inc., Mountain View, Cal.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Clarke - Hess, New York, N.Y.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly, Mass.
Computer Conversions Corp., East Northport, N.Y.
Control Sciences, Inc., Granada Hills, Cal.
Data-Control Systems, Danbury, Conn.
Dynair Elctrns. Inc., San Diego, Calif.
Electrac, Inc., Anaheim, Calif.
Environmental Communications Inc., Santa Ana, Cal.
Feedback, Inc., Berkeley Hghts., N.J.
General Magnetics, Bloomfield, N.J.
General Resistance, Inc., Mt. Vernon, N.Y.
Glentek, Inc., Santa Monica, Calif.
Ind'l. Control Co., Farmingdale, N.Y.
Ithaco, Inc., Ithaca, N.Y.
Jerrold Electronics Corp., Philadelphia, Pa.
Lorch Elctrns. Corp., Englewood, N.J.
Microtran Co. Inc., Valley Stream, N.Y.
Monitor Systems, Ft. Washington, Pa
Norsal Industries, Inc., Brentwood, N.Y.
North Atlantic Inds., Plainview, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Radiation Devices Co., Baltimore, Md.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Signetics. Corp., Sunnyvale, Calif.
Singer Co., Little Falls, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Statek Corp., Orange, Cal.
Theta Instr. Corp., Fairfield, N.J.
Validyne Engrg. Corp., Northridge, Cal.
Vari-L Co., Inc., Denver, Colo.
Vega Precision Labs., Vienna, Va.
Video Research Corp., Gaithersburg, Md.
Watkins Johnson Co., Palo Alto, Cal.

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General Magnetics, Bloomfield, N.J. Vol 2•340
Transmagnetics Inc., Farmingdale, N. Y. Vol 1•379
American Aerospace Controls Inc., Farmingdale, N.Y.
Computer Conversions Corp., East Northport, N.Y.

Densitometers, Electronic

Beckman Instrs., (AISSD), Fullerton, Cal.
Chemical Etching Equip. & Supply, Alexandria, Va.
Cosar Corp., Garland, Texas
Gaertner Scientific Corp., Chicago, Ill.
Gamma Sci., San Diego, Cal.
Sargent Welch Sci. Co., Skokie, Ill.
Spatial Data Systems, Inc., Goleta, Cal.

Deposition Equipment, Vacuum & Accessories-Also See Evaporation Equipment, Electron Beam

CCA Elctrns. Corp., Gloucester, N.J.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Edwards High Vacuum, Grand Island, N.Y.
GTE Sylvania Inc., Danvers, Mass.
High Vacuum Equip. Corp., Hingham, Mass.
Inficon Inc., E. Syracuse, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
Proto Matic Co., Cincinnati,, Ohio
Sloan Technology Corp., Santa Barbara, Calif.
T-M Vacuum Prods., Riverton, N.J.
Thin Film Services, Gile, Wisc.
Torr Labs., Los Angeles, Cal.
Uthe Technology Int'l., Sunnyvale, Cal.
Vactronic Lab. Equip., Inc., E. Northport, N.Y.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Dessicants

Union Carbide, San Diego, Cal.
United Mineral & Chem. Corp., New York, N.Y.

Desiccators—See Dehumidifiers

Desoldering Tools & Equipment—See Soldering Accessories; Soldering Equip.; Soldering Guns; etc.

Detectors, A-F—See Detectors, Frequency

Detectors, Cable & Pipe—See Locators, Metal

Detectors, Coaxial

Aertech Inds., Sunnyvale, Calif.
Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Bird Elctrn., Cleveland, Ohio
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
CES Elctrns., Brooklyn, N.Y.
Engelmann Microwave, Montville, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Radiation Devices Co., Baltimore, Md.
Radio Resch. Co., Rockaway, N.J.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Vector Industries, Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Wide Band Engrg. Co., Phoenix, Ariz.
Wiltron Co., Palo Alto, Calif.

Detectors, Corona—See Testers, Corona

Detectors, Crystal

R L C Elctrns., Inc., Mt. Kisco, N.Y. Vol 2•620
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Aertech Inds., Sunnyvale, Calif.
Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Americon Microwave Inds., Inc., Waltham, Mass.
Electro/Data, Inc., Garland, Tex.
Frequency Elctrns., New Hyde Pk., N.Y.
General Radio Co., Concord, Mass.
Hope Elctrns., Clifton, N.J.
Jerrold Electronics Corp., Philadelphia, Pa.
Linden Labs., Inc., State College, Pa.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
Packard Instrument Co., Inc., Downers Grove, Ill.
PRD Elctrns., Inc., Westbury, N.Y.
Radiation Devices Co., Baltimore, Md.
Soltec Corp., No. Hollywood, Cal.

Systron-Donner Microwave Div., Van Nuys, Cal.
Waveline, Inc., W. Caldwell, N.J.
Wiltron Co., Palo Alto, Calif.

Detectors, Electrostatic—See Meters, Volt, Electrostatic

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GRM Corp., Medford, N.J. ..... Vol 1•319
American Gas & Chemicals, New York, N.Y.
Automation Inds., Danbury, Conn.
Barnes Engrg. Co., Stamford, Conn.
Beckman Instrs., Cedar Grove, N.J.
Biddle, James G., Plymouth Meeting, Pa.
Black Light Corp. Amer., San Gabriel, Cal.
Branson Instruments Co., Stamford, Conn.
Chemical Etching Equip. & Supply, Alexandria, Va.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Fiber Photics, Inc., Santa Cruz, Cal.
Ind'l. Control Co., Farmingdale, N.Y.
Magnaflux Corp., Chicago, Ill.
North American Philips Controls Corp., Cheshire, Conn.
Peschel Instrs., Cape Coral, Fla.
Photobell Co., Inc., New York, N.Y.
Princeton Elctrn. Prods., New Brunswick, N.J.
Scientific Technology, Mountain View, Cal.
Sensor Corp., Scottsdale, Pa.
Sotcher Measurement, Cupertino, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Ultra-Violet Prods., Inc., San Gabriel, Cal.

Detectors, Frequency

Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Acromag, Inc., Wixom, Mich.
Anadex Instrs., Inc., Van Nuys, Calif.
Autronics Corp., Pasadena, Calif.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Bramco Controls, Piqua, Ohio
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Data-Control Systems, Danbury, Conn.
Douglas Randall Div., Pawcatuck, Conn.
Elcom Sys., Deer Pk., N.Y.
Electro-Module, Inc., Pomona, Cal.
Engelmann Microwave, Montville, N.J.
Environmental Communications Inc., Santa Ana, Cal.
Frequency Elctrns., New Hyde Pk., N.Y.
General Microwave Corp., Farmingdale, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Guardian California, Culver City, Cal.
Hi-G, Windsor Locks, Conn.
ITT Mackay Marine, Elizabeth, N.J.
Jerrold Electronics Corp., Philadelphia, Pa.
Kay Elemetrics, Pine Brook, N.J.
Kratos, Pasadena, Cal
Lithic Systems, Inc., Cupertino, Cal.
Logitek, Inc., Farmingdale, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Nelson Ross Elctrns., Lake Success, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Proto Matic Co., Cincinnati,, Ohio
RHG Elctrns. Lab., Deer Park, N.Y.
Signetics. Corp., Sunnyvale, Calif.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
T-F Electronics, Inc., Austin, Tex.
Techsonics, El Prado, N.M.
Telonic Inds., Inc., Laguna Beach, Calif.
Tempo Instrument, Inc., Plainview, N.Y.
Texscan Corp., Indianapolis, Ind.
Watkins Johnson Co., Palo Alto, Cal.
Wavetek Indiana, Inc., Beech Grove, Ind.
Wiltron Co., Palo Alto, Calif.

Detectors, Gas Leak

Gulton Inds., Newport Bch., Cal. Vol 3•683
Air Prods. & Chems., Inc., Allentown, Pa.
American Gas & Chemicals, New York, N.Y.
Amperex Electronic Corp., Hicksville, N.Y.
Bacharach Instr. Co., Pittsburgh, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Datametrics Inc., Wilmington, Mass.
Devco Engrg., W. Caldwell, N.J.
Dukane Corp., St. Charles, Ill.
Erdco Engrg. Corp., Addison, Ill.
General Elec., W. Lynn, Mass.
General Monitors, Inc., Costa Mesa, Calif.
Gow-Mac Instr. Co., Madison, N.J.
Honeywell, Ft. Washington, Pa.
Ind'l. Test Equip., Clifton, NJ
Inficon Inc., E. Syracuse, N.Y.
Lion Precision Corp, Newton, Mass.
Matheson Gas Products, East Rutherford, N.J.
MKS Instrs., Inc., Burlington, Mass.
Shannon Luminous Mat'ls., Hollywood, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Techni-Tool, Inc., Philadelphia, Pa.
Techsonics, El Prado, N.M.
Trio-Tech, Inc. of Calif., Burbank, Calif.
Union Carbide, Linde Div., New York, N. Y.
Vacumetrics Inc., Waltham, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Detectors, Impedance—See Meters, Impedance

Detectors, Infrared

Advanced Kinetics, Costa Mesa, Calif.
Amperex Elctronic Corp., Slatersville, R.I.
Automation Devices, Inc., Fairview, Pa.
Barnes Engrg. Co., Stamford, Conn.
Bendix Corp., Sturbridge, Mass.
Cetron Elctrn. Corp., Geneva, Ill.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Dolan-Jenner Inds., Inc., Melrose, Mass.
EG & G, Inc., Salem, Mass.
Electro-Nuclear Labs., Inc., Menlo Park, Calif.
Gamma Sci., San Diego, Cal.
General Electrodynamics Corp., Garland, Tex.
General Microwave Corp., Farmingdale, N.Y.
Hamamatsu Corp. (E), Middlesex, N. J.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Harshaw Chem. Co., Cleveland, Ohio
HEI, Inc., Chaska, Minn.
Honeywell, Minneapolis, Minn.
Honeywell, Mpls., Minn.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Judson Resch. & Mfg. Co., Conshohocken, Pa.
Laser Sys. Corp., Ann Arbor, Mich.
Mikron Instr. Co., Ridgewood, N.J.
Molectron Corp., Sunnyvale, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Ohio Semitronics, Columbus, Ohio
Omega Engrg., Inc., Stamford, Conn.
Optical Communications, Inc., Orlando, Fla.
Photobell Co., Inc., New York, N.Y.
Plessey Semiconductors, Farmingdale, N.Y.
Radiation Devices Co., Baltimore, Md.
Rank Precision Inds., Des Plaines, Ill.
Raytek, Inc., Mountain View, Cal.
Raytheon Co., Waltham, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Santa Barbara Resch. Ctr., Goleta, Calif.
Scientific Technology, Mountain View, Cal.
Sensor Corp., Scottsdale, Pa.
Sensor Technology, Chatsworth, Cal.
Skan-A-Matic Corp., Elbridge, N. Y.
Special Microwave Devices Oper., Waltham, Mass.
Spectronics, Inc., Richardson, Tex.
Thermometrics, Inc., Edison, N.J.
United Detector Technology Inc., Santa Monica, Cal.
Victory Engrg. Corp., Springfield, N.J.

Detectors, Light Intensity—See Meters, Light, Nonphotographic

Detectors, Magnetic

Advanced Kinetics, Costa Mesa, Calif.
American Aerospace Controls Inc., Farmingdale, N.Y.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Controlcraft Corp., West Chicago, Ill.
Electro-Mechanics Co., Austin, Tex.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Int'l. Electro-Magnetics, Palatine, Ill.
Mag-Con, Inc., New Brighton, Minn.
Magnaflux Corp., Chicago, Ill.
Ohio Semitronics, Columbus, Ohio
PECO Corp., Milpitas, Cal.
Rank Precision Inds., Des Plaines, Ill.
RFL Inds., Instr. Div., Boonton, N.J.
Schonstedt Instr. Co., Reston, Va.
Sensor Corp., Scottsdale, Pa.
Sprague Elec. Co., No. Adams, Mass.
Stearns Magnetics Inc., Cudahy, Wisc.
O. S. Walker Co., Worcester, Mass.

Detectors, Metal—See Locators, Metal

Detectors, Microwave

Electro/Data, Inc., Garland, Tex. Vol 1•547
Texscan Corp., Indianapolis, Ind. Vol 1•514
Aertech Inds., Sunnyvale, Calif.
Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Alford Mfg. Co., Winchester, Mass.
Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amperex Electronic Corp., Hicksville, N.Y.
CES Elctrns., Brooklyn, N.Y.
Cir-Q-Tel, Kensington, Md.
Collins Radio Co., Dallas, Tex.
Engelmann Microwave, Montville, N.J.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Melpar, Falls Church, Va.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
Parametric Inds., Inc., Winchester, Mass.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Radiation Devices Co., Baltimore, Md.
RCA Elctrns. Comps., Harrison, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.
Technical Research & Mfg. Co., Manchester, N.H.
Texas Instruments, Dallas, Tex.
TRG Prods., E. Boston, Mass.
Vector Industries, Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

Detectors, Null—See Indicators, Null

Detectors, Phase-Sensitive

Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Varl-L Co., Inc., Denver, Colo. Vol 2•623-626,628
Associated Resch., Chicago, Ill.
Autronics Corp., Pasadena, Calif.
C & A Products, Inc., Woodside, N. Y.
Climatronics Corp., Hauppauge, N.Y.
Control Technology Co., L.I.C., N.Y.
Datron Systems, Chatsworth, Cal.
Diversified Elctrns., Evansville, Ind
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynamic Controls Corp., S. Windsor, Conn.
Dytronics Co., Columbus, Ohio
Elcom Sys., Deer Pk., N.Y.
Electrac, Inc., Anaheim, Calif.
Electro-Module, Inc., Pomona, Cal.
Engelmann Microwave, Montville, N.J.
General Magnetics, Bloomfield, N.J.
Guardian California, Culver City, Cal.
Hi-G, Windsor Locks, Conn.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Ind'l. Test Equip., Clifton, NJ
Ithaco, Inc., Ithaca, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Logitek, Inc., Farmingdale, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Mini-Circuits Lab., Brooklyn, N.Y.
Natel Engrg. Co., Canoga Pk., Cal.
Norsal Industries, Inc., Brentwood, N.Y.
North Atlantic Inds., Plainview, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nuclear Meas. Corp., Indianapolis, Ind.
Opad Elec. Co., Inc., New York, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Radio Resch. Co., Rockaway, N.J.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
Signetics. Corp., Sunnyvale, Calif.
Theta Instr. Corp., Fairfield, N.J.
Triac Elctrn. Sys., Forest Hills, N. Y.
Trio Labs, Inc., Plainview, N.Y.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Varian Assocs., Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.

Detectors, Photovoltaic —See Cells, Photovoltaic

Detectors,R-F—See Detectors, Frequency

Detectors, Radiation

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1183

Detectors, Standing Wave

Bird Elctrn., Cleveland, Ohio.... Vol 1•396
Aircom, Inc., Union, N.H.
Alford Mfg. Co., Winchester, Mass.
Anzac Elctrns., Waltham, Mass.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
CCA Elctrns. Corp., Gloucester, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Johnson E. F. Co., Waseca, Minn.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
PRD Elctrns., Inc., Westbury, N.Y.
Radiation Devices Co., Baltimore, Md.
Rank Precision Inds., Des Plaines, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
TRG Prods., E. Boston, Mass.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

Detectors, Ultraviolet

Clairex Elctrns., Mt. Vernon, N.Y. Vol 2•673
Amperex Elctronic Corp., Slatersville, R.I.
Bendix Corp., Sturbridge, Mass.
Black Light Corp. Amer., San Gabriel, Cal.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Edison, Instr. Div., W. Orange, N.J.
Gamma Sci., San Diego, Cal.
Hamamatsu Corp. (E), Middlesex, N. J.
Honeywell, Ft. Washington, Pa.
Sensor Technology, Chatsworth, Cal.
Shannon Luminous Mat'ls., Hollywood, Cal.
Soltec Corp., No. Hollywood, Cal.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
United Detector Technology Inc., Santa Monica, Cal.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Detectors, Vacuum

Amperex Elctronic Corp., Slatersville, R.I.
Bendix Corp., Sturbridge, Mass.
Datametrics Inc., Wilmington, Mass.
Edwards High Vacuum, Grand Island, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
United Elec. Controls Co., Watertown, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Detectors,Vibration—See Transducers, Vibration

Detectors, Video

Aertech Inds., Sunnyvale, Calif.
American Elctrn. Labs., Inc., Lansdale, Pa.
Electro/Data, Inc., Garland, Tex.
Hamamatsu Corp. (E), Middlesex, N. J.
Microphase Corp., Cos Cob, Conn.
Waveline, Inc., W. Caldwell, N.J.
Wide Band Engrg. Co., Phoenix, Ariz.

Detectors, Voltage

ADC Prods., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
Applied Control Co., Fairfield, N.J.
Autronics Corp., Pasadena, Calif.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C & A Products, Inc., Woodside, N. Y.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Diversified Elctrns., Evansville, Ind
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Module, Inc., Pomona, Cal.
Electro Sci. Inds., Portland, Ore.
General Magnetics, Bloomfield, N.J.
Guardian California, Culver City, Cal.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hi-G, Windsor Locks, Conn.
Ideal Industries, Inc., Sycamore, Ill.
ILC Data Device Corp., Hicksville, N.Y.
Ind'l. Test Equip., Clifton, NJ
Keithley Instrs., Inc., Cleveland, Ohio
Kratos, Pasadena, Cal
Logitek, Inc., Farmingdale, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Micro Instr. Co., Hawthorne, Cal.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Parametric Inds., Inc., Winchester, Mass.
PECO Corp., Milpitas, Cal.
Peschel Instrs., Cape Coral, Fla.
Pioneer/Instrumentation, Cleveland, Ohio
Ross Engrg. Corp., Campbell, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Tempo Instrument, Inc., Plainview, N.Y.
Texscan Corp., Indianapolis, Ind.
Triac Elctrn. Sys., Forest Hills, N. Y.
Warren G-V Communications, Livingston, N.J.
Zeltex, Inc., Concord, Calif.

Detectors, Waveguide Arc

Varian Assocs., Palo Alto, Cal.

Dial Locks—See Locks, Dial & Shaft

Dials, Instrument, Metal, Plastic, etc.

Beckman Instrs., Helipot Div., Fullerton, Cal. ..... Vol 3•1212
Datak Corp., Passaic, N.J. ..... Vol 2•479
Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•824
Theta Instr. Corp., Fairfield, N.J. Vol 1•377
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Alco Elctrn. Prods., North Andover, Mass.
Amphenol Controls Oper. of Connector Div., Broadview, Ill.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Apahouser Corp. of N.E., Boston, Mass.
Birnbach Co., Inc., Freeport, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Central Plastics Dists., Chicago, Ill.
Davies, Harry Molding Co., Chicago, Ill.
Dura Plastics N.Y., Inc., Westport, Conn.
Electronic Hardware Corp., Jamaica, N.Y.
Hermes Plastics, Inc., New York, N.Y.
Jackson Bros., (London) Ltd., New York, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Matheson Gas Products, East Rutherford, N.J.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Millen, James Mfg., Malden, Mass.
NOBEX Div., Burlingame, Cal.
Norelcom Inds., Inc., Farmingdale, N.Y.
Panelgraphic Corp., Caldwell, N.J.
Perfect Gear & Instr. Corp., Northridge, Calif.
Photo Chemical Prods. Cal., Santa Monica, Cal.
PIC Design Division, Ridgefield,, Conn.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Precision Timer Co., Westbrook, Conn.
Radial Controls Div. Nicely Corp., Indianapolis, Ind.
Raytheon Co., Quincy, Mass.
Simpson Elec. Co., Chicago, Ill.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Tech-Etch, Inc., Hingham, Mass.
3M Co., St. Paul, Minn.
Vemaline Prods. Co., Wyckoff, N.J.
Waldom Elctrns., Inc., Chicago, Ill.
Weston Instruments, Inc., Newark, N.J.

Dials, Telephone-Type

Bramco Controls, Piqua, Ohio
GTE Automatic Elec., Northlake, Ill.
ITT Telecommunications, Corinth, Miss.
Ledex, Inc., Dayton, Ohio
Shigoto Inds., Ltd., New York, N.Y.

Dials, Turns-Counting

Amphenol Controls Oper. of Connector Div., Broadview, Ill. ..... Vol 2•462,463
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill. ..... Vol 2•462,463
Beckman Instrs., Helipot Div., Fullerton, Cal. ..... Vol 3•1212
Bourns, Inc., Trimpot Prods. Div., Riverside, Cal. ..... Vol 3•1200
Clarostat Mfg. Co., Inc., Dover, N.H. Vol 3•1219
Duncan Elctrns., Costa Mesa, Cal. Vol 3•1224
Harrel, Inc., E. Norwalk, Conn. Vol 2•1163
Millen, James Mfg., Malden, Mass. Vol 2•520
Spectrol Elctrns., City of Industry, Cal. Vol 3•1228,1229
TRW/IRC Potentiometers, St. Petersburg, Fla. ..... Vol 3•1233
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Johnson E. F. Co., Waseca, Minn.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Waters Mfg., Inc., Wayland, Mass.

Dielectric Coolants—See Coolants, Circuit & Component

Dielectric Heating Equipment

Cober Elctrns., Inc., Stamford, Conn. Vol 1•545
Advanced Energy Conversion, Belmont, Cal.
Cycle-Dyne, Inc., Jamaica, N.Y.
Taylor-Winfield Corp., Warren, Ohio
3M Co., St. Paul, Minn.

Dielectrics—See Films; Insulation Materials

Differentials, Mechanical—See Gears & Gear Mechanisms

Digital Comparators—See Comparators, Digital

Digital Tape Recorders—See Data Recorders, Computer

Digital Voltmeters—See Meters, Volt, Digital

Digitizers, Pencil Follower (Inc. Coordinate & Graphic)

California Computer Prods., Anaheim, Cal
Data Specialties Inc., Highland Park, Ill.
Data Technology Inc., Watertown, Mass.
MFE Corporation, Salem, N.H.
Norden Div., Norwalk, Conn.
Spatial Data Systems, Inc., Goleta, Cal.
Superior Elec., Bristol, Conn.
Universal Drafting Mach., Bedford Hgts., Ohio

Diode Arrays

Beckman Instrs., Helipot Div., Fullerton, Cal. ..... Vol 2•589
Centralab Semiconductor, El Monte, Cal. ..... Vol 2•670
International Rectifier, El Segundo, Cal. Vol 2•906
Mini-Systems, Inc, North Attleboro, Mass. ..... Vol 3•1147
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal. ..... Vol 2•522
Nat'l. Semiconductors, Plattsburgh, N.Y. Vol 2•674
Optron, Inc., Carrollton, Tex. Vol 2•678,921,922
Semtech Corp., Newbury Pk., Cal. Vol 2•933-935
Solid State Devices, Inc., La Mirada, Cal. ..... Vol 2•941
Wagner Elec. Corp., Livingston, N.J. Vol 2•952-954
American Elctrn. Labs., Inc., Lansdale, Pa.
Amperex Electronic Corp., Hicksville, N.Y.
Carter Semiconductor, Syossett, N.Y.
Computer Diode, Fair Lawn, N.J.
Eastern Delta Corp., Fair Lawn, N.J.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Hamamatsu Corp. (E), Middlesex, N. J.
HEI, Inc., Chaska, Minn.
ITT Semiconductors, W. Palm Beach, Fla.
Micro Components Corp., Cranston, R.I.
Microsemiconductor Corp., Culver City, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
RCA Solid State Div., Somerville, N. J.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
Transitron Elctrn. Corp., Wakefield, Mass.
United Detector Technology Inc., Santa Monica, Cal.

Diode Testers—See Testers, Diode

Diodes, Avalanche

M & H Electronics, Long Branch, N.J. Vol 2•908-915
TRW Semiconductors, Lawndale, Cal. Vol 2•950
Wagner Elec. Corp., Livingston, N.J. Vol 2•955,956
Alpha Instr. Inc., Woburn, Mass.
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Carter Semiconductor, Syossett, N.Y.
Computer Diode, Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
AFI Industries Inc., Long Branch, N. J.
FMC Corp., Homer City, Pa.
General Semiconductor Inds., Tempe, Ariz.
GHZ Devices, Inc., So. Chelmsford, Mass.
KMC Semiconductor Corp., Long Valley, N.J.
KSC Semiconductor Corp., Chelmsford, Mass.
Microsemiconductor Corp., Culver City, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Power Components, Inc., Woodland Hills, Cal.
RCA Solid State Div., Somerville, N. J.
Sarkes Tarzian, Inc., Bloomington, Ind.
Semicon Inc., Burlington, Mass.
Semtech Corp., Newbury Pk., Cal.
Sensitron Semiconductor, Deer Pk., N.Y.
Solid State Devices, Inc., La Mirada, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Varo Semiconductor, Inc., Garland, Tex.

Diodes, Backward

Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Carter Semiconductor, Syossett, N.Y.
Centralab Semiconductor, El Monte, Cal.
Computer Diode, Fair Lawn, N.J.
KMC Semiconductor Corp., Long Valley, N.J.
Microphase Corp., Cos Cob, Conn.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Sarkes Tarzian, Inc., Bloomington, Ind.
Solid State Devices, Inc., La Mirada, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Electroluminescent (Radiating)

Electro-Nuclear Labs., Inc., Menlo Park, Calif.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
Motorola Semiconductor Prods., Phoenix, Ariz.
OPCOA, Inc., Edison, N.J.
Sensor Technology, Chatsworth, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Gallium Arsenide

Aertech Inds., Sunnyvale, Calif.
Alpha Instr. Inc., Woburn, Mass.
Dialight Corp., Brooklyn, N.Y.
Electro-Nuclear Labs., Inc., Menlo Park, Calif.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
GHZ Devices, Inc., So. Chelmsford, Mass.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Spectronics, Inc., Richardson, Tex.
Sperry Elctrn. Tube, Gainesville, Fla.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian, Solid State West Division, Palo Alto, Cal.

Diodes, Germanium

RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. Vol 4•436*
Aertech Inds., Sunnyvale, Calif.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Cordover, Carl & Co., Mineola, N.Y.
CSR Industries Inc., E. Farmingdale, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Electro-Nuclear Labs., Inc., Menlo Park, Calif.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
ITT Semiconductors, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., Newburyport, Mass.
KMC Semiconductor Corp., Long Valley, N.J.
Microphase Corp., Cos Cob, Conn.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Solid State Devices, Inc., La Mirada, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

Diodes, Gunn

Amperex Elctronic Corp., Slatersville, R.I. Vol 2•1183
Plessey Semiconductors, Farmingdale, N.Y. Vol 2•604
Alpha Instr. Inc., Woburn, Mass.
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
GHZ Devices, Inc., So. Chelmsford, Mass.
Litton Inds., San Carlos, Calif.
Microwave Assocs., Inc., Burlington, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian, Solid State West Division, Palo Alto, Cal.

Diodes, High-Voltage (1,000 Volts & Over)

General Instr. Corp., Semiconductor Comps. Div., Hicksville, N.Y. Vol 2•902,903
International Rectifier, El Segundo, Cal. Vol 2•906
RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. Vol 4•436*
Rectifier Comps. Corp., Union, N.J. Vol 2•925; Vol 4•527*
Semtech Corp., Newbury Pk., Cal. Vol 2•926-937
Sensitron Semiconductor, Deer Pk., N.Y. Vol 2•938,939
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Carter Semiconductor, Syossett, N.Y.
Computer Diode, Fair Lawn, N.J.
Dickson Elctrns. Corp., Scottsdale, Ariz
Edal Inds., Inc., E. Haven, Conn.
Eimac, San Carlos, Calif.
Elctrn. Enterprises, Newark, N.J.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
AFI Industries Inc., Long Branch, N. J.
FMC Corp., Homer City, Pa.
M & H Electronics, Long Branch, N.J.
Microsemiconductor Corp., Culver City, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Sarkes Tarzian, Inc., Bloomington, Ind.
Semicon Inc., Burlington, Mass.
Solid State Devices, Inc., La Mirada, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
Unitrode Corp., Watertown, Mass.
Varo Semiconductor, Inc., Garland, Tex.
Victoreen Instr., Cleveland, Ohio
Westinghouse Elec., Youngwood, Pa.

Diodes, Hot Carrier

Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
International Diode Corp., Jersey City, N.J.
International Rectifier, El Segundo, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Light-Emitting (LED)

Centralab Semiconductor, El Monte, Cal. Vol 2•670,671
Dialight Corp., Brooklyn, N.Y.. Vol 2•483
Genisco Technology Corp., Eldema Div., Compton, Cal. Vol 2•495
Lamps, Inc., Torrance, Cal. Vol 2•517
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal. Vol 2•522
Optron, Inc., Carrollton, Tex. Vol 2•678,921,922
Plessey Semiconductors, Farmingdale, N.Y. Vol 2•604
SCS Corporation-Microsystems, Ft. Lauderdale, Fla. Vol 2•605
Shigoto Inds., Ltd., New York, N.Y. Vol 2•676
Sloan Co., Sun Valley, Cal. Vol 2•530
Spectronics, Inc., Richardson, Tex. Vol 2•677
Antex Inds., Inc., Palo Alto, Cal.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Calvert Elctrns., Inc., New York, N.Y.
Chicago Miniature Lamp Works, Chicago, Ill.
Data Display Products, Los Angeles, Cal.
Drake Mfg., Harwood Hgts., Ill.
Electro-Nuclear Labs., Inc., Menlo Park, Calif.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
General Illumination, Inc., St. Paul, Minn.
HEI, Inc., Chaska, Minn.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Leecraft Mfg. Co., Inc., Long Island City, N.Y.
Licon Div., Chicago, Ill.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
OPCOA, Inc., Edison, N.J.
Oshino Electric Lamp Works, Ltd, Shinagawa-ku, Tokyo, Japan
RCA Elctrns. Comps., Harrison, N.J.
Skan-A-Matic Corp., Elbridge, N. Y.
TEC, Inc., Tucson, Ariz.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Limiting

Aertech Inds., Sunnyvale, Calif.
Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Calvert Elctrns., Inc., New York, N.Y.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
GHZ Devices, Inc., So. Chelmsford, Mass.
Int'l. Elctrns., Melville, N.Y.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Power Components, Inc., Woodland Hills, Cal.
Schauer Mfg. Corp., Cincinnati, Ohio
Siliconix, Inc., Santa Clara, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

Diodes, Matched Pairs

Centralab Semiconductor, El Monte, Cal. Vol 2•670,671
Semtech Corp., Newbury Pk., Cal. Vol 2•933-935
Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Carter Semiconductor, Syossett, N.Y.
Computer Diode, Fair Lawn, N.J.
Dickson Elctrns. Corp., Scottsdale, Ariz
Edal Inds., Inc., E. Haven, Conn.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Semiconductor Inds., Tempe, Ariz.
International Diode Corp., Jersey City, N.J.
International Rectifier, El Segundo, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Microphase Corp., Cos Cob, Conn.
Microsemiconductor Corp., Culver City, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
Power Components, Inc., Woodland Hills, Cal.
Semicon Inc., Burlington, Mass.
Solid State Devices, Inc., La Mirada, Cal.
Sperry Elctrn. Tube, Gainesville, Fla.
Summit Engrg. Corp., Bozeman, Mont.
Teledyne Crystalonics, Cambridge, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRG Prods., E. Boston, Mass.

Diodes, Matched Quads

Semtech Corp., Newbury Pk., Cal. Vol 2•933,934
Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amperex Elctrn., Slatersville, R.I.
Carter Semiconductor, Syossett, N.Y.
Computer Diode, Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
International Diode Corp., Jersey City, N.J.
International Rectifier, El Segundo, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Microphase Corp., Cos Cob, Conn.
Microsemiconductor Corp., Culver City, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Parametric Inds., Inc., Winchester, Mass.
Power Components, Inc., Woodland Hills, Cal.
Semicon Inc., Burlington, Mass.
Solid State Devices, Inc., La Mirada, Cal.
Summit Engrg. Corp., Bozeman, Mont.
Teledyne Crystalonics, Cambridge, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
United Detector Technology Inc., Santa Monica, Cal.

Diodes, Microwave Detector

Amperex Elctronic Corp., Slatersville, R.I. Vol 2•1182,1183
Aertech Inds., Sunnyvale, Calif.
Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Kemtron Electron Prods., Inc., Newburyport, Mass.
KMC Semiconductor Corp., Long Valley, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Special Microwave Devices Oper., Waltham, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Microwave Mixer

Amperex Elctronic Corp., Slatersville, R.I. Vol 2•1182,1183
Aertech Inds., Sunnyvale, Calif.
Alpha Instr. Inc., Woburn, Mass.
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Kemtron Electron Prods., Inc., Newburyport, Mass.
KMC Semiconductor Corp., Long Valley, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Sarkes Tarzian, Inc., Bloomington, Ind.
Special Microwave Devices Oper., Waltham, Mass.
Sperry Elctrn. Tube, Gainesville, Fla.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.

Diodes, Noise

Solitron Devices, San Diego, Cal. Vol 2•943
Solitron Devices, Inc., Riviera Bch., Fla. Vol 2•943
Solitron Devices, Inc., Tappan, N.Y. Vol 2•943
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alpha Instr. Inc., Woburn, Mass.
Calvert Elctrns., Inc., New York, N.Y.
Centralab Semiconductor, El Monte, Cal.
Computer Diode, Fair Lawn, N.J.
General Semiconductor Inds., Tempe, Ariz.
Signalite, Neptune, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Photoelectric

Centralab Semiconductor, El Monte, Cal. Vol 2•670,671
International Rectifier, El Segundo, Cal. Vol 2•906
Nat'l. Semiconductors, Plattsburgh, N.Y. Vol 2•674
Optron, Inc., Carrollton, Tex. Vol 2•678,920-922
Shigoto Inds., Ltd., New York, N.Y. Vol 2•676
Calvert Elctrns., Inc., New York, N.Y.
Clairex Elctrns., Mt. Vernon, N.Y.
EG & G, Inc., Salem, Mass.
Electro-Nuclear Labs., Inc., Menlo Park, Calif.
Hamamatsu Corp. (E), Middlesex, N. J.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
HEI, Inc., Chaska, Minn.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
RCA Elctrns. Comps., Harrison, N.J.
Santa Barbara Resch. Ctr., Goleta, Calif.
Sensor Corp., Scottsdale, Pa.
Sensor Technology, Chatsworth, Cal.
Skan-A-Matic Corp., Elbridge, N. Y.
Spectronics, Inc., Richardson, Tex.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
United Detector Technology Inc., Santa Monica, Cal.

Diodes, Pin

Unitrode Corp., Watertown, Mass. Vol 2•621
Aertech Inds., Sunnyvale, Calif.
Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Calvert Elctrns., Inc., New York, N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
GHZ Devices, Inc., So. Chelmsford, Mass.
Microsemiconductor Corp., Culver City, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Sensor Technology, Chatsworth, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
TRW Semiconductors, Lawndale, Cal.
United Detector Technology Inc., Santa Monica, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Schottky

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TRW Semiconductors, Lawndale, Cal. Vol 2•950
Aertech Inds., Sunnyvale, Calif.
Alpha Instr. Inc., Woburn, Mass.
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
International Rectifier, El Segundo, Cal.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Special Microwave Devices Oper., Waltham, Mass.
Sperry Elctrn. Tube, Gainesville, Fla.
Thor Elctrns. Corp., Elizabeth, N.J.
TRG Prods., E. Boston, Mass.
United Detector Technology Inc., Santa Monica, Cal.
Varian Assocs., Palo Alto, Cal.

Diodes, Selenium—See Rectifiers, Selenium

Diodes, Silicon

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Rectifier Comps. Corp., Union, N.J. Vol 2•925; Vol 4•527*
Sanford-Miller Corp., Brooklyn, N.Y. Vol 2•919; Vol 3•1272
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Solitron Devices, San Diego, Cal. Vol 2•943
Solitron Devices, Inc., Riviera Bch., Fla. Vol 2•943
Solitron Devices, Inc., Tappan, N.Y. Vol 2•943
Unitrode Corp., Watertown, Mass. Vol 2•963,964
Varo Semiconductor, Inc., Garland, Tex. Vol 2•972-974
Wagner Elec. Corp., Livingston, N.J. Vol 2•952-956
Westinghouse Elec., Youngwood, Pa. Vol 2•976,977; Vol 4•535-537*
Aertech Inds., Sunnyvale, Calif.
Alpha Components Corp., El Segundo, Cal.
Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amperex Electronic Corp., Hicksville, N.Y.
Amperex Elctrn., Slatersville, R.I.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Calvert Elctrns., Inc., New York, N.Y.
Carter Semiconductor, Syossett, N.Y.
Components, Inc., Biddeford, Me.
Computer Diode, Fair Lawn, N.J.
Cordover, Carl & Co., Mineola, N.Y.
CSR Industries Inc., E. Farmingdale, N.Y.
Delco Elctrns. Div., Kokomo, Ind.
Dutrex Inds., Inc., New York, N.Y.
Edal Inds., Inc., E. Haven, Conn.
EG & G, Inc., Salem, Mass.
Elctrn. Devices, Yonkers, N.Y.
Electronic Transistors, Flushing, N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
AFI Industries Inc., Long Branch, N. J.
FMC Corp., Homer City, Pa.
General Semiconductor Inds., Tempe, Ariz.
GHZ Devices, Inc., So. Chelmsford, Mass.
Hamamatsu Corp. (E), Middlesex, N. J.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
ITT Semiconductors, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Micro Components Corp., Cranston, R.I.
Microsemiconductor Corp., Culver City, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
Power Components, Inc., Woodland Hills, Cal.
Raytheon, Mt. View, Calif.
RCA Elctrns. Comps., Harrison, N.J.
Sarkes Tarzian, Inc., Bloomington, Ind.
Schauer Mfg. Corp., Cincinnati, Ohio
Semicon Inc., Burlington, Mass.
Special Microwave Devices Oper., Waltham, Mass.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
TRW Semiconductors, Lawndale, Cal.
United Detector Technology Inc., Santa Monica, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Step Recovery

Aertech Inds., Sunnyvale, Calif.
Alpha Instr. Inc., Woburn, Mass.
Calvert Elctrns., Inc., New York, N.Y.
Carter Semiconductor, Syossett, N.Y.
GHZ Devices, Inc., So. Chelmsford, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Surface Barrier

Aertech Inds., Sunnyvale, Calif.
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Parametric Inds., Inc., Winchester, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.
United Detector Technology Inc., Santa Monica, Cal.

Diodes, Switching

Anaren Microwave, Inc., Syracuse, N.Y. Vol 4•438*
Arra Inc., Bay Shore, N.Y. ..... Vol 2•608
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Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Carter Semiconductor, Syossett, N.Y.
Computer Diode, Fair Lawn, N.J.
CSR Industries Inc., E. Farmingdale, N.Y.
Electronic Transistors, Flushing, N.Y.
GHZ Devices, Inc., So. Chelmsford, Mass.
Hutson Industries, Dallas, Tex.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
ITT Semiconductors, W. Palm Beach, Fla.
Micro Components Corp., Cranston, R.I.
Microphase Corp., Cos Cob, Conn.
Microsemiconductor Corp., Culver City, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Raytheon, Mt. View, Calif.
RCA Elctrns. Comps., Harrison, N.J.
Scientific Technology, Mountain View, Cal.
Sensitron Semiconductor, Deer Pk., N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Tunnel

Centralab Semiconductor, El Monte, Cal. ..... Vol 2•897
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
KMC Semiconductor Corp., Long Valley, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Parametric Inds., Inc., Winchester, Mass.
Solid State Devices, Inc., La Mirada, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Varactor

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1183
TRW Semiconductors, Lawndale, Cal. Vol 2•950
Aertech Inds., Sunnyvale, Calif.
Alpha Instr. Inc., Woburn, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amperex Electronic Corp., Hicksville, N.Y.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Centralab Semiconductor, El Monte, Cal.
Computer Diode, Fair Lawn, N.J.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Fansteel Inc., N Chicago, Ill.
GHZ Devices, Inc., So. Chelmsford, Mass.
ITT Electron Tube, Easton, Pa.
ITT Semiconductors, W. Palm Beach, Fla.
KSC Semiconductor Corp., Chelmsford, Mass.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
MSI Electronics, Inc., Woodside, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Solid State Devices, Inc., La Mirada, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Teledyne Crystalonics, Cambridge, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Video Detector—See Diodes, Microwave Detector

Diodes, Zener & Stabistors (Forward Reference Diodes)

Centralab Semiconductor, El Monte, Cal. ..... Vol 2•896-898
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Wagner Elec. Corp., Livingston, N.J. Vol 2•955,956
Amperex Elctrn., Slatersville, R.I.
Beckman Instrs., Cedar Grove, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Components, Inc., Biddeford, Me.
Computer Diode, Fair Lawn, N.J.
Cordover, Carl & Co., Mineola, N.Y.
CSR Industries Inc., E. Farmingdale, N.Y.
Dickson Elctrns. Corp., Scottsdale, Ariz
Electronic Transistors, Flushing, N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Semiconductor Inds., Tempe, Ariz.
International Diode Corp., Jersey City, N.J.
ITT Semiconductors, W. Palm Beach, Fla.
Julie Research Lab., New York, N.Y.
KSC Semiconductor Corp., Chelmsford, Mass.
M & H Electronics, Long Branch, N.J.
Mauratron, Inc., Dallas, Tex.
Microsemiconductor Corp., Culver City, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Nucleonic Prods., Canoga Pk, Cal.
Power Components, Inc., Woodland Hills, Cal.
RCA Elctrns. Comps., Harrison, N.J.
Sarkes Tarzian, Inc., Bloomington, Ind.
Schauer Mfg. Corp., Cincinnati, Ohio
Semicon Inc., Burlington, Mass.
Semtech Corp., Newbury Pk., Cal.
Shigoto Inds., Ltd., New York, N.Y.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
TRW Capacitors, Ogallala, Neb.
TRW Semiconductors, Lawndale, Cal.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.

Diplexers—See Multiplexers

Direction Finders

Bendix Corp., Ft. Lauderdale, Fla.
Honeywell, Minneapolis, Minn.
Loral Elctrn. Sys., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.

Directional Couplers—See Couplers, Directional

Discharge Systems, Energy

CML-Macarr, Inc., Edison, N.J. Vol 1•645
Advanced Kinetics, Costa Mesa, Calif.
General Lab. Assocs., Norwich, N.Y.
LDJ Electronics, Troy, Mich.
Tobe Deutschmann Labs., Inc., Canton, Mass.
U.S. Scientific Instrs., Watertown, Mass.
Velonex, Santa Clara, Calif.

Discriminators

Anaren Microwave, Inc., Syracuse, N.Y. Vol 4•438*
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Electronic Research Co., Shawnee Mission, Kan. ..... Vol 2•405
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Tyco Filters Div. Inc., Phoenix, Ariz. Vol 2•454
Adar Assocs., Cambridge, Mass.
Almond Instrs. Co., Covina, Cal
American Trans-Coil Corp., Richmond Hill, N.Y.
Automated Meas., Oakland, Calif.
Berkeley Nucleonics Corp., Berkeley, Calif.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Conic Corp., San Diego, Calif.
Crystal Network Prods. Corp., Erie, Pa.
Damon Corp., Westwood, Mass.
Data-Control Systems, Danbury, Conn.
E-H Resch. Labs., Inc., Oakland, Cal.
Engelmann Microwave, Montville, N.J.
Environmental Communications Inc., Santa Ana, Cal.
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
Frequency Elctrns., New Hyde Pk., N.Y.
Hughes Aircraft Co., Communication Prods. Dept., Microelectronic Prods. Div., Newport Bch., Cal.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Millen, James Mfg., Malden, Mass.
Nuclear Data, Palatine, Ill.
Physical Elctrn. Labs., Menlo Park, Calif.
Piezo Crystal Co., Carlisle, Pa.
Premier Microwave, Port Chester, N.Y.
RHG Elctrns. Lab., Deer Park, N.Y.
Ryka Scientific, Inc., Sunnyvale, Cal.
Sherold Crystal Prods., Kansas City, Mo.
SSR Instrs. Co., Santa Monica, Cal.
Teledyne Geotech, Dallas, Tex.
Varian Assocs., Palo Alto, Cal.
Varian, Solid State West Division, Palo Alto, Cal.
Vega Precision Labs., Vienna, Va.
Vidar Corp., Mountain View, Cal.

Disc Packs, Magnetic

Digital Equip. Corp., Maynard, Mass.
Elctrn. Memories, Hawthorne, Cal.
Honeywell Information Systems, Waltham, Mass.
3M Co., St. Paul, Minn.
Wang Labs., Inc., Tewksbury, Mass.

Discs, Computer Memory—See Memory Systems, Disc

Discs, Optical Encoder—See Coded Discs, Optical

Display Boards—See Boards, Plotting

Display Devices, LED

Genisco Technology Corp., Eldema Div., Compton, Cal. ..... Vol 2•495
Ind'l Elctrn. Engrs., Van Nuys, Cal. Vol 2•509
Lamps, Inc., Torrance, Cal. ..... Vol 2•517
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal. ..... Vol 2•522
Antex Inds., Inc., Palo Alto, Cal.
Electro-Nuclear Labs., Inc., Menlo Park, Calif.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Information Transfer, Inc., Holcomb, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
OPCOA, Inc., Edison, N.J.
Precision Dynamics Corp., Burbank, Cal.
Scientific Technology, Mountain View, Cal.
Shigoto Inds., Ltd., New York, N.Y.
W.V. Industries Inc., Franklin Lakes, N.J.

Display Devices, Liquid Crystal

Ind'l Elctrn. Engrs., Van Nuys, Cal. Vol 2•509
Ragen Precision Inds., Inc., N. Arlington, N.J.
W.V. Industries Inc., Franklin Lakes, N.J.

Display Panels (Back-Lighted & Edge-Lighted)

Datatron, Inc., Santa Ana, Cal Vol 2•525
Dialight Corp., Brooklyn, N.Y. ... Vol 2•483
Display Devices, Inc., Encinitas, Cal. Vol 2•484,485
ESE, Inglewood, Cal. ..... Vol 2•337
Info-Lite Corp., Corona, N.Y. ..... Vol 2•510
Inter-Market, Inc., Glenview, Ill. Vol 2•511
K. C. C. Shokai Ltd., Nada-ku, Kobe 657, Japan ..... Vol 2•512
TEC, Inc., Tucson, Ariz. ..... Vol 2•537
Analogic, Wakefield, Mass.
Arvin Sys., Inc., Dayton, Ohio
Autocon Inds., Inc., Minneapolis, Minn.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Dataprobe, Inc., So. Hackensack, N.J.
Devco Engrg., W. Caldwell, N.J.
Fiber Photics, Inc., Santa Cruz, Cal.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Luminator Div., Plano, Tex.
LVC Inds. Inc., Flushing, N.Y.
NES, Inc., Itasca, Ill.
Panelgraphic Corp., Caldwell, N.J.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Precision Dynamics Corp., Burbank, Cal.
Sigma Instrs., Inc., Braintree, Mass.
Singer Co., Little Falls, N.J.
Telmar, Inc., Columbus, Ohio
Vemaline Prods. Co., Wyckoff, N.J.
Zonic Tech. Labs., Cincinnati, Ohio

Displays, Projection Type (CRT; Electromechanical; Film; Light Valve)

Daco Instr. Co., Milford, Conn. Vol 2•478
Ind'l Elctrn. Engrs., Van Nuys, Cal. Vol 2•509
Infodex, Inc., Waterbury, Conn. Vol 1•460
K. C. C. Shokai Ltd., Nada-ku, Kobe 657, Japan ..... Vol 2•512
TEC, Inc., Tucson, Ariz. ..... Vol 2•537
Allard Instr. Corp., Westbury, NY
Applied Digital Data Systems, Inc., Hauppauge, N.Y.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
CELCO, Mahwah, N.J.
Conrac Div., Covina, Calif.
CPS, Sunnyvale, Calif.
Data Disc, Inc., Sunnyvale, Cal.
Devco Engrg., W. Caldwell, N.J.
Dialight Corp., Brooklyn, N.Y.
E-Systems Inc., Dallas, Tex.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
Gould Data Systems, Newton Upper Falls, Mass.
Gould, Inc., Cleveland, Ohio
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Minneapolis, Minn.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Hughes Aircraft Co., Ground Systems Grp., Fullerton, Cal.
Information Displays, Inc., Mt. Kisco, N.Y.
Kollsman Instr. Co., Syosset, N.Y.
Kratos, Pasadena, Cal
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Leeds & Northrup Corp., No. Wales, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Major Data Corp., Costa Mesa, Cal.
Mast Dev. Co., Davenport, Iowa
McDonnell Douglas Electronics Co., St. Charles, Mo.
Metra Instruments, Inc., Mt. View, Cal.
Monitor Systems, Ft. Washington, Pa
NES, Inc., Itasca, Ill.
Optimation, Inc., Chatsworth, Cal.
Princeton Elctrn. Prods., New Brunswick, N.J.
Raytheon Data Systems Co., Norwood, Mass.
Raytheon Co., Quincy, Mass.
Scientific Communications, Garland, Tex.
Singer Co., Glendale, Cal.
Spatial Data Systems, Inc., Goleta, Cal.
Staver Co., Inc., Bay Shore, N.Y.
Stereotronics Television Co., Sherman Oaks, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Tektronix, Inc., Beaverton, Ore.
Telmar, Inc., Columbus, Ohio
Thomson-CSF Inc., New York, N.Y.
W.V. Industries Inc., Franklin Lakes, N.J.
Westinghouse Elec., Elmira, N.Y.

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Wagner Elec. Corp., Livingston, N.J. Vol 2•539

Displays, Tube—See Tubes, Readout

Diplexers, Antenna

A.R.F. Products, Inc., Boulder, Colo.
CCA Elctrns. Corp., Gloucester, N.J.
Design Automation, Inc., Lexington, Mass.
Microphase Corp., Cos Cob, Conn.
Mu-Del Elctrns., Silver Spring, Md.
Norsal Industries, Inc., Brentwood, N.Y.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.

Dissipators, Heat—See Heat Sinks-Also See Transistor & Diode Heat Dissipators

Distortion Analyzers, Indicators—See Analyzers, A-F

Dividers, Analog

Intronics, Inc., Newton, Mass. Vol 2•316
Burr-Brown Resch. Corp., Tucson, Ariz.
Foxboro Co., Foxboro, Mass.
Junction Modules, Inc., Irvine, Cal.
General Magnetics, Bloomfield, N.J.
GPS Corp., Framingham, Mass.
Hybrid Sys. Corp., Burlington, Mass.
Teledyne Philbrick, Dedham, Mass.
Transmagnetics Inc., Farmingdale, N. Y.
Zeltex, Inc., Concord, Calif.

Dividers, Frequency

Digitran Co., Pasadena, Cal. .. Vol 2•1049
Hybrid Sys. Corp., Burlington, Mass. Vol 1•348
Plessey Semiconductors, Farmingdale, N.Y. ..... Vol 2•601,602
Accutronics, Geneva, Ill.
Advanced Energy Conversion, Belmont, Cal.
American Time Products, Woodside, N.Y.
Anadex Instrs., Inc., Van Nuys, Calif.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Coast Coil Co., Los Angeles, Calif.
Connor-Winfield Corp., West Chicago, Ill.
Ferwalt, W.H., Inc., Lapwai, Idaho
Fork Standards, W. Chicago, Ill.
Frequency Elctrns., New Hyde Pk., N.Y.
Interstate Elctrns. Corp., Anaheim, Cal.
Kelk, George Ltd., Don Mills, Ont., Canada
Lithic Systems, Inc., Cupertino, Cal.
LVC Inds. Inc., Flushing, N.Y.
Microphase Corp., Cos Cob, Conn.
Milletron, Inc., Pittsburgh, Pa.
NH Research, Inc., Santa Ana, Calif.
Rohde & Schwarz Sls., Passaic, N.J.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Solid State Elctrns. Corp., Sepulveda, Cal.
Somerset Radiation Lab., Arlington, Va.
Specific Products, Monrovia, Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tempo Instrument, Inc., Plainview, N.Y.
3M Co., St. Paul, Minn.
Vector Industries, Palo Alto, Cal.

Dividers, Magnetic Analog

American Aerospace Controls Inc., Farmingdale, N.Y.
General Magnetics, Bloomfield, N.J.

Dividers, Power (LF, HF, VHF, UHF)

Anaren Microwave, Inc., Syracuse, N.Y. Vol 4•438*
Lorch Elctrns. Corp., Englewood, N.J. Vol 2•615
Mini-Circuits Lab., Brooklyn, N.Y. Vol 2•617
North Hills Elctrns., Inc., Glen Cove, N.Y. ..... Vol 3•1268
Weinschel Engrg. Co., Gaithersburg, Md. ..... Vol 1•534
Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
Advanced Energy Conversion, Belmont, Cal.
Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Anzac Elctrns., Waltham, Mass.
Arra Inc., Bay Shore, N.Y.
Coil Craft Inc., Bronxville, N.Y.
Comdel, Inc., Beverly, Mass.
Daico Inds. Inc., Compton, Cal.
Electro Impulse, Inc., Red Bank, N.J.
Engelmann Microwave, Montville, N.J.
General Radio Co., Concord, Mass.
Merrimac Inds., Inc., West Caldwell, N.J.
Microphase Corp., Cos Cob, Conn.
Mu-Del Elctrns., Silver Spring, Md.
Norsal Industries, Inc., Brentwood, N.Y.
Radiation Devices Co., Baltimore, Md.
Radio Resch. Co., Rockaway, N.J.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
Technical Research & Mfg. Co., Manchester, N.H.
Trompeter Elctrns., Chatsworth, Cal.
Vari-L Co., Inc., Denver, Colo.
Wide Band Engrg. Co., Phoenix, Ariz.

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Bendix, Franklin, Ind. ..... Vol 2•609
Lorch Elctrns. Corp., Englewood, N.J. Vol 2•615
North Hills Elctrns., Inc., Glen Cove, N.Y. ..... Vol 3•1268
Vari-L Co., Inc., Denver, Colo. Vol 2•622
Vega Precision Labs., Vienna, Va. Vol 1•569
Aertech Inds., Sunnyvale, Calif.
Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Americon Microwave Inds., Inc., Waltham, Mass.
Amphenol RF Div., Danbury, Conn.
Anzac Elctrns., Waltham, Mass.
Arra Inc., Bay Shore, N.Y.
CES Elctrns., Brooklyn, N.Y.
Collins Radio Co., Dallas, Tex.
Daico Inds. Inc., Compton, Cal.
E & M Laboratories, Inc., Westlake Village, Cal.
Environmental Communications Inc., Santa Ana, Cal.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
HRB-Singer, Inc., State College, Pa.
Maury Microwave Corp., Cucamonga, Calif.
MCL, Inc., La Grange, Ill.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sealectro Corp., Mamaroneck, N.Y.
Solitron/Microwave, Port Salerno, Fla.

Systron-Donner Microwave Div., Van Nuys, Cal.
Technical Research & Mfg. Co., Manchester, N.H.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Trompeter Elctrns., Chatsworth, Cal.
Varian Assocs., Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.

Dividers, Voltage Also See Transformers, Voltage Dividing

Caddock Elctrns., Riverside, Cal. Vol 3•1103
Electro Sci. Inds., Portland, Ore. Vol 1•435
Julie Research Lab., New York, N.Y. Vol 1•467-469
Kilovolt Corp., Hackensack, N.J. Vol 1•757
North Atlantic Inds., Plainview, N.Y. Vol 1•365
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Ross Engrg. Corp., Campbell, Cal. Vol 2•871
Vishay Resistor Prod. Div., Malvern, Pa. Vol 3•1198
AMP Capitron Div./AMP Incorporated, Elizabethtown, Pa.
Arra Inc., Bay Shore, N.Y.
Astrosystems, Inc., Lake Success, N.Y.
Beckman Instrs., Cedar Grove, N.J.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Centralab Elctrns Div., Milwaukee, Wisc
Coast Coil Co., Los Angeles, Calif.
Collins, G.L. Corp., Long Beach, Calif.
Computer Instrs., Hempstead, N.Y.
Del Electronics Corp., Mt. Vernon, N.Y.
Digitran Co., Pasadena, Cal.
Edison Elctrns. Div., Manchester, N.H.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Radio Co., Concord, Mass.
General Resistance, Inc., Mt. Vernon, N.Y.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
LVC Inds. Inc., Flushing, N.Y.
Marstan Resistor, Orange, N.J.
Micro Instr. Co., Hawthorne, Cal.
Microtran Co. Inc., Valley Stream, N.Y.
Oeco Corp., Portland, Ore.
Ohmite Mfg. Co., Skokie, Ill.
Pearson Elctrns., Inc., Palo Alto, Calif.
Pyrofilm Corp., Whippany, N.J.
RFL Inds., Instr. Div., Boonton, N.J.
Shallcross, Selma, N.C.
Vari-L Co., Inc., Denver, Colo.

Dollies & Instrument Carts—See Carts, Instrument & Equipment

Doors, Cabinet, Metal—See Cabinets & Accessories, Metal

Doublers, Frequency—See Multipliers, Frequency

Drafting Machines

Chemical Etching Equip. & Supply, Alexandria, Va.
Dietzgen Corp., Chicago, Ill.
HAPCO, Boulder, Colo.
Information Displays, Inc., Mt. Kisco, N.Y.
Keuffel & Esser Co., Morristown, N.J.
Universal Drafting Mach., Bedford Hgts., Ohio
Xynetics, Inc., Canoga Pk., Cal.

Drafting Symbols, Dry Transfer, Pressure Sensitive, etc.

Datak Corp., Passaic, N.J. ..... Vol 2•479
Bishop Graphics, No. Hollywood, Cal.
Brady, W.H. Co., Milwaukee, Wisc.
Centron Engrg., Torrance, Cal.
Chartpak, Leeds, Mass.
Circuit-Stik, Inc., Torrance, Cal.
HAPCO, Boulder, Colo.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Keuffel & Esser Co., Morristown, N.J.
Russell Inds., Inc., Lynbrook, N.Y.

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Premier Metal Prods. Co., Bronx, N.Y. Vol 3•326-329,334
Scanbe Mfg. Corp., El Monte, Cal. Vol 3•773
Techmar Corp., Los Angeles, Cal. Vol 3•339
Bud Radio, Willoughby, Ohio
Chassis-Trak, Div., Indianapolis, Ind.
Honeywell, Inc., Wabash, Ind.
Lyon Metal Prod., Inc., Aurora, Ill.
Mupac Corp., Brockton, Mass.
Optima Enclosures, Tucker, Ga.
Stanford Applied Engrg., Inc., Santa Ana, Cal.
Zero Mfg. Co., Burbank, Cal.

Drills & Accessories, Hand & Power

Aremco Prods., Inc., Briarcliff Manor, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
Gardner-Denver Co., Quincy, Ill.
General Hardware Mfg. Co., New York, N.Y.
High Speed Hammer Co., Inc., Rochester, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Mann, Henry Inc., Feasterville, Pa.
Moody Tools, Inc., Providence, R.I.
Petty Geophysical Engrg., San Antonio, Tex.
Price & Rutzebeck, Hayward, Calif.
Standard Pneumatic Motor Co., Reno, Nev.
Techni-Tool, Inc., Philadelphia, Pa.
Vigor Co., New York, N.Y.
Wen Prods., Inc., Chicago, Ill.
X-Acto, Long Island City, N.Y.

Drivers, Chopper

American Time Products, Woodside, N.Y.
Firing Circuits, Norwalk, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Solid State Elctrns. Corp., Sepulveda, Cal.

Drivers, Nut

Channellock, Inc., Meadville, Pa. Vol 3•1235
Megavolt, Inc., New York, N.Y. Vol 1•761
Vaco Prods. Co., Chicago, Ill. Vol 3•1242
Gardner-Denver Co., Quincy, Ill.
General Hardware Mfg. Co., New York, N.Y.
Hunter Tools, El Monte, Calif
Jonard Inds. Corp., Bronx, N.Y.
Klein, Mathias & Sons, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Moody Tools, Inc., Providence, R.I.
Porter, H.K., Inc., Somerville, Mass.
Standard Pneumatic Motor Co., Reno, Nev.
Techni-Tool, Inc., Philadelphia, Pa.
Xcelite, Inc., Orchard Park, N.Y.

Drivers, Solenoid—See Solenoid Drivers

Drivers, Switch

American Elctrn. Labs., Inc., Lansdale, Pa.
Arra Inc., Bay Shore, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cole Instrument Corp., Costa Mesa, Cal.
E & M Laboratories, Inc., Westlake Village, Cal.
OPtimax Inc., Colmar, Pa.
Technical Research & Mfg. Co., Manchester, N.H.

Drivers, Tube

Burroughs Corp., Plainfield, N.J.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Keltron Corp., Waltham, Mass.
Varian Assocs., Travel Wave Tube Div., Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.

Drivers & Decoders For Readouts

Alco Elctrn. Prods., North Andover, Mass. ..... Vol 2•458
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Burroughs Corp., Plainfield, N.J.
Digital Equip. Corp., Maynard, Mass.
Inter-Market, Inc., Glenview, Ill.
Keltron Corp., Waltham, Mass.
NES, Inc., Itasca, Ill.
Pinlites, Fairfield, N.J.
Precision Dynamics Corp., Burbank, Cal.
Signetics. Corp., Sunnyvale, Calif.
Sperry Information Displays Div., Scottsdale, Ariz.
Theta Instr. Corp., Fairfield, N.J.

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Allis, Louis Div., Milwaukee, Wisc.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Concord Elctrns., New York, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Dale Elctrns., Inc., Yankton, S.D.
Furnas Elec. Co., Batavia, Ill.
Jackson Bros., (London) Ltd., New York, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Lisk, G.W. Co., Clifton Springs, N.Y.
Machine Components Corp., Plainview, N.Y.
Millen, James Mfg., Malden, Mass.
MPC Prods. Corp., Chicago, Ill.
North American Philips Controls Corp., Cheshire, Conn.
Perfect Gear & Instr. Corp., Northridge, Calif.
PIC Design Division, Ridgefield,, Conn.
Servo-Tek Prods. Co., Hawthorne, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transicoil, Inc., Worcester, Pa.
Vemaline Prods. Co., Wyckoff, N.J.
Waldom Elctrns., Inc., Chicago, Ill.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Drums, Computer Memory Also See Memory Systems, Drum

Cognitronics Corp., Stamford, Conn.
Digital Equip. Corp., Maynard, Mass.
Honeywell Information Systems, Waltham, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.

—Dry Boxes -- See Boxes Glove

Dry Transfer Letters & Numbers—See Kits, Marking-Also See Drafting Symbols

Dryers, Air, Heatless

Chemical Etching Equip. & Supply, Alexandria, Va.
Daco Instr. Co., Milford, Conn.
Humphrey, Inc., San Diego, Calif.
Lear Siegler, Inc., Elyria, Ohio
Pall Corp., Glen Cove, N.Y.
Pall Trinity Micro Corp., Cortland, N.Y.
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Roberts Air Dryer, Chesterfield, Mo.

Ducts, Wiring

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Wiremold Co., W. Hartford, Conn. Vol 3•976,977
Co-Operative Inds., Inc., Chester, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Electrovert, Mt. Vernon, N.Y.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hoffman Engrg. Co., Anoka, Minn.
K. C. C. Shokai Ltd., Nada-ku, Kobe 657, Japan
Richco Plastic Co., Chicago, Ill.
Square D Co., Park Ridge, Ill.
Taylor Industries Inc., Howell, Mich.
Wadsworth Elec. Mfg. Co., Inc., Covington, Ky.

Dummy Loads

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Electro Impulse, Inc., Red Bank, N.J. Vol 1•548,549
Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Americon Microwave Inds., Inc., Waltham, Mass.
Arnold Magnetics, Culver City, Cal.
Arra Inc., Bay Shore, N.Y.
AUL Instrs., Inc., Flushng, N.Y.
Avtron Mfg., Inc., Cleveland, Ohio
Barth Elctrns., Inc., Cleveland, Ohio
Bendix, Franklin, Ind.
CCA Elctrns. Corp., Gloucester, N.J.
CES Elctrns., Brooklyn, N.Y.
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
E & M Laboratories, Inc., Westlake Village, Cal.
Elcom Sys., Deer Pk., N.Y.
Electronautics, Littleton, Mass.
EMC Technology Inc, Cherry Hill, N.J.
GRM Corp., Medford, N.J.
Heath Co., Benton Harbor, Mich.
Hybrid Technology Corp., Arlington, Tex.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Mobil Elctrns., Inc., Anderson, Ind.
Narda Microwave Corp., Plainview, N.Y.
New-Tronics Corp., Brookpark, Ohio
Norsal Industries, Inc., Brentwood, N.Y.
Ohmite Mfg. Co., Skokie, Ill.
OMNI Spectra, Farmington, Mich.
Premier Microwave, Port Chester, N.Y.
Pyrofilm Corp., Whippany, N.J.
Radiation Devices Co., Baltimore, Md.
Raytheon Co., Waltham, Mass.
RCA Corp., Camden, N.J.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Sealectro Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
Technical Mat'l., Mamaroneck, N.Y.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
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Rohde & Schwarz Sls., Passaic, N.J.
Sealectro Corp., Mamaroneck, N.Y.

Sinclair Radio Labs., Maple, Ont., Can.
Teledyne Mec., Palo Alto, Cal.
Teledyne Microwave, Mountain View, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
Texscan Microwave Prods., Indianapolis, Ind.
Transco Prods., Inc., Venice, Cal.
TT Elctrns., Inc., Los Angeles, Cal.
USCC/Centralab, Elctrns. Div., Burbank, Cal.
UTE Microwave, Asbury Park, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Varian, Solid State West Division, Palo Alto, Cal.
Vector Industries, Palo Alto, Cal.
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Blackhawk Networks Corp., Janesville, Wisc.
Bliley Electric, Erie, Pa.
Chesterfield Prods. Inc., Saddle Brook, N. J.
Cir-Q-Tel, Kensington, Md.
Cirtech Corp., Leawood, Kans.
Crystal Network Prods. Corp., Erie, Pa.
CTS Corp, Elkhart, Ind.
Damon Corp., Westwood, Mass.
Dietz Design, Inc., Belton, Mo.
Dynalab Corp., Van Nuys, Cal.
Electrac, Inc., Anaheim, Calif.
Electrocom Inds., So. Bend, Indiana
Electronic Research Co., Shawnee Mission, Kan.
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Devices, Inc., Haverhill, Mass.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Syosset, N.Y.
Hisonic, Inc., Olathe, Kans.
Kappa Networks, Inc., Carteret, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
Maury Microwave Corp., Cucamonga, Calif.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microsonics, Inc., Weymouth, Mass.
Monitor Prods., S. Pasadena, Cal.
Mu-Del Elctrns., Silver Spring, Md.
Multimetric Industries, Richmond Hill, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Piezo Crystal Co., Carlisle, Pa.
Piezo Technology Inc., Orlando, Fla.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Sinclair Radio Labs., Maple, Ont., Can.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Stanford Applied Engrg., Santa Clara, Cal.
Statek Corp., Orange, Cal.
T-F Electronics, Inc., Austin, Tex.
Teledyne Microwave, Mountain View, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Torotron, Mt. Vernon, N.Y.
TT Elctrns., Inc., Los Angeles, Cal.
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Bafco, Inc., Warminster, Pa.
Cir-Q-Tel, Kensington, Md.
Cirtech Corp., Leawood, Kans.
Dynalab Corp., Van Nuys, Cal.
Electro/Data, Inc., Garland, Tex.
Electro-Mechanics Co., Austin, Tex.
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Devices, Inc., Haverhill, Mass.
Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Kinetic Tech., Inc., Santa Clara, Cal.
Maury Microwave Corp., Cucamonga, Calif.
Metavac, Inc., Flushing, N.Y.
Microlab/FXR, Livingston, N.J.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
Physical Elctrn. Labs., Menlo Park, Calif.
Premier Microwave, Port Chester, N.Y.
Radiation Devices Co., Baltimore, Md.
RHG Elctrns. Lab., Deer Park, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rockland Sys. Corp., W. Nyack, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Ryka Scientific, Inc., Sunnyvale, Cal.
Signal Analysis Oper., Hauppauge, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
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Frequency Elctrns., New Hyde Pk., N.Y.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microsonics, Inc., Weymouth, Mass.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Piezo Crystal Co., Carlisle, Pa.
Radiation Devices Co., Baltimore, Md.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Sherold Crystal Prods., Kansas City, Mo.
Snelgrove, C. R. Ltd., Don Mills 404 Ont., Ont. Can.
Tedford Crystal Labs., Cincinnati, Ohio
TT Elctrns., Inc., Los Angeles, Cal.
Valpey Corp., Holliston, Mass.

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Panelgraphic Corp., Caldwell, N.J.
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Varian, Solid State West Division, Palo Alto, Cal.

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Amphenol Canada Ltd., Scarborough, (Ont.), Can.
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A.R.F. Products, Inc., Boulder, Colo.
Captor Corp., Tipp City, Ohio
De Coursey Engrg. Lab., Culver City, Cal.
Estes Engrg. Co., Gardena, Calif.
F-Dyne Elctrns., Bridgeport, Conn.
General Lab. Assocs., Norwich, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Gulton Inds., Inc., Metuchen, N.J.
Hisonic, Inc., Olathe, Kans.
ITT Jennings-Monrovia, San Jose, Cal.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Research Prods. Corp., Madison, Wisc
RtroN Corp., Skokie, Ill.
Sanders Assocs., Nashua, N.H.
Solar Elctrns. Co., Hollywood, Cal.
Sprague Elec. Co., No. Adams, Mass.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
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Bowmar/ALI, Inc., Acton, Mass.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Dietz Design, Inc., Belton, Mo.
Dranetz Engrg. Labs., So. Plainfield, N.J.
El-Rad Mfg. Co., Chicago, Ill.
Elctrn. Assocs., W. Long Branch, N.J.
Freed Transformer Co., Bklyn., N.Y.
Frequency Devices, Inc., Haverhill, Mass.
Frequency Elctrns., New Hyde Pk., N.Y.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Syosset, N.Y.
Hisonic, Inc., Olathe, Kans.
ITT Jennings-Monrovia, San Jose, Cal.
Kinetic Tech., Inc., Santa Clara, Cal.
Microtran Co. Inc., Valley Stream, N.Y.
Multimetric Industries, Richmond Hill, N.Y.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Techniques, Inc., Teaneck, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Shallco, Inc., Smithfield, N.C.
Spectra Sonics, Ogden, Utah
TT Elctrns., Inc., Los Angeles, Cal.
White Instrs., Inc., Austin, Tex.

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Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
CCA Elctrns. Corp., Gloucester, N.J.
Chesterfield Prods. Inc., Saddle Brook, N. J.
Coast Coil Co., Los Angeles, Calif.
Data Delay Devices, Clifton, N.J.
Dietz Design, Inc., Belton, Mo.
Dynalab Corp., Van Nuys, Cal.
Electrocube, San Gabriel, Cal
ESC Elctrns. Corp., Palisades Pk., N.J.
Filtron Co., Flushing, N.Y.
Frequency Devices, Inc., Haverhill, Mass.
Frequency Engrg. Labs., Farmingdale, N.J.
General Radio Co., Concord, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
ITT Jennings-Mohrovia, San Jose, Cal.
Kappa Networks, Inc., Carteret, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
Lorch Elctrns. Corp., Englewood, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microtran Co. Inc., Valley Stream, N.Y.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.

Multimetric Industries, Richmond Hill, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Polyphase Instr. Co., Bridgeport, Pa.
RF Interonics, Bay Shore, N.Y.
Rockland Sys. Corp., W. Nyack, N.Y.
Sinclair Radio Labs., Maple, Ont., Can.
Sprague Elec. Co., No. Adams, Mass.
Telonic Inds., Inc., Laguna Beach, Calif.
Torotel, Inc., Grandview, Mo.
Torotron, Mt. Vernon, N.Y.
TT Elctrns., Inc., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Vibration Instrs. Co., Anaheim, Cal.
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Airtron, Morris Plains, N.J.
All-Tronics Inc., Westbury, N.Y.
Allison Labs., Inc., Austin, Tex.
Altec Div., Anaheim, Calif.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
American Trans-Coil Corp., Richmond Hill, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
Automatic Coil, New Hyde Pk., N.Y.
Beukers Labs., Inc., Hauppauge, N.Y.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bramco Controls, Piqua, Ohio
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Captor Corp., Tipp City, Ohio
Centralab Elctrns Div., Milwaukee, Wisc
Coast Coil Co., Los Angeles, Calif.
Coil Craft Inc., Bronxville, N.Y.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Corcom Inc., Chicago, Ill.
Cornell-Dubilier Elctrns., Newark, N.J.
Crystal Network Prods. Corp., Erie, Pa.
Data-Control Systems, Danbury, Conn.
De Coursey Engrg. Lab., Culver City, Cal.
Dietz Design, Inc., Belton, Mo.
Drake, R.L., Co., Miamisburg, Ohio
Dytronics Co., Columbus, Ohio
El-Rad Mfg. Co., Chicago, Ill.
Elcom Sys., Deer Pk., N.Y.
Electro-Voice, Inc., Buchanan, Mich.
Electrocom Inds., So. Bend, Indiana
Elctrn. Assocs., W. Long Branch, N.J.
Engelmann Microwave, Montville, N.J.
EWC, Inc., Kenilworth, N.J.
Filtron Co., Flushing, N.Y.
Freed Transformer Co., Bklyn., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Gudeman Corp., Chicago, Ill.
Harder, Donald C. Co., Inc., San Diego, Calif.
Hertz Filter, Syosset, N.Y.
Hisonic, Inc., Olathe, Kans.
Industrial Condenser Corp., Chicago, Ill.
Inservco, Inc., La Grange, Ohio
ITT Jennings-Monrovia, San Jose, Cal.
Kinetic Tech., Inc., Santa Clara, Cal.
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Lorch Elctrns. Corp., Englewood, N.J.
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McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microsonics, Inc., Weymouth, Mass.
Microtran Co. Inc., Valley Stream, N.Y.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
Monitor Prods., S. Pasadena, Cal.
Mu-Del Elctrns., Silver Spring, Md.
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Norsal Industries, Inc., Brentwood, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Polyphase Instr. Co., Bridgeport, Pa.
Premier Microwave, Port Chester, N.Y.
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RF Interonics, Bay Shore, N.Y.
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Singer Co., Philadelphia, Pa.
Solar Elctrns. Co., Hollywood, Cal.
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Sprague Elec. Co., No. Adams, Mass.
Stanford Applied Engrg., Santa Clara, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
Tedford Crystal Labs., Cincinnati, Ohio
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Texscan Corp., Indianapolis, Ind.
Texscan Microwave Prods., Indianapolis, Ind.
Torotron, Mt. Vernon, N.Y.
TRW Elctrnc. Functions, Candem, N.J.
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A.R.F. Products, Inc., Boulder, Colo.
Blackhawk Networks Corp., Janesville, Wisc.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Centralab Elctrns Div., Milwaukee, Wisc
Cir-Q-Tel, Kensington, Md.
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Coil Craft Inc., Bronxville, N.Y.
Collins Radio Co., Dallas, Tex.
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Croven, Ltd., Whitby, Ont., Can.
Crystal Network Prods. Corp., Erie, Pa.
Dietz Design, Inc., Belton, Mo.
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ESC Elctrns. Corp., Palisades Pk., N.J.
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Frequency Elctrns., New Hyde Pk., N.Y.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Gudeman Corp., Chicago, Ill.
Heliotek, Sylmar, Calif.
Hertz Filter, Syosset, N.Y.
Hisonic, Inc., Olathe, Kans.
Hope Elctrns., Clifton, N.J.
Industrial Condenser Corp., Chicago, Ill.
ITT Jennings-Monrovia, San Jose, Cal.
Kappa Networks, Inc., Carteret, N.J.
Krohn-Hite, Cambridge, Mass.
Lorch Elctrns. Corp., Englewood, N.J.
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Microphase Corp., Cos Cob, Conn.
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Piezo Crystal Co., Carlisle, Pa.
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Q-Tech Corp., Los Angeles, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
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Filtron Co., Flushing, N.Y.
Frequency Devices, Inc., Haverhill, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hopkins Engrg., San Fernando, Cal.
ITT Jennings-Monrovia, San Jose, Cal.
Microtran Co. Inc., Valley Stream, N.Y.
NWL Transformers, Trenton, N.J.
RF Interonics, Bay Shore, N.Y.
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Linear Networks Co., San Pedro, Cal.
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Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
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McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microlab/FXR, Livingston, N.J.
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Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Piezo Crystal Co., Carlisle, Pa.
Polyphase Instr. Co., Bridgeport, Pa.
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Rockland Sys. Corp., W. Nyack, N.Y.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
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Spectrum Instrs., Inc., New Rochelle, N.Y.
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Texscan Corp., Indianapolis, Ind.
Texscan Microwave Prods., Indianapolis, Ind.
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Torotron, Mt. Vernon, N.Y.
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Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
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Cirtech Corp., Leawood, Kans.
Coil Craft Inc., Bronxville, N.Y.
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Electrac, Inc., Anaheim, Calif.
ESC Elctrns. Corp., Palisades Pk., N.J.
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General Microwave Corp., Farmingdale, N.Y.
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Premier Microwave, Port Chester, N.Y.
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Ryka Scientific, Inc., Sunnyvale, Cal.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Signal Analysis Oper., Hauppauge, N.Y.
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E & M Laboratories, Inc., Westlake Village, Cal.
Filtron Co., Flushing, N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
Greenray Inds., Inc., Mechanicsburg, Pa.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
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Premier Microwave, Port Chester, N.Y.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
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RHG Elctrns. Lab., Deer Park, N.Y.
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UTE Microwave, Asbury Park, N.J.
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Emerson & Cuming, Inc., Canton, Mass.
Hartwell Corp., Los Angeles, Calif.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
McLean Engrg. Labs., Princeton Jctn., N.J.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Parker Seal Co., Culver City, Calif.
Penn Fibre & Specialty, Phila., Pa.
Premier Microwave, Port Chester, N.Y.
Tapecon, Inc., Rochester, N.Y.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.

Gates, Computer Circuit (AND, OR, NOR, ETC.)—See Cards, Logic; IC's, Logic Circuits

Gauges, Connector
Jonard Inds. Corp., Bronx, N.Y.
Maury Microwave Corp., Cucamonga, Calif.

Gauges, Displacement, Linear
Applied Control Co., Fairfield, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bourns, Inc., Instr. Div., Riverside, Calif.
Computer Instrs., Hempstead, N.Y.
Faria, Thomas G. Corp., Uncasville, Conn.
Gaertner Scientific Corp., Chicago, Ill.
Jonard Inds. Corp., Bronx, N.Y.
Kaman Sciences Corp., Colorado Springs, Colo.
Lion Precision Corp, Newton, Mass.
Minnetech Labs, Minneapolis, Minn.
Rank Precision Inds., Des Plaines, Ill.
Schaevitz Engrg., Pennsauken, N.J.
Transducer Controls Corp., Covina, Calif.
West Coast Resch. Corp., Los Angeles, Calif.

Gauges, Ionization
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Edwards High Vacuum, Grand Island, N.Y.
Fredericks Co., Huntingdon Valley, Pa.
High Vacuum Equip. Corp., Hingham, Mass.
High Voltage Engrg. Corp., Burlington, Mass.
Nuclear Resch. Corp., Southampton, Pa.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
Torr Labs., Los Angeles, Cal.
Vactronic Lab. Equip., Inc., E. Northport, N.Y.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Gauges, Pressure-Also See Transducers, Pressure
Harrel, Inc., E. Norwalk, Conn. Vol 2•1163
Ailtech, City of Industry, Cal.
Alnor Instr. Co., Chicago, Ill.
Amersil, Inc., Hillside, N.J.
Amphenol Controls Oper. of Connector Div., Broadview, Ill.
Astrosystems, Inc., Lake Success, N.Y.
Bailey Meter Co., Wickliffe, Ohio
Bell & Howell Co., Pasadena, Calif.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bourns, Inc., Instr. Div., Riverside, Calif.
Bristol Div, Waterbury, Conn
Consolidated Controls Corp., Bethel, Conn.
Datametrics Inc., Wilmington, Mass.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Doric Sci. Corp., San Diego, Calif.
Dynisco, Westwood, Mass.
Edison, Instr. Div., W. Orange, N.J.
Foxboro Co., Foxboro, Mass.
Honeywell, Ft. Washington, Pa.
Jonard Inds. Corp., Bronx, N.Y.
Kistler Instr. Co., Redmond, Wash.
Kollsman Instr. Co., Syosset, N.Y.
Kratos, Pasadena, Cal
Kulite Semiconductor Prod., Ridgefield, N.J.
Lion Precision Corp, Newton, Mass.
Matheson Gas Products, East Rutherford, N.J.
MKS Instrs., Inc., Burlington, Mass.
Owatonna Tool Co., Owatonna, Minn.
Pall Trinity Micro Corp., Cortland, N.Y.
Plessey Enviromental Sys., San Diego, Cal.
Schauer Mfg. Corp., Cincinnati, Ohio
Sensotec, Inc., Columbus, Ohio
SRC Div., Newport Bch., Cal.
Statham Instrs., Inc., Oxnard, Cal.
Texas Instruments, Inc., Houston, Tex.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
Transducer Controls Corp., Covina, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Gauges, Strain
Jonard Inds. Corp., Bronx, N.Y. Vol 4•559*
Ailtech, City of Industry, Cal.
Amphenol Controls Oper. of Connector Div., Broadview, Ill.
Bell & Howell Co., Pasadena, Calif.
BLH Elctrns., Inc., Waltham, Mass.
Doric Sci. Corp., San Diego, Calif.
Foxboro Co., Foxboro, Mass.
Hughes Aircraft Co., Space & Comm. Grp., Los Angeles, Cal.
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y.
Kaman Sciences Corp., Colorado Springs, Colo.
Kulite Semiconductor Prod., Ridgefield, N.J.
Magnaflux Corp., Chicago, Ill.
Micro-Measurements Div., Romulus, Mich.
Statham Instrs., Inc., Oxnard, Cal.
Teledyne Geotech, Dallas, Tex.
Toledo Scale, Toledo, Ohio
West Coast Resch. Corp., Los Angeles, Calif.

Gauges, Tension
Jonard Inds. Corp., Bronx, N.Y. Vol 4•559*
Chatillon John & Sons, Kew Gardens, N.Y.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Doric Sci. Corp., San Diego, Calif.
Hunter Spring, Hatfield, Pa.
Kaman Sciences Corp., Colorado Springs, Colo.
Minnetech Labs, Minneapolis, Minn.
Neuses, P.K., Inc., Arlington Hgts., Ill.
N.Y. Testing Labs., Inc., Westbury, N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Transducer Controls Corp., Covina, Calif.
West Coast Resch. Corp., Los Angeles, Calif.

Gauges, Thickness—See Testers, Thickness (All Types)

Gauges, Vacuum
Bailey Meter Co., Wickliffe, Ohio
Bristol Div, Waterbury, Conn
Cole-Parmer Instr. Co., Chicago, Ill.
Consolidated Controls Corp., Bethel, Conn.
Datametrics Inc., Wilmington, Mass.

Dixson Inc., Meter Div., Grand Junction, Colo.
Edwards High Vacuum, Grand Island, N.Y.
Foxboro Co., Foxboro, Mass.
Fredericks Co., Huntingdon Valley, Pa.
High Vacuum Equip. Corp., Hingham, Mass.
High Voltage Engrg. Corp., Burlington, Mass.
Honeywell, Ft. Washington, Pa.
Lion Precision Corp, Newton, Mass.
Materials Resch. Corp., Orangeburg, N.Y.
Matheson Gas Products, East Rutherford, N.J.
MKS Instrs., Inc., Burlington, Mass.
Nuclear Resch. Corp., Southampton, Pa.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
Precision Sci. Co., Chicago, Ill.
RIL Elctrns., Inc., Southampton, Pa.
Schauer Mfg. Corp., Cincinnati, Ohio
Statham Instrs., Inc., Oxnard, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Vacuum Resch. Mfg., San Ramon, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.
VirTis Co., Gardiner, N.Y.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Westinghouse Elec., Elmira, N.Y.

Gearheads & Speed Reducers

Bowmar Instr. Corp., Ft. Wayne, Ind. Vol 2•334

Gears & Gear Mechanisms (Precision)

Precision Mechanisms Corp., Westbury, N.Y. ..... Vol 2•990
Bendix, Utica, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
GAF Corp., New York, N.Y.
Gibbs Mfg. & Resch., Janesville, Wisc.
Gibson/Egan Co., Arcadia, Calif.
Gries Reproducer Co., New Rochelle, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Instru-Lec Corp., Mt. Vernon, N.Y.
Invincible Gear Co., Detroit, Mich.
Jackson Bros., (London) Ltd., New York, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Keller, Hugo P., Inc., New York, N.Y.
Kidde, Walter & Co., Belleville, N.J.
Kwikset Powdered Metal Prods., Anaheim, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Machine Components Corp., Plainview, N.Y.
Meltronics Inc., Leeds, Ala.
Millen, James Mfg., Malden, Mass.
MPC Prods. Corp., Chicago, Ill.
Orbit Instr. Corp., Syosset, N.Y.
Perfect Gear & Instr. Corp., Northridge, Calif.
PIC Design Division, Ridgefield,, Conn.
Planet Instr., Gardena, Cal.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Suffolk Etched Prods., Inc., Riverhead, N.Y.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Transicoil, Inc., Worcester, Pa.
Western Gear Corp., Pasadena, Cal.

Generators, A-M

Boonton Elctrns., Parsippany, N.J. Vol 1•408
Logimetrics, Inc., Greenvale, N.Y. Vol 1•480,481
Ailtech, City of Industry, Cal.
AUL Instrs., Inc., Flushng, N.Y.
CCA Elctrns. Corp., Gloucester, N.J.
Edison Elctrns. Div., Manchester, N.H.
Exact Elctrns., Inc., Hillsboro, Ore.
General Radio Co., Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Test Equip., Clifton, NJ
Interstate Elctrns. Corp., Anaheim, Cal.
Kay Elemetrics, Pine Brook, N.J.
Leader Instruments Corp., Long Island City, N.Y.
Marconi Instrs., Englewood, N.J.
MCL, Inc., La Grange, Ill.
Radio Resch. Co., Rockaway, N.J.
RCA Corp., Camden, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Wavetek, San Diego, Cal.
Wiltron Co., Palo Alto, Calif.

Generators, A-M/F-M

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Logimetrics, Inc., Greenvale, N.Y. Vol 1•479,481
Marconi Instrs., Englewood, N.J. Vol 1•483
Ailtech, City of Industry, Cal.
AUL Instrs., Inc., Flushng, N.Y.
CCA Elctrns. Corp., Gloucester, N.J.
Exact Elctrns., Inc., Hillsboro, Ore.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Test Equip., Clifton, NJ
Kay Elemetrics, Pine Brook, N.J.
Krohn-Hite, Cambridge, Mass.
Leader Instruments Corp., Long Island City, N.Y.
London Co., Cleveland, Ohio
Polarad Elctrn. Instrs., Lake Success, N.Y.
Radio Resch. Co., Rockaway, N.J.
RCA Corp., Camden, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Texscan Corp., Indianapolis, Ind.
Tucker Electronics Co., Garland, Tex.
Wavetek, San Diego, Cal.
Wavetek Indiana, Inc., Beech Grove, Ind.
Wiltron Co., Palo Alto, Calif.

Generators, Acoustic, High Intensity Noise

CML-Macarr, Inc., Edison, N.J.
Elgenco, Inc., Santa Monica, Cal.

Generators, Audio

Dynascan Corp., Chicago, Ill. .. Vol 1•401
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Krohn-Hite, Cambridge, Mass. Vol 1•474
Advanced Energy Conversion, Belmont, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
Altec Div., Anaheim, Calif.
American Time Products, Woodside, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Barker & Williamson, Inc., Bristol, Pa.
BECO, Inc., Salem, Va.
Behlman Div., California Instrs., San Diego, Cal
Bramco Controls, Piqua, Ohio
Brown Electro-Meas. Corp., Kirkland, Wash.
California Instrs. Co., San Diego, Cal.
Clarke - Hess, New York, N.Y.
CML-Macarr, Inc., Edison, N.J.
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Elgenco, Inc., Santa Monica, Cal.
Elin Div., San Diego, Cal.
Exact Elctrns., Inc., Hillsboro, Ore.
Fork Standards, W. Chicago, Ill.
Frequency Elctrns., New Hyde Pk., N.Y.
General Radio Co., Concord, Mass.
GRM Corp., Medford, N.J.
Heath Co., Benton Harbor, Mich.
Holt Instr. Labs., Oconto, Wisc.
Hope Elctrns., Clifton, N.J.
Ind'l. Test Equip., Clifton, NJ
Kay Elemetrics, Pine Brook, N.J.
Leader Instruments Corp., Long Island City, N.Y.
Marconi Instrs., Englewood, N.J.
Nelson Ross Elctrns., Lake Success, N.Y.
NH Research, Inc., Santa Ana, Calif.
Optimation, Inc., Chatsworth, Cal.
RCA Elctrns. Comps., Harrison, N.J.
Riverbank Labs., Geneva, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Solar Elctrns. Co., Hollywood, Cal.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Systron-Donner Datapulse Div., Culver City, Cal.
T-F Electronics, Inc., Austin, Tex.
Tech Serv., Inc., Fogelsville, Pa.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
Unholtz-Dickie Corp., Hamden, Conn.
Wavetek, San Diego, Cal.
Wiltron Co., Palo Alto, Calif.

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Dranetz Engrg. Labs., So. Plainfield, N.J. ..... Vol 1•427
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
E-H Resch. Labs., Inc., Oakland, Cal.
Exact Elctrns., Inc., Hillsboro, Ore.
Information Displays, Inc., Mt. Kisco, N.Y.
Instrumentation Tech. Corp., Northbridge, Cal.
Monitor Systems, Ft. Washington, Pa
NES, Inc., Itasca, Ill.
Singer - Tele-Signal, Woodbury, N.Y.
Systron-Donner Corp., Concord, Cal.
Systron-Donner Datapulse Div., Culver City, Cal.
Texas Instruments, Dallas, Tex.
Varian Data Machines, Palo Alto, Cal.

Generators, Digital Delay—

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Generators, F-M

Boonton Elctrns., Parsippany, N.J. Vol 1•408
Interstate Elctrns. Corp., Anaheim, Cal. Vol 1•462
Logimetrics, Inc., Greenvale, N.Y. Vol 1•480
Ailtech, City of Industry, Cal.
Astro Comm. Lab., Gaithersburg, Md.
CCA Elctrns. Corp., Gloucester, N.J.
Clarke - Hess, New York, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Exact Elctrns., Inc., Hillsboro, Ore.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Test Equip., Clifton, NJ
Kay Elemetrics, Pine Brook, N.J.
Krohn-Hite, Cambridge, Mass.
Leader Instruments Corp., Long Island City, N.Y.
Piezo Technology Inc., Orlando, Fla.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Radio Resch. Co., Rockaway, N.J.
Regency Elctrns., Inc., Indianapolis, Ind.
Rohde & Schwarz Sls., Passaic, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Sound Technology, Cupertino, Cal.
Texscan Corp., Indianapolis, Ind.
Tucker Electronics Co., Garland, Tex.
Video Research Corp., Gaithersburg, Md.
Wavetek, San Diego, Cal.
Wavetek Indiana, Inc., Beech Grove, Ind.
Wiltron Co., Palo Alto, Calif.

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London Co., Cleveland, Ohio .. Vol 1•478
CCA Elctrns. Corp., Gloucester, N.J.
Hickok Elect. Instr., Cleveland, Ohio
Leader Instruments Corp., Long Island City, N.Y.
Sound Technology, Cupertino, Cal.
Test & Measuring Instrs. Inc., Hicksville, N.Y.

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General Magnetics, Bloomfield, N.J. Vol 2•339
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Adar Assocs., Cambridge, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
A.R.F. Products, Inc., Boulder, Colo.
Bailey Meter Co., Wickliffe, Ohio
BECO, Inc., Salem, Va.
Bicron Elctrns. Co., Canaan, Conn.
Bowmar/ALI, Inc., Acton, Mass.
CELCO, Mahwah, N.J.
Chronetics, Inc., Mt. Vernon, N.Y.
Comaltest, Danbury, Conn.
Computer Diode, Fair Lawn, N.J.
EI Instruments, Derby, Conn.
Electro-Optical Inds., Inc., Santa Barbara, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Esterline Angus Div., Indianapolis, Ind.
Exact Elctrns., Inc., Hillsboro, Ore.
Feedback, Inc., Berkeley Hghts., N.J.
General Computers, Inc., Los Angeles, Calif.
Heath Co., Benton Harbor, Mich.
Hybrid Sys. Corp., Burlington, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Leader Instruments Corp., Long Island City, N.Y.
Magnetic Elctrns., Van Nuys, Cal.
Monitor Systems, Ft. Washington, Pa
Norden Div., Norwalk, Conn.
Perkin-Elmer Corp., Electronic Prods. Dept., Norwalk, Conn.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Systron Donner Trygon Elctrns. Sub., Westbury, N.Y.
Teledyne Philbrick, Dedham, Mass.
Telonic Inds., Inc., Laguna Beach, Calif.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Texas Instruments, Dallas, Tex.
Transicoil, Inc., Worcester, Pa.
Tucker Electronics Co., Garland, Tex.
Universal Elctrns. Co., Irvine, Cal.

Generators, Hall

American Aerospace Controls Inc., Farmingdale, N.Y. ..... Vol 2•332
Ohio Semitronics, Columbus, Ohio Vol 2•1179
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Sprague Elec. Co., No. Adams, Mass.

Generators, Harmonic

Varian, Solid State West Division, Palo Alto, Cal. ..... Vol 4•440*
Calvert Elctrns., Inc., New York, N.Y.
CML-Macarr, Inc., Edison, N.J.
Electro/Data, Inc., Garland, Tex.
Ind'l. Test Equip., Clifton, NJ
Ryka Scientific, Inc., Sunnyvale, Cal.
Trak Microwave, Tampa, Fla.

Generators, Impulse

Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.

Generators, Infrared—See Lamps, Infrared

Generators, Low-Frequency

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Wavetek, San Diego, Cal. ..... Vol 1•531
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Accutronics, Geneva, Ill.

Advanced Energy Conversion, Belmont, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
American Elctrns., Inc., Fullerton, Cal.
American Time Products, Woodside, N.Y.
AUL Instrs., Inc., Flushng, N.Y.
Behlman Div., California Instrs., San Diego, Cal
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
California Instrs. Co., San Diego, Cal.
CCA Elctrns. Corp., Gloucester, N.J.
CML-Macarr, Inc., Edison, N.J.
Digiac Corp., Plainview, N.Y.
Electric Indicator Co., Inc., Norwalk, Conn.
Elgenco, Inc., Santa Monica, Cal.
Exact Elctrns., Inc., Hillsboro, Ore.
Feedback, Inc., Berkeley Hghts., N.J.
Fork Standards, W. Chicago, Ill.
Frequency Elctrns., New Hyde Pk., N.Y.
Georator Corporation, Manassas, Va.
Hope Elctrns., Clifton, N.J.
Interstate Elctrns. Corp., Anaheim, Cal.
Kato Engrg. Co., Mankato, Minn.
Kay Elemetrics, Pine Brook, N.J.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Krohn-Hite, Cambridge, Mass.
Leader Instruments Corp., Long Island City, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Logimetrics, Inc., Greenvale, N.Y.
Meloy Laboratories Inc., Springfield, Va.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
NH Research, Inc., Santa Ana, Calif.
Optimation, Inc., Chatsworth, Cal.
Riverbank Labs., Geneva, Ill.
Rockland Sys. Corp., W. Nyack, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Spectrum Technology, Goleta, Cal.
Systron-Donner Datapulse Div., Culver City, Cal.
T-F Electronics, Inc., Austin, Tex.
Tektronix, Inc., Beaverton, Ore.
Texscan Corp., Indianapolis, Ind.
Wiltron Co., Palo Alto, Calif.

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Ballantine Laboratories, Inc., Boonton,, N. J.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Dynascan Corp., Chicago, Ill.
Electro/Data, Inc., Garland, Tex.
Fork Standards, W. Chicago, Ill.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Jerrold Electronics Corp., Philadelphia, Pa.
Leader Instruments Corp., Long Island City, N.Y.
Meloy Laboratories Inc., Springfield, Va.
Microwave/Sys., Inc., E. Syracuse, N.Y.
PPM, Inc., Bedford, Ohio
RCA Elctrns. Comps., Harrison, N.J.
Regency Elctrns., Inc., Indianapolis, Ind.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Tektronix, Inc., Beaverton, Ore.
Wiltron Co., Palo Alto, Calif.

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AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
Aircom, Inc., Union, N.H.
Amperex Electronic Corp., Hicksville, N.Y.
AUL Instrs., Inc., Flushng, N.Y.
Cober Elctrns., Inc., Stamford, Conn.
Collins Radio Co., Dallas, Tex.
E-H Resch. Labs., Inc., Oakland, Cal.
Energy Systems, Palo Alto, Cal.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Greenray Inds., Inc., Mechanicsburg, Pa.
Hope Elctrns., Clifton, N.J.
Litton Inds., San Carlos, Calif.
Marconi Instrs., Englewood, N.J.
Micro-Now Instr., Chicago, Ill.
Micro-Tel Corp., Baltimore, Md.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Raytheon Co., Waltham, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Signalite, Neptune, N.J.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Corp., Concord, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Eastern Tube Div., Beverly, Mass.
Varian, Beverly, Mass.
VTM Microwaves, Inc., Boulder, Colo.
Watkins Johnson Co., Palo Alto, Cal.
Wavetek Indiana, Inc., Beech Grove, Ind.
Wiltron Co., Palo Alto, Calif.

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AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Allison Labs., Inc., Austin, Tex.
B & K Instrs., Inc., Cleveland, Ohio
Baganoff Assocs., Inc., St. Louis, Mo.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Berkeley Nucleonics Corp., Berkeley, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Computer Diode, Fair Lawn, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
International Data Sciences, Providence, R.I.
Kay Elemetrics, Pine Brook, N.J.
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Buckeye Stamping Co., Columbus, Ohio
Calabro Unitrack, Upper Darby, Pa.
Circuit Structures Lab., Burbank, Calif.
D-Cemco, Inc., Burbank, Calif.
Douglas Electronics, Inc., San Leandro, Cal.
Elco, Willow Grove, Pa.
Gibson/Egan Co., Arcadia, Calif.
Int'l. Elctrn. Resch., Burbank, Cal.
Methode Elctrns., Inc., Chicago, Ill.
National Metal Crafters Inc., Phila., Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Premier Metal Prods. Co., Bronx, N.Y.
Thermalloy Co., Inc., Dallas, Tex.
Titchener, E.H. & Co., Binghamton, N.Y.
Vero Electronics, Inc., Hauppauge, N.Y.

Guns, Electron Beam (For Vacuum Equip.)

Deltaray Corp., Woburn, Mass.
Materials Resch. Corp., Orangeburg, N.Y.
Maxwell Labs., Inc., San Diego, Calif.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
Sloan Technology Corp., Santa Barbara, Calif.
Union Carbide, Linde Div., New York, N. Y.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

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Bendix Aerospace-Elctrns., Teterboro, N.J.
Clary Corp., San Gabriel, Calif.
Condor Pacific Inds. Calif., Canoga Park, Cal.
Conrac Corp., Duarte, Cal.
Delco Elctrns. Div., Kokomo, Ind.
Electronic Specialty Div., Portland, Ore
Gyrosystems, Inc., Farmingdale, N.Y.
Honeywell, Minneapolis, Minn.
Humphrey, Inc., San Diego, Calif.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Singer Co., Little Falls, N.J.
Systron-Donner Inertial Division, Concord, Cal.

Hall Effect Devices—See Generators, Hall; Magnetoresistors,Hall; Multipliers, Hall; Probes, Hall

Handles For Cabinets, Circuit Boards, Racks, etc.

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Concord Elctrns., New York, N.Y. Vol 3•655
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Adams Rite Mfg. Co., Glendale, Calif.
Barnes Engrg. Co., Santa Ana, Calif.
Birnbach Co., Inc., Freeport, N.Y.
Bivar, Inc., Santa Ana, Cal.
Bud Radio, Willoughby, Ohio
Cambridge Thermionic, Cambridge, Mass
CGS Units, Inc., Rochester, N.Y.
Control Inds. Inc., Inwood, N.Y.
D-Cemco, Inc., Burbank, Calif.
Davies, Harry Molding Co., Chicago, Ill.
Deutsch Fastener Corp., Los Angeles, Cal.
Electronic Hardware Corp., Jamaica, N.Y.
Elctrn. Molding Corp., Woonsocket, R.I.
General Mfg. Co., Glendale, Calif.
Globe Plastics, Pomona, Cal.
Goe Engrg. Co., City of Industry, Calif.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hartwell Corp., Los Angeles, Calif.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Mobil Elctrns., Inc., Anderson, Ind.
Optima Enclosures, Tucker, Ga.
Paul, F.H. & Stein Bros., New York, N.Y.
PIC Design Division, Ridgefield,, Conn.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Positronic Inds., Springfield, Mo.
Premier Metal Prods. Co., Bronx, N.Y.
Sterling Instr., New Hyde Pk., NY
TA Mfg. Corp., Los Angeles, Cal.
Useco Div., Van Nuys, Cal.
Vemaline Prods. Co., Wyckoff, N.J.
Vent-Rak, Indianapolis, Ind.
Vero Electronics, Inc., Hauppauge, N.Y.
Zero Mfg. Co., Burbank, Cal.

Handsets, Chestsets, Headphones, Headsets, Etc.

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AKG, New York, N.Y.
Cannon, C.F. Co., Springwater, N.Y.
Electro-Voice, Inc., Buchanan, Mich.
GTE Automatic Elec., Northlake, Ill.
Knowles Elctrns., Inc., Franklin Park, Ill.
Saxton Prods., Congers, N.Y.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.
Stanton Magnetics, Inc., Plainview, N.Y.
Telex Comm. Div., Minneapolis, Minn.

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Harmonic Analyzers—See Analyzers, Harmonic

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American Lava Corp., Chattanooga, Tenn.
Amphenol Ind'l. Div., Chicago, Ill.
Basic Ceramics Inc., Hawthorne, N.J.
Berg Electronics, New Cumberland, Pa.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Eimac, San Carlos, Calif.
Electrical Inds., Murray Hill, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
Flex-Link Products, Inc., San Fernando, Cal.
Grayhill Inc., LaGrange, Ill.
Grayhill Moldtronics, Inc., Downers Grove, Ill.
GTE Sylvania Inc., Warren, Pa.
GTI Corp. (E), Pittsburgh, Pa.
Hermetic Seal Corp., Rosemead, Cal.
Keystone Elctrns. Corp., New York, N.Y.
Raytheon Co., Quincy, Mass.
Tekform Prods. Co., Anaheim, Cal.
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Basic Ceramics Inc., Hawthorne, N.J.
Croven, Ltd., Whitby, Ont., Can.
Eimac, San Carlos, Calif.
Electrical Inds., Murray Hill, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
Flex-Link Products, Inc., San Fernando, Cal.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
Grayhill Moldtronics, Inc., Downers Grove, Ill.
GTE Sylvania Inc., Warren, Pa.
GTI Corp. (E), Pittsburgh, Pa.
Hermetic Seal Corp., Rosemead, Cal.
Keystone Elctrns. Corp., New York, N.Y.
National Beryllia Corp., Haskell, N.J.
Norelcom Inds., Inc., Farmingdale, N.Y.
Raytheon Co., Quincy, Mass.
Tekform Prods. Co., Anaheim, Cal.

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Ampex Corp., Redwood City, Calif.
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y.
Nortronics, Mpls., Minn.
Primo Company Ltd., Tokyo, Japan
Saki Magnetics Inc., Santa Monica, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Western Magnetics, Inc., Glendale, Cal.

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Applied Magnetics Corp., Goleta, Calif.
Ceramic Magnetics, Inc., Fairfield, N.J.
Cole Instrument Corp., Costa Mesa, Cal.
Ferroxcube Corp., Saugerties, N.Y.
General Instr. Corp., Hawthorne, Cal.
Gould, Inc., Cleveland, Ohio
Kenton Engrg. Corp., Skokie, Ill.
Mitsumi Elec. Co., Ltd., Kitatamagun, Tokyo, Japan
Norton Assocs., Inc., Copiague, N.Y.
Nortronics, Mpls., Minn.
Saki Magnetics Inc., Santa Monica, Cal.
Western Magnetics, Inc., Glendale, Cal.

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Applied Magnetics Corp., Goleta, Calif.
Ferroxcube Corp., Saugerties, N.Y.
General Instr. Corp., Hawthorne, Cal.
Gould, Inc., Cleveland, Ohio
Norton Assocs., Inc., Copiague, N.Y.

Nortronics, Mpls., Minn.
RCA Corp., Camden, N.J.
Saki Magnetics Inc., Santa Monica, Cal.
Video Research Corp., Gaithersburg, Md.

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Amphenol Cadre Div., Endicott, N.Y. Vol 3•1040-1043
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Bemco, Inc., Pacoima, Cal.
Bird Elctrn., Cleveland, Ohio
Chem Aero, Inc., Wilmington, Cal.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
E-Tronics, Sepulveda, Cal.
Eastern Industries, Hamden, Conn.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Eimac, San Carlos, Calif.
Int'l. Elctrn. Resch., Burbank, Cal.
International Rectifier, El Segundo, Cal.
Janitrol Aero Div., Columbus, Ohio
Johnson Corp., Three Rivers, Mich.
Lear Siegler, Inc., Elyria, Ohio
Master Appliance Corp., Racine, Wisc.
Santa Barbara Resch. Ctr., Goleta, Calif.
Standard Environmental Systems, Inc., Totowa, N.J.
Technipower Inc., Ridgefield, Conn.
Temptronix Inc., Newton, Mass.
Thermalloy Co., Inc., Dallas, Tex.
Triac Elctrn. Sys., Forest Hills, N. Y.
Union Carbide, Carbon Prods. Div., New York, N.Y.
Wakefield Engrg., Inc., Components Div., Wakefield, Mass.

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American Elec. Heater, Detroit, Mich.
Birnbach Co., Inc., Freeport, N.Y.
Burlington Opers. Div., Burlington, Mass.
Caig Labs., Inc., Westbury, N.Y.
Chemplast, Inc., Wayne, N.J.
Clements Mfg. Co., Chicago, Ill.
Cole-Flex Corp., W. Babylon, N.Y.
Commercial Elec. Heating Devices & Mfg., Inc., Monterey Park, Cal.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Henes Mfg. Co., Phoenix, Ariz.
Ico/Rally, Palo Alto, Cal.
Ideal Industries, Inc., Sycamore, Ill.
ITT Holub Inds., Sycamore, Ill.
Jonard Inds. Corp., Bronx, N.Y.
MacDonald & Co., Glendale, Calif.
Norelcom Inds., Inc., Farmingdale, N.Y.
Russell Inds., Inc., Lynbrook, N.Y.
Sara Scientific Co., San Francisco, Calif.
Sigma Sys. Corp., San Diego, Calif.
Techni-Tool, Inc., Philadelphia, Pa.
Thomas & Betts Co., Elizabeth, N.J.
UNGAR, Compton, Calif.

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Augat Inc., Attleboro, Mass.
Avtron Mfg., Inc., Cleveland, Ohio
Calabro Unitrack, Upper Darby, Pa.
Channellock, Inc., Meadville, Pa.
Clauss Cutlery Co., Fremont, Ohio
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
E-Tronics, Sepulveda, Cal.
Engineering & Elctrn. Devices, Inc., Los Angeles, Calif.
Fansteel Inc., N Chicago, Ill.
GC Electronics, Rockford, Ill.
Hunter Tools, El Monte, Calif
Jonard Inds. Corp., Bronx, N.Y.
MacDonald & Co., Glendale, Calif.
Norelcom Inds., Inc., Farmingdale, N.Y.
Smith, Herman H., Inc., Bklyn., N.Y.
South Shore Metal Prods., Inc., Farmingdale, N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Tempil Div., So. Plainfield, N.J.
Wakefield Engrg., Inc., Components Div., Wakefield, Mass.
Xcelite, Inc., Orchard Park, N.Y.

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NL Inds., Inc., Hightstown, N.J. Vol 2•1171
Advanced Energy Conversion, Belmont, Cal.
Ajax Magnethermic Corp., Warren, Ohio
Chemical Etching Equip. & Supply, Alexandria, Va.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Cycle-Dyne, Inc., Jamaica, N.Y.
General Electric, Shelbyville, Ind.
Lepel High Frequency Labs., Maspeth, N.Y.
Master Appliance Corp., Racine, Wisc.
Miller, L.C. Co., Monterey Park, Calif.
Taylor-Winfield Corp., Warren, Ohio
Watlow Elec. Mfg. Co., St. Louis, Mo.
Westinghouse Elec., Sykesville, Md.

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Cox & Co., Inc., New York, N.Y. Vol 2•1160
Armstrong Cork Co., Lancaster, Pa.
Chemical Etching Equip. & Supply, Alexandria, Va.
Elctrn. Enterprises, Newark, N.J.
General Electric, Shelbyville, Ind.
Murata Mfg. Co. Ltd., Kyoto, Japan
OAL Assocs., Inc., Westbury, N.Y.
Oven Industries, Inc., Mechanicsburg, Pa.
Signet Scientific Co., Burbank, Cal.
Sta-Warm Elec. Co., Ravenna, Ohio
Therm-O-Lab Corp., N. Hollywood, Calif.
Watlow Elec. Mfg. Co., St. Louis, Mo.
Wireflex Inc., Calumet City, Ill.

Heaters, Infrared (Production)

Armstrong Cork Co., Lancaster, Pa.
Caig Labs., Inc., Westbury, N.Y.
Casso-Solar Inc., Kew Gardens, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
General Electric, Shelbyville, Ind.
OAL Assocs., Inc., Westbury, N.Y.
Research, Inc., Minneapolis, Minn.
Watlow Elec. Mfg. Co., St. Louis, Mo.

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Ark-Les Switch Corp., Watertown, Mass.
IPT Corp., Sunnyvale, Cal.
K-Tech., Inc., Framingham, Mass.
Pylon Co., Inc., Attleboro, Mass.
Robinson-Nugent, New Albany, Ind.
Thermalloy Co., Inc., Dallas, Tex.
Zippertubing Co., Los Angeles, Calif.

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Accurate Elctrns. Corp., Elyria, Ohio
Acme Model Engrg. Co., Ridgefield, N.J.
Amphenol Ind'l. Div., Chicago, Ill.
Ark-Les Switch Corp., Watertown, Mass.
Augat Inc., Attleboro, Mass.
Bivar, Inc., Santa Ana, Cal.
Centralab Elctrns Div., Milwaukee, Wisc
Gibson/Egan Co., Arcadia, Calif.
GTE.Sylvania Inc., Warren, Pa.
GTI Corp. (E), Pittsburgh, Pa.
IPT Corp., Sunnyvale, Cal.
Jettron Prods., Hanover, N.J.
Jonard Inds. Corp., Bronx, N.Y.
K-Tech., Inc., Framingham, Mass.
Metropolitan Wire Goods, Wilkes-Barre, Pa.
Pylon Co., Inc., Attleboro, Mass.
Sealectro Corp., Mamaroneck, N.Y.
Spec Plastics Inc., No. Hollywood, Cal.
Textool Prods., Inc., Irving, Tex.
Vector Elctrn. Co., Inc., Sylmar, Cal.

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Calabro Unitrack, Upper Darby, Pa.
Chemical Etching Equip. & Supply, Alexandria, Va.
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Electrovert, Mt. Vernon, N.Y.
Engineering & Elctrn. Devices, Inc., Los Angeles, Calif.
General Hardware Mfg. Co., New York, N.Y.
Gibson/Egan Co., Arcadia, Calif.
Jonard Inds. Corp., Bronx, N.Y.
K-Tech., Inc., Framingham, Mass.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Matrix Engineering Corp., Gardena, Calif.
Metropolitan Wire Goods, Wilkes-Barre, Pa.
Modpak, Waltham, Mass.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Premier Metal Prods. Co., Bronx, N.Y.
Program Data Co., Carson, Cal.
Techni-Tool, Inc., Philadelphia, Pa.
Tech. Devices Co., Culver City, Calif.
Titchener, E.H. & Co., Binghamton, N.Y.
Vero Electronics, Inc., Hauppauge, N.Y.
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Augat Inc., Attleboro, Mass.
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GTE Sylvania Inc., Warren, Pa.
GTI Corp. (E), Pittsburgh, Pa.
Jettron Prods., Hanover, N.J.
Johnson E. F. Co., Waseca, Minn.
Keystone Elctrns. Corp., New York, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Methode Elctrns., Inc., Chicago, Ill.
Microphase Corp., Cos Cob, Conn.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Robinson-Nugent, New Albany, Ind.
Staver Co., Inc., Bay Shore, N.Y.
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American Lava Corp., Chattanooga, Tenn.
Cal-Metex Corp., Inglewood, Cal.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Laser Technology, Inc., N. Hollywood, Calif.
LectroMagnetics, Inc., Los Angeles, Cal.
McLean Engrg. Labs., Princeton Jctn., N.J.
Metex Corp., Edison, N.J.
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Triac Elctrn. Sys., Forest Hills, N. Y.
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CES Elctrns., Brooklyn, N.Y.
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Frequency Engrg. Labs., Farmingdale, N.J.
Gabriel Elctrns. Inc., Scarborough, Me.
General Microwave Corp., Farmingdale, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Micrite Metal Mfg., Inc., Canoga Park, Cal.
Microlab/FXR, Livingston, N.J.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Nurad, Inc., Baltimore, Md.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Systron-Donner Microwave Div., Van Nuys, Cal.
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Anaren Microwave, Inc., Syracuse, N.Y.
Anzac Elctrns., Waltham, Mass.
Arra Inc., Bay Shore, N.Y.
CES Elctrns., Brooklyn, N.Y.
Engelmann Microwave, Montville, N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
Premier Microwave, Port Chester, N.Y.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Systron-Donner Microwave Div., Van Nuys, Cal.
Technical Research & Mfg. Co., Manchester, N.H.
Transco Prods., Inc., Venice, Cal.
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Channel Inds., Santa Barbara, Cal.
Chesapeake Instr. Corp., Shadyside, Md.
Edo Western Corp., Salt Lake City, Utah
Erie Technological Prods. (EEM), Erie, Pa.
Geo Space, Houston, Tex.
Honeywell, Minneapolis, Minn.
Linden Labs., Inc., State College, Pa.
NUSonics, Inc., Paramus, N.J.

Hysteresisgraphs

LDJ Electronics, Troy, Mich.
Thomas & Skinner, Inc., Indianapolis, Ind.
O. S. Walker Co., Worcester, Mass.

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Aircom, Inc., Union, N.H.
Alford Mfg. Co., Winchester, Mass.
Elcom Sys., Deer Pk., N.Y.
Greenray Inds., Inc., Mechanicsburg, Pa.
Lorch Elctrns. Corp., Englewood, N.J.
MCL, Inc., La Grange, Ill.
Technical Research & Mfg. Co., Manchester, N.H.
Telonic Inds., Inc., Laguna Beach, Calif.
Wavetek Indiana, Inc., Beech Grove, Ind.

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Cole Instrument Corp., Costa Mesa, Cal.
Dialight Corp., Brooklyn, N.Y.
Lear Siegler, Grand Rapids, Mich.
Machine Components Corp., Plainview, N.Y.
Sealectro Corp., Mamaroneck, N.Y.
Stacoswitch, Inc., Costa Mesa, Cal.
Superior Elec., Bristol, Conn.

Indexing Heads, Rotary

Kahle Engrg. Co., Union City, N.J.
Opto-Metric Tools, Rockleigh, N.J.

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Ametek/Instrs. & Controls, Feasterville, Pa.
Baldwin Elctrns., Little Rock, Ark.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Clifton Precision, Clifton Hgts., Pa.
Climatronics Corp., Hauppauge, N.Y.
Computer Instrs., Hempstead, N.Y.
Conrac Corp., Duarte, Cal.
Data Technology Inc., Watertown, Mass.
Del Electronics Corp., Mt. Vernon, N.Y.
Disc Instruments, Inc., Costa Mesa, Ca.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electric Tachometer Corp., Philadelphia, Pa.
H H Controls Co., Inc., Arlington, Mass.
Humphrey, Inc., San Diego, Calif.
IMC Magnetics Corp., Maywood, Cal.
Ind'l. Control Co., Farmingdale, N.Y.
Innovatek Enterprise, Millerton, N.Y.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Metric Sys., Ft. Walton Beach, Fla.
Norden Div., Norwalk, Conn.
Northern Precision Labs., Inc., Fairfield, N.J.
Orbit Instr. Corp., Syosset, N.Y.
Planet Instr., Gardena, Cal.
Sensor Corp., Scottsdale, Pa.
Singer Co., Little Falls, N.J.
Speed Detectors, Bedford, Ohio
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transicoil, Inc., Worcester, Pa.
Transmagnetics Inc., Farmingdale, N. Y.
Veeder-Root, Hartford, Conn.
Vernitech, Deer Pk., N.Y.
West Coast Resch. Corp., Los Angeles, Calif.

Indicators, Annunciator—See Annunciators

Indicators, Antenna Position

Geo Space Sys., Tampa, Fla. .. Vol 1•550
Astrosystems, Inc., Lake Success, N.Y.
C & A Products, Inc., Woodside, N. Y.
Clifton Precision, Clifton Hgts., Pa.
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., East Northport, N.Y.
Control Data Corp., Minneapolis, Minn.
Control Technology Co., L.I.C., N.Y.
Cornell-Dubilier Elctrns., Newark, N.J.
Data Technology Inc., Watertown, Mass.
Datex Div., Duarte, Cal.
Datron Systems, Chatsworth, Cal.
Disc Instruments, Inc., Costa Mesa, Ca.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Gap Instr. Corp., Hauppauge, N.Y.
ILC Data Device Corp., Hicksville, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Metric Sys., Ft. Walton Beach, Fla.
Natel Engrg. Co., Canoga Pk., Cal.
North Atlantic Inds., Plainview, N.Y.
Northern Precision Labs., Inc., Fairfield, N.J.
Orbit Instr. Corp., Syosset, N.Y.
Republic Advanced System Technology Group, Chatsworth, Calif.
Scientific-Atlanta, Inc., Atlanta, Ga.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transicoil, Inc., Worcester, Pa.
Transmagnetics Inc., Farmingdale, N. Y.
Tri-Ex Tower Corp., Visalia, Calif.
Veeder-Root, Hartford, Conn.
Vernitech, Deer Pk., N.Y.
West Coast Resch. Corp., Los Angeles, Calif.

Indicators, Azimuth

Alco Elctrn. Prods., North Andover, Mass. ..... Vol 2•460
Astrosystems, Inc., Lake Success, N.Y. Vol 1•327
Control Technology Co., L.I.C., N.Y. Vol 2•987
Geo Space Sys., Tampa, Fla. .. Vol 1•550
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp., Ft. Lauderdale, Fla.
C & A Products, Inc., Woodside, N. Y.
Clifton Precision, Clifton Hgts., Pa.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., East Northport, N.Y.
Data Technology Inc., Watertown, Mass.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Gap Instr. Corp., Hauppauge, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Humphrey, Inc., San Diego, Calif.
Ind'l. Control Co., Farmingdale, N.Y.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Metric Sys., Ft. Walton Beach, Fla.
Natel Engrg. Co., Canoga Pk., Cal.
North Atlantic Inds., Plainview, N.Y.
Northern Precision Labs., Inc., Fairfield, N.J.
Orbit Instr. Corp., Syosset, N.Y.
Republic Advanced System Technology Group, Chatsworth, Calif.
Scientific-Atlanta, Inc., Atlanta, Ga.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transicoil, Inc., Worcester, Pa.
Transmagnetics Inc., Farmingdale, N. Y.
Veeder-Root, Hartford, Conn.
Vernitech, Deer Pk., N.Y.
Waldom Elctrns., Inc., Chicago, Ill.

Indicators, Capacitor Leakage—See Testers, Capacitor

Indicators, Circuit Condition, On, Off etc. (Electro-Mechanical)-Also see Indicators, Instrument

Allard Instr. Corp., Westbury, NY Vol 2•461
Bussmann Mfg. Div., St. Louis, Mo. Vol 2•1008,1011
Daco Instr. Co., Milford, Conn. Vol 2•478
Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
General Elec. Co., Elctrn. Comps. Sis. Dept., Schenectady, N.Y. ..... Vol 2•491
North American Philips Controls Corp., Cheshire, Conn. ..... Vol 2•357
Wagner Elec. Corp., Livingston, N.J. Vol 2•540,541
Applied Control Co., Fairfield, N.J.
A P Products, Inc., Painesville, Ohio
Artisan Elctrns. Corp., Parsippany, N.J.
Automation Services Div., Windsor, N. Y.
Clare-Pendar Co., Post Falls, Idaho
Control Data Corp., Minneapolis, Minn.
Control Switch, Inc., Folcroft, Pa.
Coto-Coil Co., Inc., Providence, R.I.
Dataprobe, Inc., So. Hackensack, N.J.
Dialight Corp., Brooklyn, N.Y.
Drake Mfg., Harwood Hgts., Ill.
General Illumination, Inc., St. Paul, Minn.
Hickok Elect. Instr., Cleveland, Ohio
Honeywell, Mpls., Minn.
IMC Magnetics Corp., Maywood, Cal.
International Electro Exchange Corp., Eden Prairie, Minn.
Jay-El Prods., Gardena, Calif.
Landis & Gyr, Inc., Elmsford, N.Y.
Molex Inc., Lisle, Ill.
OPCOA, Inc., Edison, N.J.
Penn Keystone Corp., Ansonia, Conn.
Signalite, Neptune, N.J.
Simpson Elec. Co., Chicago, Ill.
Staver Co., Inc., Bay Shore, N.Y.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Unimax Switch Corp., Wallingford, Conn.

Indicators, Computer Type & Data Display—See Lights; Dials-Also See Readouts & Displays

Indicators, Distortion—See Analyzers, A-F

Indicators, Elapsed-Time

Curtis Instrs., Inc., Mt. Kisco, N.Y. Vol 1•418
Freed Transformer Co., Bklyn., N.Y. Vol 1•447
General Elec. Co., Elctrn. Comps. Sis. Dept., Schenectady, N.Y. ..... Vol 1•448
General Time Corp., Thomaston, Conn. Vol 2•345
Geo Space Sys., Tampa, Fla. .. Vol 1•343
J-B-T Instrs., Inc., New Haven, Conn. Vol 2•1083
Kessler-Ellis Prods., Atlantic Highlands, N.J. ..... Vol 2•349
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
North American Philips Controls Corp., Cheshire, Conn. ..... Vol 2•357
Plessey Electro-Products, Los Angeles, Cal. ..... Vol 2•360
Precision Timer Co., Westbrook, Conn. Vol 2•364
Simpson Elec. Co., Chicago, Ill. Vol 1•502
American Time Products, Woodside, N.Y.
Arnoux Corp., Santa Barbara, Cal
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Biddle, James G., Plymouth Meeting, Pa.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bristol Saybrook Co., Old Saybrook, Conn.
Bulova Watch Co., Flushing, N.Y.
Cramer Division, Old Saybrook, Conn.
Datatron, Inc., Santa Ana, Cal
Dynapar Corp., Gurnee, Ill.
Dytro Corp., Hicksville, N.Y.
Electric Tachometer Corp., Philadelphia, Pa.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
ENM Co., Chicago, Ill.
Epic, Inc., New York, N.Y.
ESE, Inglewood, Cal.
General Elec., W. Lynn, Mass.
Haydon Switch & Instr., Waterbury, Conn.
Ideal Precision Meter Co., Brooklyn, N.Y.
IEC Electronics Corp., E. Rochester, N.Y.
Jewell Electrical Instrs., Manchester, N.H.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Lear Siegler, Grand Rapids, Mich.
Mallory Timers, Indpls., Ind.
NES, Inc., Itasca, Ill.
Planet Instr., Gardena, Cal.
PPM, Inc., Bedford, Ohio

Raymond Controls Corp., Middletown, Conn.
Singer Co., Little Falls, N.J.
Sticht, Herman H. Co., Inc., New York, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Concord Instr. Div., Concord, Cal.
Veeder-Root, Hartford, Conn.

Indicators, Electromechanical
—See Indicators, Circuit Condition, On / Off

Indicators, Frequency—See Meters, Frequency

Indicators, Humidity & Moisture (Electronic)

American Instr. Co., Silver Spring, Md.
Clean Room Prods., Farmingdale, N.Y.
Consolidated Controls Corp., Bethel, Conn.
Doric Sci. Corp., San Diego, Calif.
Forma Scientific, Marietta, Ohio
Honeywell, Ft. Washington, Pa.
Inficon Inc., E. Syracuse, N.Y.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Lab-Line Instrs., Inc., Melrose Park, Ill.
NES, Inc., Itasca, Ill.
Panametrics Inc., Waltham, Mass.

Indicators, Illumination—See Meters, Light (Non Photographic)

Indicators, Instrument, Flag, Pointer, etc.

Allard Instr. Corp., Westbury, NY Vol 2•461
Daco Instr. Co., Milford, Conn. Vol 2•478
Abrams Instr., Lansing, Mich.
Ammon Instrs., Inc., Manchester, N.H.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp., Ft. Lauderdale, Fla.
Clifton Precision, Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Ideal Precision Meter Co., Brooklyn, N. Y.
IMC Magnetics Corp., Westbury, N.Y.
IMC Magnetics Corp., Rochester, N.H.
IMC Magnetics Corp., Maywood, Cal.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Grand Rapids, Mich.
Leeds & Northrup Corp., No. Wales, Pa.
Penn Keystone Corp., Ansonia, Conn.
Robertshaw Controls Co., Richmond, Va.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Suffolk Etched Prods., Inc., Riverhead, N.Y.
Transicoil, Inc., Worcester, Pa.

Indicators, Linear Displacement

Ametek/Instrs. & Controls, Feasterville, Pa.
Applied Control Co., Fairfield, N.J.
Astrosystems, Inc., Lake Success, N.Y.
Collins, G.L. Corp., Long Beach, Calif.
Computer Instrs., Hempstead, N.Y.
Consolidated Controls Corp., Bethel, Conn.
Control Technology Co., L.I.C., N.Y.
Davidson Elctrn. Dev. Co., Erie, Pa.
Disc Instruments, Inc., Costa Mesa, Ca.
Doric Sci. Corp., San Diego, Calif.
Dynamic Data Corp., Columbus, Ohio
Dynapar Corp., Gurnee, Ill.
Electro Corp., Sarasota, Fla.
Gems Sensors Div., Farmington, Conn.
Humphrey, Inc., San Diego, Calif.
Impact-O-Graph Corp., Bedford, Ohio
IMPACT-O-GRAPH Div., Bedford, Ohio
Itek Corp. Meas. Sys. Div., Newton, Mass.
Kaman Sciences Corp., Colorado Springs, Colo.
Larson Aero Dev., Concord, Calif.
Lion Precision Corp, Newton, Mass.
Mann, David W. Co., Burlington, Mass.
Minnetech Labs, Minneapolis, Minn.
Rank Precision Inds., Des Plaines, Ill.
Schaevitz Engrg., Pennsauken, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Scientific Technology, Mountain View, Cal.
Speed Detectors, Bedford, Ohio
Taylor Instr. Process Control Div., Rochester, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
Transmagnetics Inc., Farmingdale, N. Y.
Unholtz-Dickie Corp., Hamden, Conn.
United Detector Technology Inc., Santa Monica, Cal.
Veeder-Root, Hartford, Conn.
West Coast Resch. Corp., Los Angeles, Calif.
Westronics, Inc., Ft. Worth, Tex.

Indicators, Liquid Level

Advanced Kinetics, Costa Mesa, Calif.
Ametek/Instrs. & Controls, Feasterville, Pa.
Autocon Inds., Inc., Minneapolis, Minn.
Bailey Meter Co., Wickliffe, Ohio
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp., Davenport, Iowa
Bristol Div, Waterbury, Conn
Coil Co. of Amer., Northvale, N.J.
Conrac Corp., Fairfield, N.J.
Consolidated Controls Corp., Bethel, Conn.
Continental Data Sys., Dayton, Ohio
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Delavan Electronics, Scottsdale, Ariz.
Edison, Instr. Div., W. Orange, N.J.
Faria, Thomas G. Corp., Uncasville, Conn.
Fenwal Elctrns., Framingham, Mass.
Flow Technology, Inc., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
Gems Sensors Div., Farmington, Conn.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Johnson Corp., Three Rivers, Mich.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Keystone Carbon Co., St. Marys, Pa.
Kratos, Pasadena, Cal
Micro Switch, Freeport, Ill.
National Sonics, Farmingdale, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Oxford Instr. Corp., Annapolis, Md.
Penn Airborne Prods., Southampton, Pa.
P.E.T., Inc., Pittsburgh, Pa.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Robertshaw Controls Co., Richmond, Va.
Scientific Technology, Mountain View, Cal.
Square D Co., Park Ridge, Ill.
Statham Instrs., Inc., Oxnard, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Trans-Sonics, Inc., Lexington, Mass.
Transducer Controls Corp., Covina, Calif.
Triac Elctrn. Sys., Forest Hills, N. Y.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Weston Instruments, Inc., Newark, N.J.
Westronics, Inc., Ft. Worth, Tex.
Zi-Tech Div., Palo Alto, Cal.

Indicators, Magnetic Field

Perfection Mica Co., Bensenville, Ill. Vol 2•1189
Advanced Kinetics, Costa Mesa, Calif.
Automation Inds., Danbury, Conn.
Davidson Elctrn. Dev. Co., Erie, Pa.
Electro-Mechanics Co., Austin, Tex.
High Voltage Engrg. Corp., Burlington, Mass.
LDJ Electronics, Troy, Mich.
Magnaflux Corp., Chicago, Ill.
Ohio Semitronics, Columbus, Ohio
Oxford Instr. Corp., Annapolis, Md.
RFL Inds., Instr. Div., Boonton, N.J.
Thomas & Skinner, Inc., Indianapolis, Ind.
Varian Assocs., Palo Alto, Cal.
O. S. Walker Co., Worcester, Mass.

Indicators, Material Thickness
—See Testers, Thickness (All Types)

Indicators, Noise-Figure—See Meters, Noise-Figure

Indicators, Null

Biddle, James G., Plymouth Meeting, Pa. ..... Vol 1•399
Brown Electro-Meas. Corp., Kirkland, Wash. ..... Vol 1•398
Control Technology Co., L.I.C., N.Y. Vol 2•987
Freed Transformer Co., Bklyn., N.Y. Vol 1•445
Ammon Instrs., Inc., Manchester, N.H.
Beckman Instrs., (AISSD), Fullerton, Cal.
Bristol Div, Waterbury, Conn
Collins Radio Co., Dallas, Tex.
Dixson Inc., Meter Div., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dytronics Co., Columbus, Ohio
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Electro Sci. Inds., Portland, Ore.
Electronic Dev. Corp., Boston, Mass.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Geo Space Sys., Tampa, Fla.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Control Co., Farmingdale, N.Y.
Jewell Electrical Instrs., Manchester, N.H.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Leeds & Northrup Corp., No. Wales, Pa.
Mini-Circuits Lab., Brooklyn, N.Y.
Modutec, Inc., Norwalk, Conn.
Mura Corp., Jericho, N.Y.
North Atlantic Inds., Plainview, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Penn Airborne Prods., Southampton, Pa.
Princeton Applied Resch. Corp., Princeton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Shallcross, Selma, N.C.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Stock Drive Prods., New Hyde Pk., N.Y.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Theta Instr. Corp., Fairfield, N.J.
Trio Labs, Inc., Plainview, N.Y.
Triplett Corp., Bluffton, Ohio
United Detector Technology Inc., Santa Monica, Cal.
Weinschel Engrg. Co., Gaithersburg, Md.
Weston Instruments, Inc., Newark, N.J.
Westronics, Inc., Ft. Worth, Tex.
Zi-Tech Div., Palo Alto, Cal.

Indicators, Numeric Readout
—See Readouts

Indicators, Positioning

Astrosystems, Inc., Lake Success, N.Y. Vol 1•327
Austron, Inc., Austin, Tex. ..... Vol 1•391
Geo Space Sys., Tampa, Fla. .. Vol 1•550
Natel Engrg. Co., Canoga Pk., Cal. Vol 1•361
Servo-Tek Prods. Co., Hawthorne, N.J. Vol 2•661
Vernitech, Deer Pk., N.Y. ..... Vol 2•543
Vernitron Control Comps., Torrance, Cal. ..... Vol 2•992
Aerospace Knob Co., So. El Monte, Calif.
Ametek/Instrs. & Controls, Feasterville, Pa.
Avtron Mfg., Inc., Cleveland, Ohio
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barnes Engrg. Co., Stamford, Conn.
Bendix Aerospace-Elctrns., Teterboro, N.J.
C & A Products, Inc., Woodside, N. Y.
Clifton Precision, Clifton Hgts., Pa.
Climatronics Corp., Hauppauge, N.Y.
Computer Conversions Corp., East Northport, N.Y.
Computer Instrs., Hempstead, N.Y.
Control Sciences, Inc., Granada Hills, Cal.
Control Technology Co., L.I.C., N.Y.
Data Technology Inc., Watertown, Mass.
Datron Systems, Chatsworth, Cal.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dynamic Data Corp., Columbus, Ohio
Dynapar Corp., Gurnee, Ill.
Edo Western Corp., Salt Lake City, Utah
Electric Tachometer Corp., Philadelphia, Pa.
Electro-Numerics, Santa Clara, Cal.
Electro-Pacific, Inc., Goleta, Calif.
Farrand Controls, Inc., Valhalla, N.Y.
Gap Instr. Corp., Hauppauge, N.Y.
Gems Sensors Div., Farmington, Conn.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Humphrey, Inc., San Diego, Calif.
Icon Corp., Sub of U.S.M. Corp., Cambridge, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Jewell Electrical Instrs., Manchester, N.H.
Kaman Sciences Corp., Colorado Springs, Colo.
Midland Standard Inc., Elgin, Ill.
Minnetech Labs, Minneapolis, Minn.
National Sonics, Farmingdale, N.Y.
NES, Inc., Itasca, Ill.
Norden Div., Norwalk, Conn.
North Atlantic Inds., Plainview, N.Y.
Orbit Instr. Corp., Syosset, N.Y.
Parametrics, Inc., Orange, Conn.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Schaevitz Engrg., Pennsauken, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Scientific Technology, Mountain View, Cal.
Sensor Corp., Scottsdale, Pa.
Singer Co., Little Falls, N.J.
Skan-A-Matic Corp., Elbridge, N. Y.
Stake Fastener Co., S. El Monte, Calif.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
Transicoil, Inc., Worcester, Pa.
United Detector Technology Inc., Santa Monica, Cal.
Veeder-Root, Hartford, Conn.
West Coast Resch. Corp., Los Angeles, Calif.
Western Indicator Co., So. El Monte, Cal.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Westronics, Inc., Ft. Worth, Tex.

Indicators, Power Level—See Monitors, Power, R-F

Indicators, Pressure—See Gauges, Pressure

Indicators, Proximity

Advance Instr. Corp., Belmar, N. J.
Ametek/Instrs. & Controls, Feasterville, Pa.
Automation Services Div., Windsor, N. Y.
Collins Radio Co., Dallas, Tex.
Controlcraft Corp., West Chicago, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Delavan Electronics, Scottsdale, Ariz.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dynamic Data Corp., Columbus, Ohio
Electro Corp., Sarasota, Fla.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Fiber Photics, Inc., Santa Cruz, Cal.
Kaman Sciences Corp., Colorado Springs, Colo.
Larson Aero Dev., Concord, Calif.
Lion Precision Corp, Newton, Mass.
Photobell Co., Inc., New York, N.Y.
Robertshaw Controls Co., Richmond, Va.
Schaevitz Engrg., Pennsauken, N.J.
Scientific Technology, Mountain View, Cal.
Sensor Corp., Scottsdale, Pa.
Skan-A-Matic Corp., Elbridge, N. Y.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Triac Elctrn. Sys., Forest Hills, N. Y.

Indicators, R-F—See Meters, Frequency

Indicators, Rotary Shaft Position—See Encoders, Shaft Position

Indicators, Servo

Control Technology Co., L.I.C., N.Y. Vol 2•987
Ind'l. Control Co., Farmingdale, N.Y. Vol 2•989
ABA Industries, Inc., Pinellas Pk., Fla.
Astrosystems, Inc., Lake Success, N.Y.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp., Davenport, Iowa
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bristol Div, Waterbury, Conn
C & A Products, Inc., Woodside, N. Y.
Clifton Precision, Clifton Hgts., Pa.
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., East Northport, N.Y.
Control Data Corp., Minneapolis, Minn.
Datron Systems, Chatsworth, Cal.
Electro-Devices, Inc., Paterson, N.J.
Esterline Angus Div., Indianapolis, Ind.
Gap Instr. Corp., Hauppauge, N.Y.
Geo Space Sys., Tampa, Fla.
Henschel Corp., Amesbury, Mass.
Innovatek Enterprise, Millerton, N.Y.
Kollsman Instr. Co., Syosset, N.Y.
Kratos, Pasadena, Cal
Lear Siegler, Inc., Santa Monica, Calif.
MPC Prods. Corp., Chicago, Ill.
Norden Div., Norwalk, Conn.
North Atlantic Inds., Plainview, N.Y.
Northern Precision Labs., Inc., Fairfield, N.J.
Orbit Instr. Corp., Syosset, N.Y.
Penn Airborne Prods., Southampton, Pa.
Precision Mechanisms Corp., Westbury, N.Y.
Singer Co., Little Falls, N.J.
Sterling Instr., New Hyde Pk., NY
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transicoil, Inc., Worcester, Pa.
Vernitech, Deer Pk., N.Y.
Westronics, Inc., Ft. Worth, Tex.

Indicators, Shorted Turn—See Testers, Coil

Indicators, Sound Level—See Meters, Audio Level

Indicators, Speed

Servo-Tek Prods. Co., Hawthorne, N.J. Vol 2•661
Transmagnetics Inc., Farmingdale, N. Y.

Indicators, Strain (For Use With Strain Gauges)

Applied Control Co., Fairfield, N.J.
Astrosystems, Inc., Lake Success, N.Y.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bell & Howell Co., Pasadena, Calif.
BLH Elctrns., Inc., Waltham, Mass.
Bristol Div, Waterbury, Conn
Consolidated Controls Corp., Bethel, Conn.
Doric Sci. Corp., San Diego, Calif.
Electro-Numerics, Santa Clara, Cal.
Esterline Angus Div., Indianapolis, Ind.
Gap Instr. Corp., Hauppauge, N.Y.
Gould, Inc., Cleveland, Ohio
Hawkeye Instrus., Inc., Marion, Iowa
Innovatek Enterprise, Millerton, N.Y.
Ithaco, Inc., Ithaca, N.Y.
Matrix Corp., Beech Grove, Ind.
Orbit Instr. Corp., Syosset, N.Y.
PPM, Inc., Bedford, Ohio
Sensotec, Inc., Columbus, Ohio
Statham Instrs., Inc., Oxnard, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tektronix, Inc., Beaverton, Ore.
Thwing-Albert Instr. Co., Philadelphia, Pa.
Toledo Scale, Toledo, Ohio
Transducer Controls Corp., Covina, Calif.
West Coast Resch. Corp., Los Angeles, Calif.
Westronics, Inc., Ft. Worth, Tex.

Indicators, Surface Roughness

Sloan Technology Corp., Santa Barbara, Calif.

Indicators, Telemetering—See Analyzers, Telemetric Data

Indicators, Temperature—See Meters, Temperature

Indicators, Temperature (Non-Meter Type)

Omega Engrg., Inc., Stamford, Conn. Vol 2•1173
B & F Instrs., Inc., Cornwells Hgts., Pa.
Brady, W.H. Co., Milwaukee, Wisc.
Cox & Co., Inc., New York, N.Y.
Gould, Inc., Cleveland, Ohio
Hy-Cal Engrg., Santa Fe Springs, Cal.
Pacific Transducer Corp., Los Angeles, Calif.
Simpson Elec. Co., Chicago, Ill.
Stow Labs., Inc., Hudson, Mass.

Indicators, Torque

Electro-Numerics, Santa Clara, Cal.
Minnetech Labs, Minneapolis, Minn.
West Coast Resch. Corp., Los Angeles, Calif.

Indicators, Vacuum—See Gauges, Vacuum

Indicators, VSWR—See Meters, Standing Wave Ratio

Inductance Comparators—See Bridges, Inductance

Inductance Standards—See Standards, Inductance

Induction Heating Equipment—See Heaters & Accessories, Induction

Induction Potentiometers—See Resolvers, Synchro

Inductors—See Coils

Inks For Thick Film Microcircuits

Alpha Metals, Inc., Jersey City, N.J.
Electro-Science Labs., Pennsauken, N. J.
Epoxy Technology, Watertown, Mass.
Micro-Circuits Co., New Buffalo, Mich.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.

Inks, Marking

Ackerman Gould Co., Inc., Oceanside, N.Y.
Black Light Corp. Amer., San Gabriel, Cal.
Caig Labs., Inc., Westbury, N.Y.
Epoxy Technology, Watertown, Mass.
Esterline Angus Div., Indianapolis, Ind.
Foxboro Co., Foxboro, Mass.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
General Elec., W. Lynn, Mass.
GTI Corp. (E), Pittsburgh, Pa.
Koh-I-Noor Rapidograph, Bloomsbury, N.J.
Lake Chemical Co., Chicago, Ill.
London Chemical Co., Bensenville, Ill.
Markal Co., Chicago, Ill.
Markem Corp., Keene, N.H.
Matthews, Jas & Co., Pittsburgh, Pa.
Meloy Laboratories Inc., Springfield, Va.
Omega Engrg., Inc., Stamford, Conn.
Phillips Process Co., Inc., Rochester, N.Y.
Podgor, Joseph Co., Pennsauken, N.J.
Randolph Prods. Co., Carlstadt, N.J.
Raytheon Co., Quincy, Mass.
Shannon Luminous Mat'ls., Hollywood, Cal.
Sprayon Prods., Inc., Bedford Hgts., Ohio
Tempil Div., So. Plainfield, N.J.
3M Co., St. Paul, Minn.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Westinghouse Elec., Bloomfield, N. J.

Insertion Loss Measurement Systems

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alford Mfg. Co., Winchester, Mass.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Emerson & Cuming, Inc., Canton, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Jerrold Electronics Corp., Philadelphia, Pa.
Maury Microwave Corp., Cucamonga, Calif.
Narda Microwave Corp., Plainview, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Solar Elctrns. Co., Hollywood, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Vari-L Co., Inc., Denver, Colo.
Weinschel Engrg. Co., Gaithersburg, Md.
Wide Band Engrg. Co., Phoenix, Ariz.
Wiltron Co., Palo Alto, Calif.

Inserts—See Bushings

Instrument Cases—See Cabinets; Cases, Instrument

Instrument Parts, Precision—See Bearings; Gears; Springs; etc.

Instruments, Elect. Measuring—See Analyzers; Bridges; Comparators; Meters; etc.

Insulating Compounds

Brand Dielectrics, Inc., N. Windham, Conn.
Communications Technology Corp., Los Angeles, Cal.
Conap, Inc., Allegany, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dixon Corp., Bristol, R.I.
Eastman Chem. Prods., Kingsport, Tenn.
Epoxy Technology, Watertown, Mass.
General Elec. Co., Waterford, N.Y.
Hardman Inc., Belleville, N.J.
National Beryllia Corp., Haskell, N.J.
Pennsylvania Ind'l. Chem. Corp., Clairton, Pa.
SWS Silicones Div., Adrian, Mich.
3M Co., St. Paul, Minn.
Union Carbide, Chemicals & Plastics, New York, N.Y.
Westinghouse Elec., W. Mifflin, Pa.

Insulation Materials

American Lava Corp., Chattanooga, Tenn. Vol 3•1074
Centralab Elctrns Div., Milwaukee, Wisc Vol 3•1075
Columbia Tech., Woodside, N.Y. Vol 3•516,517,1076
Armstrong Cork Co., Lancaster, Pa.
Bird, Richard H. & Co., Inc., Waltham, Mass.
Brand Dielectrics, Inc., N. Windham, Conn.
Cleveland Mica Co., Lakewood, Ohio
Cole-Flex Corp., W. Babylon, N.Y.
Communications Technology Corp., Los Angeles, Cal.
Conap, Inc., Allegany, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dearborn Wire & Cable Co., Rosemont, Ill.
Dixon Corp., Bristol, R.I.
Dow Chemical Co., Midland, Mich.
Eastman Chem. Prods., Kingsport, Tenn.
Electro-Science Labs., Pennsauken, N. J.
General Elec. Co., Waterford, N.Y.
Hardman Inc., Belleville, N.J.
Laminated Fabricators, San Bruno, Calif.
Murata Mfg. Co. Ltd., Kyoto, Japan
National Beryllia Corp., Haskell, N.J.
National Tel-Tronics, Meadville, Pa.
NVF Co., Yorklyn, Del.
Penn Fibre & Specialty, Phila., Pa.
Perfection Mica Co., Bensenville, Ill.
Rogers Corp., Rogers, Conn.
Rostone Corp., Lafayette, Ind.
Schjeldahl, G.T. Co., Northfield, Minn.
Schweitzer, Peter J. Div., Lee, Mass.
Spaulding Fibre Co., Inc., Tonawanda, N.Y.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Transcon Mfg. Co., Dallas, Tex.
Union Carbide, Carbon Prods. Div., New York, N.Y.
Union Carbide, Chemicals & Plastics, New York, N.Y.
United Mineral & Chem. Corp., New York, N.Y.
Varflex Corp., Rome, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Westinghouse Elec., W. Mifflin, Pa.
Zippertubing Co., Los Angeles, Calif.

Insulation Parts, Fabricated

Centralab Elctrns Div., Milwaukee, Wisc Vol 3•1075
Columbia Tech., Woodside, N.Y. Vol 3•1076
Atlantic Optical Moulding Co., Dudley, Mass.
Brand Dielectrics, Inc., N. Windham, Conn.
Cleveland Mica Co., Lakewood, Ohio
Cole-Flex Corp., W. Babylon, N.Y.
Communications Technology Corp., Los Angeles, Cal.
Conap, Inc., Allegany, N.Y.
Concord Elctrns., New York, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dixon Corp., Bristol, R.I.
Grayhill Inc., LaGrange, Ill.
Laminated Fabricators, San Bruno, Calif.
National Beryllia Corp., Haskell, N.J.
National Tel-Tronics, Meadville, Pa.
NVF Co., Yorklyn, Del.
Penn Fibre & Specialty, Phila., Pa.
Perfection Mica Co., Bensenville, Ill.
Precision Paper Tube Co., Wheeling, Ill.
Quartzite Processing, Inc., Malden, Mass.
Rostone Corp., Lafayette, Ind.
Spaulding Fibre Co., Inc., Tonawanda, N.Y.
Star Porcelain Co., Trenton, N.J.
Stevens Prods., Inc., E. Orange, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
Thermalloy Co., Inc., Dallas, Tex.
3M Co., St. Paul, Minn.
Tran-Tec Corp., Columbus, Neb.
United Mineral & Chem. Corp., New York, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.

Insulators, Antenna

Accurate Elctrns. Corp., Elyria, Ohio
Alberox Corp., New Bedford, Mass.
American Lava Corp., Chattanooga, Tenn.
Basic Ceramics Inc., Hawthorne, N.J.
Birnbach Co., Inc., Freeport, N.Y.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Johnson E. F. Co., Waseca, Minn.
Lapp Insulator Div., Interpace Corp., LeRoy, N.Y.
Nat'l. Ceramic Co., Trenton, N.J.
Norelcom Inds., Inc., Farmingdale, N.Y.
Phelps Dodge Comm., North Haven, Conn.
Rohn Mfg., Peoria, Ill.
Star Porcelain Co., Trenton, N.J.
Synthane Taylor Corp., Valley Forge, Pa.

Insulators, Bushing (Metallized)—See Bushings

Insulators, Test & Battery Clip

Mueller Elec. Co., Cleveland, Ohio Vol 3•703
Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•795
Accurate Elctrns. Corp., Elyria, Ohio
Birnbach Co., Inc., Freeport, N.Y.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan

Integrated Circuit Packaging Systems

Elctrn. Molding Corp., Woonsocket, R.I. Vol 3•666
Robinson-Nugent, New Albany, Ind. Vol 4•376-380*
Scanbe Mfg. Corp., El Monte, Cal. Vol 3•772,773
Texas Instruments, Attleboro, Mass. Vol 3•925
Amphenol Ind'l. Div., Chicago, Ill.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Ark-Les Switch Corp., Watertown, Mass.
Augat Inc., Attleboro, Mass.
Berg Electronics, New Cumberland, Pa.
Bivar, Inc., Santa Ana, Cal.
Burndy Corp., Norwalk, Conn.
Christiansen Radio Inc., Laguna Beach, Cal.
Control Data, Westlake Village, Cal.
Coors Porcelain Co., Golden, Colo.
Digitronics Corp., Albertson, N.Y.
Douglas Electronics, Inc., San Leandro, Cal.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
GTI Corp. (E), Pittsburgh, Pa.
IFE Div., E. Providence, R. I.
Ind'l. Control Co., Farmingdale, N.Y.
Kates Scientific Instrs., Inc., Watertown, Mass.
Malco, A Microdot Co., Inc., Chicago, Ill.
Modpak, Waltham, Mass.
National Beryllia Corp., Haskell, N.J.
Schjeldahl, G.T. Co., Northfield, Minn.
Spec Plastics Inc., No. Hollywood, Cal.
Techmar Corp., Los Angeles, Cal.
Tekform Prods. Co., Anaheim, Cal.
Teledyne Mec., Palo Alto, Cal.
Texas Instruments, Attleboro, Mass.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Transcon Mfg. Co., Dallas, Tex.
Uthe Technology Int'l., Sunnyvale, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
Zippertubing Co., Los Angeles, Calif.

IC's, Active Filters

Beckman Instrs., Helipot Div., Fullerton, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cermetek, Inc., Mountain View, Cal.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Integrated Microsystems Inc., Mt. View, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Signetics. Corp., Sunnyvale, Calif.
Sprague Elec. Co., No. Adams, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Adders, Full, Half, Modulo-2-Also see IC's Arithmetic Logic Units

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Hughes Aircraft Co., MOS Dept. (E3/4) Microelectronic Prods. Div., Newport Beach, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
RCA Solid State Div., Somerville, N. J.
RCA Solid State Div., MOS IC Mktg., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Solitron Devices, San Diego, Cal.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Alterable Read-Only Memories—See IC's Memories

IC's, Amplifiers, Audio

Plessey Semiconductors, Farmingdale, N.Y. ..... Vol 2•600,601
Amperex Elctrn., Slatersville, R.I.
Elctrn. Assocs., W. Long Branch, N.J.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Micro Components Corp., Cranston, R.I.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Nucleonic Prods., Canoga Pk, Cal.
RCA Elctrns. Comps., Harrison, N.J.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Sprague Elec. Co., No. Adams, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Amplifiers, Current

RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. ..... Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. ..... Vol 4•436*

IC's, Amplifiers, Instrumentation

Burr-Brown Resch. Corp., Tucson, Ariz.
Elctrn. Assocs., W. Long Branch, N.J.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
Leeds & Northrup Corp., No. Wales, Pa.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductors, Lawndale, Cal.

IC's, Amplifiers, Logarithmic

Plessey Semiconductors, Farmingdale, N.Y. ..... Vol 2•600
Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Leeds & Northrup Corp., No. Wales, Pa.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
RHG Elctrns. Lab., Deer Park, N.Y.
Signetics. Corp., Sunnyvale, Calif.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Amplifiers, Operational

Hybrid Sys. Corp., Burlington, Mass. Vol 1•348
Lansdale Transistor & Elctrns., Inc., Lansdale, Pa. ..... Vol 2•907
Precision Monolithics Inc., Santa Clara, Cal. ..... Vol 4•435*
RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. ..... Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. ..... Vol 4•436*
Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
ILC Data Device Corp., Hicksville, N.Y.
Intronics, Inc., Newton, Mass.
Leeds & Northrup Corp., No. Wales, Pa.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Raytheon, Mt. View, Calif.
RCA Elctrns. Comps., Harrison, N.J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Amplifiers, Operational, Micropower

RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. ..... Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. ..... Vol 4•436*
Beckman Instrs., Helipot Div., Fullerton, Cal.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
Leeds & Northrup Corp., No. Wales, Pa.
Lithic Systems, Inc., Cupertino, Cal.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon, Mt. View, Calif.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Teledyne Semiconductor, Mountain View, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Amplifiers, Radio-Frequency

Plessey Semiconductors, Farmingdale, N.Y. ..... Vol 2•600
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Micro Components Corp., Cranston, R.I.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nucleonic Prods., Canoga Pk, Cal.
RCA Solid State Div., Somerville, N. J.
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J.
RHG Elctrns. Lab., Deer Park, N.Y.
Signetics. Corp., Sunnyvale, Calif.
Teledyne Philbrick, Dedham, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
TRW Semiconductors, Lawndale, Cal.

IC's, Amplifiers, Sample-And-Hold—See IC's Sample-And-Hold Circuits

IC's, Amplifiers, Sense-Also see IC's Comparators, Analog

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
ITT Semiconductors, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nucleonic Prods., Canoga Pk, Cal.
Raytheon, Mt. View, Calif.
RCA Elctrns. Comps., Harrison, N.J.
RCA Solid State Div., Somerville, N. J.
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, And Gates—See IC's Logic Circuits

IC's, And-Or-Invert Gates—See IC's Logic Circuits

IC's, Arithmetic Logic Units (ALU)-Also see IC's Adders

RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. ..... Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. ..... Vol 4•436*
Cal-Tex Semiconductor, Santa Clara, Cal.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Hughes Aircraft Co., MOS Dept. (E3/4) Microelectronic Prods. Div., Newport Beach, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Leeds & Northrup Corp., No. Wales, Pa.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Raytheon, Mt. View, Calif.
RCA Elctrns. Comps., Harrison, N.J.
Signetics. Corp., Sunnyvale, Calif.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Associative Memories—See IC's Memories

IC's, Asynchronous Counters—See IC's Counters

IC's, Bidirectional Counters—See IC's, Counters

IC's, Binary Counters—See IC's Counters

IC's, Bistable Multivibrators—See IC's Multivibrators

IC's, Breadboard Circuits

Christiansen Radio Inc., Laguna Beach, Cal. ..... Vol 2•323
EI Instruments, Derby, Conn.
Lithic Systems, Inc., Cupertino, Cal.
Mostek Corp., Carrollton, Tex.
National Semiconductor, Santa Clara, Cal.
Proto Matic Co., Cincinnati,, Ohio
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Solitron Devices, San Diego, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Buffers—See IC's Logic Circuits

IC's, Bus Drivers—See IC's Data Bus Drivers

IC's, Calculator Kits

Antex Inds., Inc., Palo Alto, Cal.
Cal-Tex Semiconductor, Santa Clara, Cal.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.

Hughes Aircraft Co., MOS Dept. (E3/4) Microelectronic Prods. Div., Newport Beach, Cal.
Intel Corp., Santa Clara, Cal.
Mostek Corp., Carrollton, Tex.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
RCA Solid State Div., Somerville, N. J.
Solitron Devices, San Diego, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Central Processing Units (CPU)

Intel Corp., Santa Clara, Cal.
Mostek Corp., Carrollton, Tex.
National Semiconductor, Santa Clara, Cal.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Solitron Devices, San Diego, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Character Generators, Dot-Matrix

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
Intel Corp., Santa Clara, Cal.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Precision Dynamics Corp., Burbank, Cal.
Signetics. Corp., Sunnyvale, Calif.
Solitron Devices, San Diego, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Chroma Amplifiers Demodulators, Signal Processors

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hughes Aircraft Co., MOS Dept. (E3/4) Microelectronic Prods. Div., Newport Beach, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Sprague Elec. Co., No. Adams, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Clock Drivers

Electronic Laboratory Supply, Philadelphia, Pa. ..... Vol 2•596
Monitor Prods., S. Pasadena, Cal. Vol 2•430,431
Spectrum Technology, Goleta, Cal. Vol 2•446,447
Amperex Elctrn., Slatersville, R.I.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Cermetek, Inc., Mountain View, Cal.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Hughes Aircraft Co., MOS Dept. (E3/4) Microelectronic Prods. Div., Newport Beach, Cal.
Integrated Microsystems Inc., Mt. View, Cal.
Intel Corp., Santa Clara, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Code Converters—See IC's Encoders and Decoders

IC's, Communications Circuits

Plessey Semiconductors, Farmingdale, N.Y. ..... Vol 2•600,601
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Integrated Microsystems Inc., Mt. View, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Micro Components Corp., Cranston, R.I.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Raytheon, Mt. View, Calif.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Sprague Elec. Co., No. Adams, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductors, Lawndale, Cal.

IC's, Comparators, Analog-Also see IC's Amplifiers Sense

Lansdale Transistor & Elctrns., Inc., Lansdale, Pa. ..... Vol 2•907
Precision Monolithics Inc., Santa Clara, Cal. ..... Vol 4•435*
Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Raytheon, Mt. View, Calif.
RCA Solid State Div., Somerville, N. J.
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Siliconix, Inc., Santa Clara, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Comparators, Digital

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Raytheon, Mt. View, Calif.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Sprague Elec. Co., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Content-Addressable Memories—See IC's Memories

IC's, Converters, Analog-To-Digital

Hybrid Sys. Corp., Burlington, Mass. Vol 1•346-348
Precision Monolithics Inc., Santa Clara, Cal. ..... Vol 4•435*
Beckman Instrs., Helipot Div., Fullerton, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
Hughes Aircraft Co., MOS Dept. (E3/4) Microelectronic Prods. Div., Newport Beach, Cal.
National Semiconductor, Santa Clara, Cal.
Ragen Precision Inds., Inc., N. Arlington, N.J.
RCA Solid State Div., Somerville, N. J.
Sprague Elec. Co., No. Adams, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Converters, —See IC's Encoders and Decoders

IC's, Converters, Digital-To-Analog

Burr-Brown Resch. Corp., Tucson, Ariz. Vol 1•328
Hybrid Sys. Corp., Burlington, Mass. Vol 1•346-348
Precision Monolithics Inc., Santa Clara, Cal. ..... Vol 4•435*
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Beckman Instrs., Helipot Div., Fullerton, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Harris Semiconductor, Melbourne, Fla.
Hughes Aircraft Co., MOS Dept. (E3/4) Microelectronic Prods. Div., Newport Beach, Cal.
ILC Data Device Corp., Hicksville, N.Y.
Micro Networks, Worcester, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Converters, Voltage-To-Frequency

Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Solitron Devices, San Diego, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Counters

RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. ..... Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. ..... Vol 4•436*
EI Instruments, Derby, Conn.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
Signetics. Corp., Sunnyvale, Calif.
Solid State Scientific, Montgomeryville, Pa.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Counter Adapters—See IC's Counters

IC's, Current Regulators

Beckman Instrs., Helipot Div., Fullerton, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Integrated Microsystems Inc., Mt. View, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Raytheon, Mt. View, Calif.
RCA Solid State Div., Somerville, N. J.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Data Bus Drivers

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Sprague Elec. Co., No. Adams, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, d-c Amplifiers

Beckman Instrs., Helipot Div., Fullerton, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Control Technology Co., L.I.C., N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Sprague Elec. Co., No. Adams, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Decade Counters—See IC's Counters

IC's, Decoders, Binary-To-Octal—See IC's Encoders and Decoders

IC's, Decoder/Drivers, Binary-Code-Decimal (BCD) to Decimal—See IC's Encoder and Decoders

IC's, Decoders, One-of-16—See IC's Encoders and Decoders

IC's, Decoders, Seven-Segment Displays—See IC's Encoders and Decoders

IC's, Demultiplexers—See IC's Multiplexers

IC's, Differential Amplifiers—See IC's Amplifiers, Operational

IC's, digital multiplexers—See IC's Multiplexers, Digital

IC's, Digital-To-Analog Converters—See IC's Converters, Digital-To-Analog

IC's, Diode Matrices

Beckman Instrs., Helipot Div., Fullerton, Cal.
Harris Semiconductor, Melbourne, Fla.
RCA Solid State Div., Somerville, N. J.
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J.
Solitron Devices, San Diego, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Discriminators, FM—See IC's Television, AM/FM Sound Circuits

IC's, Display Drivers, Seven-Segment, Nine-Segment Nixie, Etc.

Alco Elctrn. Prods., North Andover, Mass.
Antex Inds., Inc., Palo Alto, Cal.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
Hybrid Technology Corp., Arlington, Tex.
ILC Data Device Corp., Hicksville, N.Y.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
RCA Solid State Div., Somerville, N. J.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Signetics. Corp., Sunnyvale, Calif.
Solid State Scientific, Montgomeryville, Pa.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's Down Counters—See IC's Counters

IC's Encoders and Decoders

RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. Vol 4•436*
Solid State Scientific, Montgomeryville, Pa. Vol 2•606
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
Hughes Aircraft Co., MOS Dept. (E3/4) Microelectronic Prods. Div., Newport Beach, Cal.
Intel Corp., Santa Clara, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Signetics. Corp., Sunnyvale, Calif.
Solitron Devices, San Diego, Cal.
Sprague Elec. Co., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's Exclusive Or Gates—See IC's Logic Circuits

IC's Expanders—See IC's Logic Circuits

IC's Flip-Flops J-K, R-S, R-S-T, Type D, Pulse Triggered Etc.—See IC's Logic Circuit

IC's Four-Quadrant Multipliers —See IC's Multipliers Analog

IC's Frequency Dividers—See IC's Counters

IC's Frequency-Shift Keyers

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Integrated Microsystems Inc., Mt. View, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.

IC's, Frequency Synthesizers

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
ITT Semiconductors, W. Palm Beach, Fla.
Lithic Systems, Inc., Cupertino, Cal.
National Semiconductor, Santa Clara, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Solitron Devices, San Diego, Cal.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Function Generators

Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
ILC Data Device Corp., Hicksville, N.Y.
Lithic Systems, Inc., Cupertino, Cal.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Raytheon, Mt. View, Calif.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Gates—See IC's Logic Circuits

IC's, Hexadecimal Counters—See IC's Counters

IC's, Intermediate-Frequency Amplifiers—See IC's Amplifiers, Radio Frequency

IC's, Inverters—See IC's Logic Circuits

IC's, Keyboard Encoders—See Encoders and Decoders

IC's Lamp Drivers—See IC's Logic Circuits

IC's Latch—See IC's Logic Circuits

IC's, Level Shifters, Translators—See IC's Logic Circuits

IC's Line Driver/Receivers

Cermetek, Inc., Mountain View, Cal.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
ILC Data Device Corp., Hicksville, N.Y.
Integrated Microsystems Inc., Mt. View, Cal.
Intel Corp., Santa Clara, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Raytheon, Mt. View, Calif.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Siliconix, Inc., Santa Clara, Cal.
Sprague Elec. Co., No. Adams, Mass.
Texas Instruments, Dallas, Tex.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Line Driver/Transmitters —See IC's Line Driver/Receivers

IC's Linear Multipliers—See IC's Multipliers Analog

IC's Logic Circuits

Electronic Laboratory Supply, Philadelphia, Pa. Vol 2•596
Plessey Semiconductors, Farmingdale, N.Y. Vol 2•601-603
Solid State Scientific, Montgomeryville, Pa. Vol 2•606
EI Instruments, Derby, Conn.
ILC Data Device Corp., Hicksville, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Sprague Elec. Co., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Look-Up Sine, Cosine Table Memories—See IC's Memories

IC's, MOS Clock Drivers—See IC's Clock Drivers

IC's Memories

Electronic Laboratory Supply, Philadelphia, Pa. Vol 2•596
Plessey Semiconductors, Farmingdale, N.Y. Vol 2•604
RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. Vol 4•436*
Solid State Scientific, Montgomeryville, Pa. Vol 2•606
Advanced Memory Systems, Inc., Sunnyvale, Cal
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
Intel Corp., Santa Clara, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Texas Instruments, Dallas, Tex.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Micropower Operational Amplifiers—See IC's Amplifiers Operational, Micropower

IC's, Mixers—See IC's Communications Circuits

IC's, Modulator/Demodulators, Balanced

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Integrated Microsystems Inc., Mt. View, Cal.
Lithic Systems, Inc., Cupertino, Cal.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Multiplexers, Analog

Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
ITT Semiconductors, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
Ragen Precision Inds., Inc., N. Arlington, N.J.
RCA Solid State Div., MOS IC Mktg., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Siliconix, Inc., Santa Clara, Cal.
Solid State Scientific, Montgomeryville, Pa.
Solitron Devices, San Diego, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Multiplexers, Digital

RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. Vol 4•436*
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Multipliers, Analog

Hybrid Sys. Corp., Burlington, Mass. Vol 1•348
Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Intronics, Inc., Newton, Mass.
Leeds & Northrup Corp., No. Wales, Pa.
Lithic Systems, Inc., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Solid State Div., Somerville, N. J.
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Silicon Gen'l. Inc., Westminster, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Multivibrators

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Lithic Systems, Inc., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Raytheon, Mt. View, Calif.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, NAND Gates—See IC's Logic Circuits

IC's, NOR Gates—See IC's Logic Circuits

IC's, One-Shot Multivibrators —See IC's Multivibrators

IC's, Opto-Electronic Amplifiers

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
RCA Solid State Div., Somerville, N. J.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, OR/NOR Gates—See IC's Logic Circuits

IC's, Oscillators

Monitor Prods., S. Pasadena, Cal. Vol 2•430,431
Spectrum Technology, Goleta, Cal. Vol 2•446,447
Vectron Labs., Inc., Norwalk, Conn. Vol 2•455
Burr-Brown Resch. Corp., Tucson, Ariz.
Connor-Winfield Corp., West Chicago, Ill.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
Lithic Systems, Inc., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Parity Generator/Checkers

Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Solitron Devices, San Diego, Cal.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Phase Lock Loop Circuits

Plessey Semiconductors, Farmingdale, N.Y. Vol 2•601
Control Technology Co., L.I.C., N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
Lithic Systems, Inc., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Raytheon, Mt. View, Calif.
RCA Solid State Div., Somerville, N. J.
Signetics. Corp., Sunnyvale, Calif.
Sprague Elec. Co., No. Adams, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Power Amplifiers (1 W Minimum)

Beckman Instrs., Helipot Div., Fullerton, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Control Technology Co., L.I.C., N.Y.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Lithic Systems, Inc., Cupertino, Cal.
Micro Components Corp., Cranston, R.I.
Mostek Corp., Carrollton, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Plessey Semiconductors, Farmingdale, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
RCA Solid State Div., Somerville, N. J.
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J.
Sprague Elec. Co., No. Adams, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's, Power Gates—See IC's Logic Circuits

IC's, Programmable Operational Amplifiers—See IC's, Amplifiers, Operational

IC's, Programmable Read-Only Memories—See IC's Memories

IC's Programmable Read-Write Memories—See IC's Memories

IC's, Pulse Shapers—See IC's Multivibrators

IC's, Random-Access Memories—IC's Memories

IC's, Read-Mostly Memories—See IC's Memories

IC's, Read-Only Memories—See IC's Memories

IC's, Read-Write Memories—See IC's Memories

IC's Receiver/Transmitter, Asynchronous

General Instr. Corp., Microelectronics Div., Hicksville, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
RHG Elctrns. Lab., Deer Park, N.Y.
Sperry Elctrn. Tube, Gainesville, Fla.

IC's, Recievers, AM, FM

HRB-Singer, Inc., State College, Pa.
Lithic Systems, Inc., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
RCA Solid State Div., Somerville, N. J.
RHG Elctrns. Lab., Deer Park, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.

IC's Receivers, Teletype

Cermetek, Inc., Mountain View, Cal.
General Instr. Corp., Microelectronics Div., Hicksville, N.Y.

IC's, Relay Drivers—See IC's Logic Circuits

IC's, Sample-And-Hold Circuits

Hybrid Sys. Corp., Burlington, Mass. Vol 1•348
Burr-Brown Resch. Corp., Tucson, Ariz.
Fairchild Semiconductor Comps. Grp., Mountain View, Cal.
Harris Semiconductor, Melbourne, Fla.
ILC Data Device Corp., Hicksville, N.Y.
National Semiconductor, Santa Clara, Cal.
RCA Solid State Div., Somerville, N. J.
Transitron Elctrn. Corp., Wakefield, Mass.

IC's, Schmitt Triggers—See IC's Logic Circuits

IC's, Shift Registers, Static or Dynamic

RCA Solid State Div., Somerville, N. J. Vol 4•436*
RCA Solid State Div., MOS IC Mktg., Somerville, N. J. Vol 4•436*
RCA Solid State Div., Linear Integrated Circuits, Somerville, N. J. .... Vol 4•436*
RCA Solid State Div., Packaged Circuit Functions, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Thyristors & Rectifiers, Somerville, N. J. Vol 4•436*
RCA Solid State Div., Transistors, Somerville, N. J. Vol 4•436*
Solid State Scientific, Montgomeryville, Pa. Vol 2•606
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Chomerics, Inc., Woburn, Mass.
Clare-Pendar Co., Post Falls, Idaho
Control Devices, Woburn, Mass.
Counterscan Systems, Sutton, Neb.
Dialight Corp., Brooklyn, N.Y.
Digitran Co., Pasadena, Cal.
El Instruments, Derby, Conn.
Flex Key Corp., Gloucester, Mass.
GTE Automatic Elec., Northlake, Ill.
Hathaway Industries Inc., Tulsa, Okla.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
ITT Thermotech, Hopkins, Minn.
Kepco, Inc., Flushing, N.Y.
Key Tronic Corp., Spokane, Wash.
Licon Div., Chicago, Ill.
Mechanical Enterprises, Alexandria, Va.
Monitor Systems, Ft. Washington, Pa
Risk, George, Inds., Inc., Kimball, Neb.
Stackpole Comps. Co., Raleigh, N.C.
TEC, Inc., Tucson, Ariz.
Texas Instruments, Attleboro, Mass.
Wild Rover Corp., Norwood, N.J.

Kits, Breadboarding (For Engineers)

Christiansen Radio Inc., Laguna Beach, Cal. .....Vol 2•323
El Instruments, Derby, Conn. .. Vol 2•324
GC Electronics, Rockford, Ill.. Vol 3•679
Mica Corporation, Culver City, Calif. **Vol 4•495•**
Alco Elctrn. Prods., North Andover, Mass.
American Tech. Ceramics, Huntington Sta., N.Y.
A P Products, Inc., Painesville, Ohio
Augat Inc., Attleboro, Mass.
Caddel-Burns Mfg. Co., Inc., Mineola, N.Y.
Cambridge Thermionic, Cambridge, Mass
Centron Engrg., Torrance, Cal.
Circon Corp., Santa Barbara, Ca.
Circuit-Stik, Inc., Torrance, Cal.
Circuit Structures Lab., Burbank, Calif.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
D-Cemco, Inc., Burbank, Calif.
Douglas Electronics, Inc., San Leandro, Cal.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Elgin Elctrns. Inc., Waterford, Pa.
ESE, Inglewood, Cal.
Fenwal Elctrns., Framingham, Mass.
Heath Co., Benton Harbor, Mich.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Jonard Inds. Corp., Bronx, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Logiconcepts Inc., Los Alamitos, Cal.
LVC Inds. Inc., Flushing, N.Y.
Modpak, Waltham, Mass.
North American Philips Controls Corp., Cheshire, Conn.
PIC Design Division, Ridgefield,, Conn.
Precision Mechanisms Corp., Westbury, N.Y.
Robinson-Nugent, New Albany, Ind.
Scanbe Mfg. Corp., El Monte, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Spectrum Dynamics, Inc., Ft. Lauderdale, Fla.
Sterling Instr., New Hyde Pk., NY
Vector Elctrn. Co., Inc., Sylmar, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
Victory Engrg. Corp., Springfield, N.J.

Kits, Cable-End Sealing

Anchor Alloys, Inc., Brooklyn, N.Y.
Cole-Flex Corp., W. Babylon, N.Y.
Communications Technology Corp., Los Angeles, Cal.
Conap, Inc., Allegany, N.Y.
Hardman Inc., Belleville, N.J.
Hysol Div., Olean, N.Y.
Phelps Dodge Comm., North Haven, Conn.
SWS Silicones Div., Adrian, Mich.
3M Co., St. Paul, Minn.
Tra-Con, Inc., Medford, Mass.

Kits, Marking (Dial, Instrument, Equipment, etc.)

Datak Corp., Passaic, N.J. ..... Vol 2•479
Ackerman Gould Co., Inc., Oceanside, N.Y.
Brady, W.H. Co., Milwaukee, Wisc.
Chartpak, Leeds, Mass.
El Instruments, Derby, Conn.
Globe Plastics, Pomona, Cal.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Lectroetch, E. Cleveland, Ohio
Photo Chemical Prods. Cal., Santa Monica, Cal.
Russell Inds., Inc., Lynbrook, N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Techinques, Inc., Englewood, N.J.
3M Co., St. Paul, Minn.
Zippertubing Co., Los Angeles, Calif.

Kits, Potentiometer, Rheostat

Dale Elctrns., Inc., Yankton, S.D.
New England Instr., Natick, Mass.
Ohmite Mfg. Co., Skokie, Ill.

Kits, Power Supply

Tecnetics, Inc., Boulder, Colo. Vol 1•896
Tele-Dynamics/Wanlass, Fort Washington, Pa..... Vol 1•901
BECO, Inc., Salem, Va.
BF Elctrns., Solana Beach, Calif.
E-Tronics, Sepulveda, Cal.
El Instruments, Derby, Conn.
Heath Co., Benton Harbor, Mich.
Lambda Elctrns., Melville, N.Y.
Opad Elec. Co., Inc., New York, N.Y.
POWERTEC INC., Chatsworth, Cal.
Universal Elctrns. Co., Irvine, Cal.

Kits, Printed Circuit

Augat Inc., Attleboro, Mass.
BECO, Inc., Salem, Va.
Bishop Graphics, No. Hollywood, Cal.
Cambridge Thermionic, Cambridge, Mass
Centron Engrg., Torrance, Cal.
Christiansen Radio Inc., Laguna Beach, Cal.
Circuit-Stik, Inc., Torrance, Cal.
Cordover, Carl & Co., Mineola, N.Y.
Douglas Electronics, Inc., San Leandro, Cal.
Electro-Science Labs., Pennsauken, N.J.
ESE, Inglewood, Cal.
GC Electronics, Rockford, Ill.
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Keystone Elctrns. Corp., New York, N.Y.
Micro-Circuits Co., New Buffalo, Mich.
Scanbe Mfg. Corp., El Monte, Cal.
Techinques, Inc., Englewood, N.J.
3M Co., St. Paul, Minn.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.

Kits, Programming Board

LVC Inds. Inc., Flushing, N.Y. Vol 2•1046
El Instruments, Derby, Conn.
Vector Elctrn. Co., Inc., Sylmar, Cal.

Kits, Shielding

Ferronics, Inc., Fairport, N.Y. Vol 3•1009
Estes Engrg. Co., Gardena, Calif.
LectroMagnetics, Inc., Los Angeles, Cal.
Modpak, Waltham, Mass.
Russell Inds., Inc., Lynbrook, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.

Kits, Switch Assembling

Chicago Switch, Chicago, Ill.
Cole Instrument Corp., Costa Mesa, Cal.
Grayhill Inc., LaGrange, Ill.
International Electro Exchange Corp., Eden Prairie, Minn.
Jonard Inds. Corp., Bronx, N.Y.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Key Tronic Corp., Spokane, Wash.
Seacor, Inc., Norwood, N.J.

Kits, Terminal

Vaco Prods. Co., Chicago, Ill... Vol 3•953
Accurate Elctrns. Corp., Elyria, Ohio
Amp Inc., Harrisburg, Pa.
Augat Inc., Attleboro, Mass.
Burndy Corp., Norwalk, Conn.
Cambridge Thermionic, Cambridge, Mass
Circon Corp., Santa Barbara, Ca.
Communications Technology Corp., Los Angeles, Cal.
Hoffman Engrg. Co., Anoka, Minn.
Hollingsworth Solderless Terminal, Phoenixville, Pa.
Ico/Rally, Palo Alto, Cal.
Keystone Elctrns. Corp., New York, N.Y.
Magnum Elec. Corp., Erie, Mich.
Smith, Herman H., Inc., Bklyn., N.Y.
Thomas & Betts Co., Elizabeth, N.J.
3M Co., St. Paul, Minn.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Waldom Elctrns., Inc., Chicago, Ill.

Kits, Test Equipment

ESE, Inglewood, Cal..... Vol 2•337
BECO, Inc., Salem, Va.
Digitech Data Inds., Inc., Ridgefield, Conn.
El Instruments, Derby, Conn.
GC Electronics, Rockford, Ill.
Heath Co., Benton Harbor, Mich.
Jonard Inds. Corp., Bronx, N.Y.

Keystone Elctrns. Corp., New York, N.Y.
Logiconcepts Inc., Los Alamitos, Cal.
Magnaflux Corp., Chicago, Ill.
Microlab/FXR, Livingston, N.J.
Modpak, Waltham, Mass.
Multicore Sales Corp., Westbury, N.Y.
Schauer Mfg. Corp., Cincinnati, Ohio
Shannon Luminous Mat'ls., Hollywood, Cal.
Tech Serv., Inc., Fogelsville, Pa.
Telonic Inds., Inc., Laguna Beach, Calif.
Triplett Corp., Bluffton, Ohio
Vector Elctrn. Co., Inc., Sylmar, Cal.

Kits, Training Aid

Allied Elctrns., Chicago, Ill.
AMF Electical Prods., Alexandria, Va.
Arra Inc., Bay Shore, N.Y.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Chartpak, Leeds, Mass.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Digiac Corp., Plainview, N.Y.
Digital Equip. Corp., Maynard, Mass.
EI Instruments, Derby, Conn.
Heath Co., Benton Harbor, Mich.
Logiconcepts Inc., Los Alamitos, Cal.
Microlab/FXR, Livingston, N.J.
PIC Design Division, Ridgefield,, Conn.
PRD Elctrns., Inc., Westbury, N.Y.
Rank Precision Inds., Des Plaines, Ill.
RCA Elctrns. Comps., Harrison, N.J.
Scientific Measurements, Wilmette, Ill.
Smith, Herman H., Inc., Bklyn., N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Worner Elctrn. Devices, Rankin, Ill.

Kits, Transistor Mounting—See Pads, Transistor Mounting

Knives & Knife Sets

Channellock, Inc., Meadville, Pa. Vol 3•1235
American Safety Razor, Staunton, Va
Chartpak, Leeds, Mass.
Chemical Etching Equip. & Supply, Alexandria, Va.
Circon Corp., Santa Barbara, Ca.
General Hardware Mfg. Co., New York, N.Y.
Klein, Mathias & Sons, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Techni-Tool, Inc., Philadelphia, Pa.
Uber Grafic Instrs., Palo Alto, Calif.
X-Acto, Long Island City, N.Y.
Xcelite, Inc., Orchard Park, N.Y.

Knobs

Alco Elctrn. Prods., North Andover, Mass. ..... Vol 2•456-458,460
Electronic Hardware Corp., Jamaica, N.Y. ..... Vol 2•489
Millen, James Mfg., Malden, Mass. Vol 2•521
NOBEX Div., Burlingame, Cal. Vol 2•502,503
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Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•824
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Aerospace Knob Co., So. El Monte, Calif.
Allied Elctrns., Chicago, Ill.
Birnbach Co., Inc., Freeport, N.Y.
Buckeye Stamping Co., Columbus, Ohio
Cambridge Thermionic, Cambridge, Mass
Control Inds. Inc., Inwood, N.Y.
Davies, Harry Molding Co., Chicago, Ill.
Dimco-Gray Co., Dayton, Ohio
Ind'l. Devices, Edgewater, N.J.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Kurz-Kasch Incorporated, Dayton, Ohio
Millen, James Mfg., Malden, Mass.
Norelcom Inds., Inc., Farmingdale, N.Y.
Paul, F.H. & Stein Bros., New York, N.Y.
PIC Design Division, Ridgefield,, Conn.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
Rostone Corp., Lafayette, Ind.
Russell Inds., Inc., Lynbrook, N.Y.
Seacor, Inc., Norwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Stake Fastener Co., S. El Monte, Calif.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Useco Div., Van Nuys, Cal.
Vemaline Prods. Co., Wyckoff, N.J.
Waldom Elctrns., Inc., Chicago, Ill.
Western Indicator Co., So. El Monte, Cal.
Westmoreland Plastics Co., Latrobe, Pa.

Klystron, Tubes—See Tubes, Klystron

Labels, Pressure-Sensitive, Adhesive

Datak Corp., Passaic, N.J. ..... Vol 2•479
Display Devices, Inc., Encinitas, Cal. Vol 2•485
Acme Model Engrg. Co., Ridgefield, N.J.
Althor Prods., Brooklyn, N.Y.
Bishop Graphics, No. Hollywood, Cal.
Brady, W.H. Co., Milwaukee, Wisc.
Decalcraft Corp., Hatfield, Pa.
K. C. C. Shokai Ltd., Nada-ku, Kobe 657, Japan
Labelon Corp., Canandaigua, N.Y.
Manger Elec. Co., Inc., Stamford, Conn.
Meyercord Co., Wheaton, Ill.
Monarch Marking Sys., Dayton, Ohio
Photo Chemical Prods. Cal., Santa Monica, Cal.
Robins Ind's. Corp., Consumer Products Div., Commack, N.Y.
Tapecon, Inc., Rochester, N.Y.
Thomas & Betts Co., Elizabeth, N.J.
3M Co., St. Paul, Minn.
Topflight Corp., York, Pa.
Uniroyal, Inc., New York, N.Y.

Labels, Temperature Indicating

Brady, W.H. Co., Milwaukee, Wisc.
Camwil, Inc., Honolulu, Haw.
Omega Engrg., Inc., Stamford, Conn.
Tempil Div., So. Plainfield, N.J.

Laboratories, Testing—See Services, Electrical Measurement; Services Environmental Testing

Laboratory Furniture—See Benches, Consoles, Stools, Tables (Lab and Shop)

Lacing, Cable—See Cords & Tapes, Lacing

Laminates, Metal Clad

Display Devices, Inc., Encinitas, Cal. Vol 2•485
Mica Corporation, Culver City, Calif. Vol 4•495*
Alpha Metals, Inc., Jersey City, N.J.
Burlington Opers. Div., Burlington, Mass.
Cadilac Plastics & Chems., Detroit, Mich.
Central Plastics Dists., Chicago, Ill.
Cincinnati Dev. & Mfg. Co., Cincinnati, Ohio
Devco Engrg., W. Caldwell, N.J.
Dixon Corp., Bristol, R.I.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Fansteel Inc., N Chicago, Ill.
General Elec., Coshocton, Ohio
Injectorall Elctrns. Corp., Glen Cove, N.Y.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Keystone Elctrns. Corp., New York, N.Y.
Laminated Shim Co., Inc., Glenbrook, Conn.
New England Laminates Co., Inc., Glenbrook, Conn.
Norplex Div. UOP, LaCrosse, Wisc.
NVF Co., Yorklyn, Del.
Penn Fibre & Specialty, Phila., Pa.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Rogers Corp., Rogers, Conn.
Schjeldahl, G.T. Co., Northfield, Minn.
Stevens Prods., Inc., E. Orange, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
Tapecon, Inc., Rochester, N.Y.
Thiokol Chemical Div., Trenton, N.J.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Westinghouse Elec., W. Mifflin, Pa.
Whittaker Corp., Los Angeles, Cal.
Zero Mfg. Co., Burbank, Cal.

Laminates, Plastic Impregnated (Unclad)

Cadilac Plastics & Chems., Detroit, Mich.
Central Plastics Dists., Chicago, Ill.
Cincinnati Dev. & Mfg. Co., Cincinnati, Ohio
Comco Plastics, Inc., Richmond Hill, N.Y.
Fansteel Inc., N Chicago, Ill.
General Elec., Coshocton, Ohio
Glastic Corp., Cleveland, Ohio
Haysite Div., Erie, Pa.
Keystone Elctrns. Corp., New York, N.Y.
Laminated Fabricators, San Bruno, Calif.
Mica Corporation, Culver City, Calif.
Natvar Corp., Rahway, N.J.
New England Laminates Co., Inc., Glenbrook, Conn.
Norplex Div. UOP, LaCrosse, Wisc.
NVF Co., Yorklyn, Del.
Penn Fibre & Specialty, Phila., Pa.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Precision Paper Tube Co., Wheeling, Ill.
Rogers Corp., Rogers, Conn.
Schjeldahl, G.T. Co., Northfield, Minn.
Spaulding Fibre Co., Inc., Tonawanda, N.Y.
Stevens Prods., Inc., E. Orange, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
Thiokol Chemical Div., Trenton, N.J.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Triac Elctrn. Sys., Forest Hills, N. Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Westinghouse Elec., W. Mifflin, Pa.
Whittaker Corp., Los Angeles, Cal.

Laminates, Plastic (With Integral Heating Elements)

Cox & Co., Inc., New York, N.Y.
Rogers Corp., Rogers, Conn.
Synthane Taylor Corp., Valley Forge, Pa.
Triac Elctrn. Sys., Forest Hills, N. Y.

Laminations, Magnetic Recording Head

SGL Inds., Inc., Westville, N.J. Vol 3•1038
Buckbee-Mears Co., St. Paul, Minn.
Hamilton Technology, Inc., Lancaster, Pa.
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y.

Laminations, Transformer & Inductor

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SGL Inds., Inc., Westville, N.J. Vol 3•1038
Allegheny Ludlum Steel Co., Pittsburgh, Pa.
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y.
Laminated Shim Co., Inc., Glenbrook, Conn.
Magnetic Metals Co., Camden, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Thomas & Skinner, Inc., Indianapolis, Ind.

Lamp Adapters

Display Devices, Inc., Encinitas, Cal. Vol 2•484
Arcolectric Switch Corp., No. Hollywood, Cal.
Dialight Corp., Brooklyn, N.Y.
Elctrn. Molding Corp., Woonsocket, R.I.
GTE Sylvania Inc., Danvers, Mass.
Int'l. Prods., Atchison, Kans.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
LVC Inds. Inc., Flushing, N.Y.
Sloan Co., Sun Valley, Cal.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Lamp Drivers

Beckman Instrs., Helipot Div., Fullerton, Cal.
Cermetek, Inc., Mountain View, Cal.
Data Display Products, Los Angeles, Cal.
Electro-Module, Inc., Pomona, Cal.
GRM Corp., Medford, N.J.
ILC Data Device Corp., Hicksville, N.Y.
Ind'l. Devices, Edgewater, N.J.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Ledex, Inc., Dayton, Ohio
Lithic Systems, Inc., Cupertino, Cal.
Luminator Div., Plano, Tex.
TEC, Inc., Tucson, Ariz.

Lamp Holders—See Sockets, Lamp & Lamp Assemblies

Lamp Pullers—See Pullers, Lamp

Lamps, Dial & Pilot, Incandescent

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Amp Inc., Harrisburg, Pa.
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Circon Corp., Santa Barbara, Ca.
Clare-Pendar Co., Post Falls, Idaho
Control Switch, Inc., Folcroft, Pa.
Devco Engrg., W. Caldwell, N.J.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
GTE Sylvania Inc., Danvers, Mass.
Info-Lite Corp., Corona, N.Y.
Int'l. Prods., Atchison, Kans.
Lear Siegler, Grand Rapids, Mich.
Ledex, Inc., Dayton, Ohio
Licon Div., Chicago, Ill.
Mura Corp., Jericho, N.Y.
Oshino Electric Lamp Works, Ltd, Shinagawa-ku, Tokyo, Japan
Penn Keystone Corp., Ansonia, Conn.
Pinlites, Fairfield, N.J.
Precision Dynamics Corp., Burbank, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Vemaline Prods. Co., Wyckoff, N.J.
Westinghouse Elec., Bloomfield, N. J.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Lamps, Electroluminescent—See Panels, Electroluminescent

Lamps, Exciter, Photographic

Christie Elec., Los Angeles, Cal.
EG & G, Inc., Salem, Mass.
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Danvers, Mass.
Hamamatsu Corp. (E), Middlesex, N. J.
Lamps, Inc., Torrance, Cal.
Shigoto Inds., Ltd., New York, N.Y.

Torr Labs., Los Angeles, Cal.
Westinghouse Elec., Bloomfield, N. J.
Xenon Corp., Medford, Mass.

Lamps, Flashtube

General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio Vol 2•490
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Edmund Scientific Co., Barrington, N.J.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Bedford, Mass.
Eimac, San Carlos, Calif.
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Danvers, Mass.
Heimann GmbH, Mt. Vernon, N.Y.
Illumination Inds., Inc., Sunnyvale, Cal.
Kemlite Labs., Inc., Chicago, Ill.
Mura Corp., Jericho, N.Y.
Torr Labs., Los Angeles, Cal.
U.S. Scientific Instrs., Watertown, Mass.
Voltarc Tubes, Fairfield, Conn.
West Coast Resch. Corp., Los Angeles, Calif.
Xenon Corp., Medford, Mass.

Lamps, Glow—See Lamps, Neon

Lamps, Infrared

Advanced Kinetics, Costa Mesa, Calif.
Caig Labs., Inc., Westbury, N.Y.
Casso-Solar Inc., Kew Gardens, N.Y.
Chicago Miniature Lamp Works, Chicago, Ill.
Christie Elec., Los Angeles, Cal.
Eimac, San Carlos, Calif.
Gamma Sci., San Diego, Cal.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
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Heath Co., Benton Harbor, Mich.
Illumination Inds., Inc., Sunnyvale, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
OAL Assocs., Inc., Westbury, N.Y.
Scientific Technology, Mountain View, Cal.
Skan-A-Matic Corp., Elbridge, N. Y.
TRW Instrs., El Segundo, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Western Coil & Elec. Co., Racine, Wisc.
Westinghouse Elec., Bloomfield, N. J.
Wild Heerbrugg Instrs., Farmingdale, N.Y.

Lamps, Magnifying, Inspection

Allied Elctrns., Chicago, Ill.
Chemical Etching Equip. & Supply, Alexandria, Va.
New Era Products, Cleveland, Ohio

Lamps, Mercury Vapor

Illumination Inds., Inc., Sunnyvale, Cal. Vol 2•682
Advanced Kinetics, Costa Mesa, Calif.
Black Light Corp. Amer., San Gabriel, Cal.
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Christie Elec., Los Angeles, Cal.
Edmund Scientific Co., Barrington, N.J.
Epic, Inc., New York, N.Y.
Fusion Systems Corp., Rockville, Md.
Gaertner Scientific Corp., Chicago, Ill.
Gates, Geo. W. & Co., Franklin Sq., N.Y.
GTE Sylvania Inc., Danvers, Mass.
Ionics, Inc., Watertown, Mass
Kemlite Labs., Inc., Chicago, Ill.
Oriel Corp. of America, Stamford, Conn.
Shannon Luminous Mat'ls., Hollywood, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Thermal Amer. Fused Quartz, Montville, N.J.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Voltarc Tubes, Fairfield, Conn.
Westinghouse Elec., Bloomfield, N. J.
Wild Heerbrugg Instrs., Farmingdale, N.Y.

Lamps, Miniature & Subminiature

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Circon Corp., Santa Barbara, Ca.
Control Switch, Inc., Folcroft, Pa.
Dialight Corp., Brooklyn, N.Y.
Edmund Scientific Co., Barrington, N.J.
GTE Sylvania Inc., Danvers, Mass.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Info-Lite Corp., Corona, N.Y.
Int'l. Prods., Atchison, Kans.
Ledex, Inc., Dayton, Ohio
Marco-Oak, Anaheim, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Mura Corp., Jericho, N.Y.
Oshino Electric Lamp Works, Ltd, Shinagawa-ku, Tokyo, Japan
Pinlites, Fairfield, N.J.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Ray-O-Vac Div., Madison, Wisc.
Shigoto Inds., Ltd., New York, N.Y.
Skan-A-Matic Corp., Elbridge, N. Y.
Techni-Tool, Inc., Philadelphia, Pa.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Union Carbide, Consumer Prods., New York, N.Y.
Vemaline Prods. Co., Wyckoff, N.J.
Welch Allyn, Inc., Skaneateles Falls, N.Y.
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Black Light Corp. Amer., San Gabriel, Cal.
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Circon Corp., Santa Barbara, Ca.
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Kemlite Labs., Inc., Chicago, Ill.
Lamps, Inc., Torrance, Cal.
Ledex, Inc., Dayton, Ohio
Licon Div., Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Marco-Oak, Anaheim, Cal.
Master Specialties, Costa Mesa, Cal.
Mura Corp., Jericho, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Sloan Co., Sun Valley, Cal.
Vemaline Prods. Co., Wyckoff, N.J.
Voltarc Tubes, Fairfield, Conn.

Lamps, Projection

Christie Elec., Los Angeles, Cal.
Drake Mfg., Harwood Hgts., Ill.
Edmund Scientific Co., Barrington, N.J.
Eimac, San Carlos, Calif.
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Danvers, Mass.
Illumination Inds., Inc., Sunnyvale, Cal.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
ITT Electron Tube, Easton, Pa.
Shigoto Inds., Ltd., New York, N.Y.
Westinghouse Elec., Bloomfield, N. J.

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Leecraft Mfg. Co., Inc., Long Island City, N.Y.
Licon Div., Chicago, Ill.
LVC Inds. Inc., Flushing, N.Y.
National Semiconductor, Santa Clara, Cal.
OPCOA, Inc., Edison, N.J.
Oshino Electric Lamp Works, Ltd, Shinagawa-ku, Tokyo, Japan
Scientific Technology, Mountain View, Cal.
Sensor Technology, Chatsworth, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Spectronics, Inc., Richardson, Tex.
Texas Instruments, Dallas, Tex.

Lamps, Stroboscopic

General Radio Co., Concord, Mass.
Heimann GmbH, Mt. Vernon, N.Y.
Illumination Inds., Inc., Sunnyvale, Cal.
Voltarc Tubes, Fairfield, Conn.

Lamps, Tungsten Halogen

Hamamatsu Corp. (E), Middlesex, N. J. Vol 2•1186
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Edmund Scientific Co., Barrington, N.J.
Gamma Sci., San Diego, Cal.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Danvers, Mass.
Oriel Corp. of America, Stamford, Conn.
Shigoto Inds., Ltd., New York, N.Y.
Welch Allyn, Inc., Skaneateles Falls, N.Y.
Wild Heerbrugg Instrs., Farmingdale, N.Y.

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Christie Elec., Los Angeles, Cal.
Fusion Systems Corp., Rockville, Md.
Gaertner Scientific Corp., Chicago, Ill.
Gates, Geo. W. & Co., Franklin Sq., N.Y.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Heath Co., Benton Harbor, Mich.
Oriel Corp. of America, Stamford, Conn.
Shannon Luminous Mat'ls., Hollywood, Cal.
Voltarc Tubes, Fairfield, Conn.
Western Coil & Elec. Co., Racine, Wisc.
Wild Heerbrugg Instrs., Farmingdale, N.Y.
Xenon Corp., Medford, Mass.

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Chemical Etching Equip. & Supply, Alexandria, Va.
EG&G, Inc., Bedford, Mass.
Eimac, San Carlos, Calif.
Fusion Systems Corp., Rockville, Md.
Gates, Geo. W. & Co., Franklin Sq., N.Y.
GTE Sylvania Inc., Danvers, Mass.
Ionics, Inc., Watertown, Mass
Mann, David W. Co., Burlington, Mass.
Mura Corp., Jericho, N.Y.
Oriel Corp. of America, Stamford, Conn.
Shigoto Inds., Ltd., New York, N.Y.
U.S. Scientific Instrs., Watertown, Mass.
Varian Assocs., Palo Alto, Cal.
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Datalight Inc., Bloomfield, Conn.
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GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hadron Inc., Westbury, N.Y.
Kappa Scientific Corp., Santa Barbara, Cal.
Lasermetrics, Inc., Rochelle Park, N.J.
Maxwell Labs., Inc., San Diego, Calif.
Optics International, Tenafly, N.J.
Raytheon Co., Waltham, Mass.
Union Carbide, San Diego, Cal.
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GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hadron Inc., Westbury, N.Y.
Honeywell, Minneapolis, Minn.
Maxwell Labs., Inc., San Diego, Calif.
Molectron Corp., Sunnyvale, Cal.
Optics Technology, Palo Alto, Calif.
Raytheon Co., Waltham, Mass.
R.C.A. Aerospace Sys. Div., Burlington, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Spectra-Physics, Inc., Mountain View, Calif.
Thermal Amer. Fused Quartz, Montville, N.J.
TRW Instrs., El Segundo, Cal.
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Amp Inc., Harrisburg, Pa.
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Beman Mfg., Inc., New Cumberland, Pa.

Ceramaseal, Inc., New Lebanon Center, N.Y.
Co-Operative Inds., Inc., Chester, N.J.
De Soto Elec. Prods., De Soto, Mo.
Dearborn Wire & Cable Co., Rosemont, Ill.
Dielectric Sciences, Burlington, Mass
Electronic Coil Corp., Plainville, Conn.
Estes Engrg. Co., Gardena, Calif.
Excel Specialty Corp., Chicago, Ill.
General Lab. Assocs., Norwich, N.Y.
Gore, W.L. & Assocs., Inc., Newark, Del.
Hermetic Seal Corp., Rosemead, Cal.
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National Tel-Tronics, Meadville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Paraplegics Mfg., Bensenville, Ill.
Projects Unlimited, Inc., Dayton, Ohio
Reynolds Inds., Inc., Marina Del Rey, Cal.
Saxton Prods., Congers, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
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Wireflex Inc., Calumet City, Ill.

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AGFA-Gevaert, Inc., Teterboro, N.J.
Amersil, Inc., Hillside, N.J.
Bausch & Lomb, Rochester, N.Y.
Bishop Graphics, No. Hollywood, Cal.
CAI Div. Bourns Inc., Barrington, Ill.
Chemical Etching Equip. & Supply, Alexandria, Va.
Circon Corp., Santa Barbara, Ca.
Concord Communications Sys., Farmingdale, N.Y.
Cosmicar Optical Co., Ltd., Nerima-Ku, Tokyo, Japan
Edmund Scientific Co., Barrington, N.J.
Esco Products, Oak Ridge, NJ
Fairchild Space & Defense Sys., Syosset, N.Y.
Gaertner Scientific Corp., Chicago, Ill.
General Electrodynamics Corp., Garland, Tex.
General Hardware Mfg. Co., New York, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
Heitz, Karl, Inc., New York, N.Y.
Heliotek, Sylmar, Calif.
Javelin Div., Apollo Lasers, Inc., Los Angeles, Ca.
Kollsman Instr. Co., Syosset, N.Y.
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Olympus Corp. America, New Hyde Park, N.Y.
Optics International, Tenafly, N.J.
Opto-Metric Tools, Rockleigh, N.J.
Oriel Corp. of America, Stamford, Conn.
Perkin-Elmer Corp., Instr. Div., Norwalk, Conn.
Rank Precision Inds., Des Plaines, Ill.
RCA Corp., Camden, N.J.
Santa Barbara Resch. Ctr., Goleta, Calif.
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Singer Co., Glendale, Cal.
Statek Corp., Orange, Cal.
Stereotronics Television Co., Sherman Oaks, Cal.
Valpey Corp., Holliston, Mass.
Whittaker Corp., Los Angeles, Cal.
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Lenses, R-F

Emerson & Cuming, Inc., Canton, Mass.
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Grayhill Moldtronics, Inc., Downers Grove, Ill.
Kollsman Instr. Co., Syosset, N.Y.
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ATR Elctrns., Inc., St. Paul, Minn.
Kidde, Walter & Co., Belleville, N.J.
New Era Products, Cleveland, Ohio
North Electric Co., Galion, Ohio
Power Inc., Burnsville, Minn.
Precision Dynamics Corp., Burbank, Cal.
Ratelco, Inc., Seattle, Wash.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Tri-Ex Tower Corp., Visalia, Calif.
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Chemical Etching Equip. & Supply, Alexandria, Va.
Edmund Scientific Co., Barrington, N.J.
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Gates, Geo. W. & Co., Franklin Sq., N.Y.
Hamamatsu Corp. (E), Middlesex, N. J.
Illumination Inds., Inc., Sunnyvale, Cal.
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Amp Inc., Harrisburg, Pa.
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Chicago Miniature Lamp Works, Chicago, Ill.
Chicago Switch, Chicago, Ill.
Circon Corp., Santa Barbara, Ca.
Clare-Pendar Co., Post Falls, Idaho
Control Switch, Inc., Folcroft, Pa.
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Devco Engrg., W. Caldwell, N.J.
Electro Switch Corp., Weymouth, Mass.
Furnas Elec. Co., Batavia, Ill.
General Elec. Company, Providence, R.I.
General Illumination, Inc., St. Paul, Minn.
Genisco Technology Corp., Eldema Div., Compton, Cal.
GTE Sylvania Inc., Danvers, Mass.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Electro Exchange Corp., Eden Prairie, Minn.
Int'l. Prods., Atchison, Kans.
Korry Mfg. Co., Seattle, Wash.
Litronix, Cupertino, Cal.
Master Specialties, Costa Mesa, Cal.
Molex Inc., Lisle, Ill.
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Marco-Oak, Anaheim, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
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Signalite, Neptune, N.J.
Signet Scientific Co., Burbank, Cal.
Sloan Co., Sun Valley, Cal.
Vemaline Prods. Co., Wyckoff, N.J.
W.V. Industries Inc., Franklin Lakes, N.J.

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GTE Sylvania Inc., Danvers, Mass.
Litronix, Cupertino, Cal.
OAL Assocs., Inc., Westbury, N.Y.
OPCOA, Inc., Edison, N.J.
Precision Dynamics Corp., Burbank, Cal.
Scientific Technology, Mountain View, Cal.
Sensor Corp., Scottsdale, Pa.
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Ledex, Inc., Dayton, Ohio
Marco-Oak, Anaheim, Cal.
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Sloan Co., Sun Valley, Cal.
Square D Co., Park Ridge, Ill.
Vemaline Prods. Co., Wyckoff, N.J.

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Chicago Miniature Lamp Works, Chicago, Ill.
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Control Switch, Inc., Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Dialight Corp., Brooklyn, N.Y.
Drake Mfg., Harwood Hgts., Ill.
Electro Switch Corp., Weymouth, Mass.
Furnas Elec. Co., Batavia, Ill.
General Illumination, Inc., St. Paul, Minn.
Ind'l. Devices, Edgewater, N.J.
Korry Mfg. Co., Seattle, Wash.
LVC Inds. Inc., Flushing, N.Y.
Master Specialties, Costa Mesa, Cal.
Square D Co., Park Ridge, Ill.
TEC, Inc., Tucson, Ariz.
Vemaline Prods. Co., Wyckoff, N.J.

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B & K Instrs., Inc., Cleveland, Ohio
Chadwick-Helmuth Co., Inc., Monrovia, Calif.
Edmund Scientific Co., Barrington, N.J.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Bedford, Mass.
Eimac, San Carlos, Calif.
General Radio Co., Concord, Mass.
GTE Sylvania Inc., Danvers, Mass.
Heimann GmbH, Mt. Vernon, N.Y.
Heitz, Karl, Inc., New York, N.Y.
Illumination Inds., Inc., Sunnyvale, Cal.
Kemlite Labs., Inc., Chicago, Ill.
Mura Corp., Jericho, N.Y.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
Power Instrs., Skokie, Ill.
Sticht, Herman H. Co., Inc., New York, N.Y.
U.S. Scientific Instrs., Watertown, Mass.
Voltarc Tubes, Fairfield, Conn.
Xenon Corp., Medford, Mass.

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Atlas Electric Devices, Chicago, Ill.
Black Light Corp. Amer., San Gabriel, Cal.
Christie Elec., Los Angeles, Cal.
Clean Room Prods., Farmingdale, N.Y.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Edmund Scientific Co., Barrington, N.J.
Eimac, San Carlos, Calif.
Esco Products, Oak Ridge, NJ
Gates, Geo. W. & Co., Franklin Sq., N.Y.
GTE Sylvania Inc., Danvers, Mass.
Hamamatsu Corp. (E), Middlesex, N. J.
Illumination Inds., Inc., Sunnyvale, Cal.
Kemlite Labs., Inc., Chicago, Ill.
Magnaflux Corp., Chicago, Ill.
Sara Scientific Co., San Francisco, Calif.
Shannon Luminous Mat'ls., Hollywood, Cal.
TRW Instrs., El Segundo, Cal.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Voltarc Tubes, Fairfield, Conn.

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Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Perfect Gear & Instr. Corp., Northridge, Calif.
PIC Design Division, Ridgefield,, Conn.
Planet Instr., Gardena, Cal.
Sterling Instr., New Hyde Pk., NY
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Tapeswitch Corp. Amer., Farmingdale, N.Y.

Limiters, Current

Airpax Elctrns., Inc., Cambridge, Md.
Arnold Magnetics, Culver City, Cal.
Burndy Corp., Norwalk, Conn.
Carbone Corp., Boonton, N.J.
CGS Units, Inc., Rochester, N.Y.
Coil Co. of Amer., Northvale, N.J.
Diversified Elctrns., Evansville, Ind
Environmental Communications Inc., Santa Ana, Cal.
Halmar Elctrns., Inc., Columbus, Ohio
Kepco, Inc., Flushing, N.Y.
Lambda Elctrns., Melville, N.Y.
P.E.T., Inc., Pittsburgh, Pa.
Robicon Corp., Pittsburgh, Pa.
Texas Instruments, Attleboro, Mass.

Limiters, Microwave

Aertech Inds., Sunnyvale, Calif.
Airtron, Morris Plains, N.J.
American Elctrn. Labs., Inc., Lansdale, Pa.
Arra Inc., Bay Shore, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Collins Radio Co., Dallas, Tex.
Engelmann Microwave, Montville, N.J.
Environmental Communications Inc., Santa Ana, Cal.
General Microwave Corp., Farmingdale, N.Y.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Norsal Industries, Inc., Brentwood, N.Y.
Physical Elctrn. Labs., Menlo Park, Calif.
RCA Elctrns. Comps., Harrison, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Ryka Scientific, Inc., Sunnyvale, Cal.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Microwave Div., Van Nuys, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Vector Industries, Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.

Limiters, Surge

ATR Elctrns., Inc., St. Paul, Minn.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Environmental Communications Inc., Santa Ana, Cal.
Joslyn Elctrn. Sys., Goleta, Cal.
RFL Inds., Comms. Div., Boonton, N.J.

Line Stretchers, Microwave—See Microwave Line Stretchers

Linear Displacement Indicators—See Indicators, Linear Displacement

Liners, Tube Shield—See Shields, Tube

Lines, Slotted—See Slotted Lines, Microwave

Links, Relay (Microwave)

Environmental Communications Inc., Santa Ana, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Thomson-CSF Inc., New York, N.Y.

Liquid Crystals—See Crystals, Liquid, Temperature Indicating

Liquid-Level Indicators—See Indicators, Liquid-Level

Load Cells—See Cells, Load

Loads, Dummy—See Dummy Loads

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Advanced High Voltage Inc., Van Nuys, Cal. ..... Vol 1•594,595
Bendix, Franklin, Ind. ..... Vol 2•609
W-F Products, Inc., Denver, Co. Vol 1•934
Avtron Mfg., Inc., Cleveland, Ohio
Electronautics, Littleton, Mass.
Elctrn. Meas. Inc., Neptune, N.J.
Kepco, Inc., Flushing, N.Y.
Triac Elctrn. Sys., Forest Hills, N. Y.
Varian Assocs., Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Wide Band Engrg. Co., Phoenix, Ariz.

Locators, Metal

Gardiner Elctrns., Phoenix, Ariz.
Heath Co., Benton Harbor, Mich.
Rank Precision Inds., Des Plaines, Ill.
Schonstedt Instr. Co., Reston, Va.
Sensor Corp., Scottsdale, Pa.
Stearns Magnetics Inc., Cudahy, Wisc.

Locators, Open-Short

Associated Resch., Chicago, Ill.
Beckman Instrs., Cedar Grove, N.J.
Biddle, James G., Plymouth Meeting, Pa.
Cablemaster Div., No. Hollywood, Cal.
Communications Technology Corp., Los Angeles, Cal.
Counterscan Systems, Sutton, Neb.
Hipotronics, Inc., Brewster, N.Y.
Peschel Instrs., Cape Coral, Fla.
Railway Comm., Raytown, Mo.
Slaughter Co., Ardmore, Okla.
Tektronix, Inc., Beaverton, Ore.
Tempo Instrument, Inc., Plainview, N.Y.
Wiltron Co., Palo Alto, Calif.

Locators, Pipe & Cable—See Locators, Metal

Locks, Dial & Shaft

Millen, James Mfg., Malden, Mass. Vol 2•521
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Birnbach Co., Inc., Freeport, N.Y.
Bowmar/ALI, Inc., Acton, Mass.
Electronic Hardware Corp., Jamaica, N.Y.
Jackson Bros., (London) Ltd., New York, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Lambda Elctrns., Melville, N.Y.
Millen, James Mfg., Malden, Mass.
PIC Design Division, Ridgefield,, Conn.
Positronic Inds., Springfield, Mo.
Quadrastat Controls Corp., Glendale, Cal.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
Smith, Herman H., Inc., Bklyn., N.Y.
Vemaline Prods. Co., Wyckoff, N.J.
Waters Mfg., Inc., Wayland, Mass.

Logic Circuits—See Cards, Logic; Circuits, Integrated; Modules, Logic

Loudspeakers—See Speakers

Louvers, Vents, & Windows (For Equipment)—See Cabinets & Accessories, Metal

Lubricants

Chassis-Trak, Div., Indianapolis, Ind. Vol 3•319
Caig Labs., Inc., Westbury, N.Y.
Cerac, Inc., Butler, Wisc.
Chemplast, Inc., Wayne, N.J.
Chemtronics, Inc., Brooklyn, N.Y.
Cole-Flex Corp., W. Babylon, N.Y.
Dow Corning Corp., Midland, Mich.
Edwards High Vacuum, Grand Island, N.Y.
Elctrn. Chemical Corp., Jersey City, N.J.
GC Electronics, Rockford, Ill.
General Elec. Co., Waterford, N.Y.
Jonard Inds. Corp., Bronx, N.Y.
Loctite Corp., Newington, Conn.
LPS Research Labs., Los Angeles, Cal.
MacDonald & Co., Glendale, Calif.
Merix Chem. Co., Chicago, Ill.
Miller-Stephenson Chem. Co., Inc., Danbury, Conn.
Nye, William F., Inc., New Bedford, Mass.
Ram Chems., Gardena, Calif.
Shannon Luminous Mat'ls., Hollywood, Cal.
SWS Silicones Div., Adrian, Mich.
Tech Spray, Amarillo, Tex.
Techni-Tool, Inc., Philadelphia, Pa.
Union Carbide, Chemicals & Plastics, New York, N.Y.
Workman Elctrn. Prods., Inc., Sarasota, Fla.
X-Acto, Long Island City, N.Y.

Lugs—See Terminals, Lug

Luminescent Chemicals—See Chemicals, Luminescent

Luminous Paints—See Paints, Luminous

LVDT's—See Transducers, Displacement

Machines, Blueprint—See Blueprint Machines

Machines, Cleaning-Also See Cleaners, Ultrasonic

Aubin, A.E. Co., Glastonbury, Conn.
Baron-Blakeslee, Div. Purex Corp., Chicago, Ill.
Chemcut Corp., State College, Pa.
Chemical Etching Equip. & Supply, Alexandria, Va.
Clean Room Prods., Farmingdale, N.Y.
Cobehn, Inc., Fairfield, N.J.
Conforming Matrix Corp., Toledo, Ohio
Cyclo-Tronics, Inc., Chicago, Ill.
Electrovert, Mt. Vernon, N.Y.
Gagne Assocs., Inc., Binghamton, N.Y.
Inland Mfg. Co., Omaha, Neb.
Kepro Cir. Sys., Inc., St. Louis, Mo.
London Chemical Co., Bensenville, Ill.
Mann, Henry Inc., Feasterville, Pa.
Marcal Electro-Sonics, Los Angeles, Cal.
Phillips Mfg. Co., Chicago, Ill.
Sara Scientific Co., San Francisco, Calif.
Systron Donner Computer Systems Div., Concord, Cal.
Technic, Inc., Providence, R.I.
Tronic Corp., Belmont, Calif.
Ultrasonic Corp., Pipestone, Minn.
Wells Elctrns., Inc., So. Bend, Ind.
Zenrad Controls Co., Santa Barbara, Ca.

Machines, Coil-Winding

Arnold Magnetics, Culver City, Cal. Vol 1•607
Coil Winding Equip. Co., Oyster Bay, N.Y.
Eubanks Engrg., Monrovia, Calif.
Freudenberg, B., Inc., New York, N.Y.
Kahle Engrg. Co., Union City, N.J.
Possis Corp., Minneapolis, Minn.
Solatron Enterprises, Inglewood, Calif.
Stevens, Geo. Mfg. Co., Inc., Chicago, Ill.
Techni-Tool, Inc., Philadelphia, Pa.
Universal Mfg. Co., Inc., Irvington, N.J.

Machines, Component Handling, Feeding, Insertion & Sorting

Black & Webster, Inc., Waltham, Mass.
Conrac Corp., Cedar Rapids, Iowa
E-Systems Inc., Dallas, Tex.
Eraser Co., Syracuse, N.Y.
Freudenberg, B., Inc., New York, N.Y.
Goodrich Div., Hudsonville, Mich.
GTI Corp. (E), Pittsburgh, Pa.
IPT Corp., Sunnyvale, Cal.
Mann, Henry Inc., Feasterville, Pa.
Penn Engrg. & Mfg. Corp., Doylestown, Pa.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Trio-Tech, Inc. of Calif., Burbank, Calif.
Universal Instrs., Binghamton, N.Y.

Machines, Crimping—See Tools, Crimping & Swaging

Machines, Etching, & Processing Printed Circuit

Chemcut Corp., State College, Pa.
Chemical Etching Equip. & Supply, Alexandria, Va.
Cyclo-Tronics, Inc., Chicago, Ill.
Edwards High Vacuum, Grand Island, N.Y.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Materials Resch. Corp., Orangeburg, N.Y.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Superior Elec., Bristol, Conn.

Machines, Hermetic Sealing

Associate General Labs., Inc., Brookfield, Ill.
Conforming Matrix Corp., Toledo, Ohio
GTI Corp. (E), Pittsburgh, Pa.
Kahle Engrg. Co., Union City, N.J.
Solid State Equipment Corp., Fort Washington, Pa.

Machines, Induction Heating (Electronic)

Cober Elctrns., Inc., Stamford, Conn. Vol 1•545
Jade Corp., Huntingdon Valley, Pa. Vol 1•384
Cycle-Dyne, Inc., Jamaica, N.Y.
Taylor-Winfield Corp., Warren, Ohio
Westinghouse Elec., Sykesville, Md.

Machines, Lead Cutting & Forming

Harwil Co., Santa Monica, Calif.
Mann, Henry Inc., Feasterville, Pa.
Tech. Devices Co., Culver City, Calif.

Machines, Marking & Numbering

Ackerman Gould Co., Inc., Oceanside, N.Y.
Black & Webster, Inc., Waltham, Mass.
Bostitch, E. Greenwich, R.I.
Brady, W.H. Co., Milwaukee, Wisc.
Conrac Corp., Westminister, Cal.
GTI Corp. (E), Pittsburgh, Pa.
Hermes Plastics, Inc., New York, N.Y.
IPT Corp., Sunnyvale, Cal.
Kingsley Mach. Co., Hollywood, Calif.
Lectroetch, E. Cleveland, Ohio
Markem Corp., Keene, N.H.
Matthews, Jas & Co., Pittsburgh, Pa.
Monarch Marking Sys., Dayton, Ohio
Solatron Enterprises, Inglewood, Calif.
Universal Instrs., Binghamton, N.Y.

Machines, Mask Alignment & Exposure

Jade Corp., Huntingdon Valley, Pa. Vol 1•384
Chemical Etching Equip. & Supply, Alexandria, Va.
IPT Corp., Sunnyvale, Cal.
Mann, David W. Co., Burlington, Mass.
Opto-Metric Tools, Rockleigh, N.J.
Oriel Corp. of America, Stamford, Conn.
Research Devices, Berkeley Heights, N.J.

Machines, Metallizing, Vacuum—See Deposition Equipment, Vacuum

Machines, Parts Cleaning—See Machines, Cleaning

Machines, Plastic Molding

Alden Sys. Co., Inc., Westboro, Mass.
Chemical Etching Equip. & Supply, Alexandria, Va.
Custom Sci. Instrs., Inc., Whippany, N.J.
Di-Acro, Lake City, Minn.
H-P-M Div., Mt. Gilead, Ohio
Hull Corp., Hatboro, Pa.
K-Tech., Inc., Framingham, Mass.

Mann, Henry Inc., Feasterville, Pa.
Pentronix, Div., Lincoln Pk., Mich.
Wabash Metal Prods., Wabash, Ind.

Machines, Plating
Aubin, A.E. Co., Glastonbury, Conn.
Chemical Etching Equip. & Supply, Alexandria, Va.
Harshaw Chem. Co., Cleveland, Ohio
Opad Elec. Co., Inc., New York, N.Y.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Selectrons, Ltd., New York, N.Y.
Technic, Inc., Providence, R.I.
3M Co., St. Paul, Minn.

Machines, Printed Circuit Design & Artwork Generation
W-F Products, Inc., Denver, Co. Vol 1•934
Mann, David W. Co., Burlington, Mass.

Machines, Printed Circuit Drilling & Punching
A P Products, Inc., Painesville, Ohio
Chemical Etching Equip. & Supply, Alexandria, Va.
Di-Acro, Lake City, Minn.
Gardner-Denver Co., Quincy, Ill.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Mann, Henry Inc., Feasterville, Pa.
Superior Elec., Bristol, Conn.
Universal Instrs., Binghamton, N.Y.

Machines & Accessories, Semiconductor Manufacturing
Allied Chemical Corp., Morristown, N.J.
Amersil, Inc., Hillside, N.J.
Applied Materials Tech., Santa Clara, Cal.
Ewald Instrs. Corp., Kent, Conn.
GTI Corp. (E), Pittsburgh, Pa.
Hull Corp., Hatboro, Pa.
IPT Corp., Sunnyvale, Cal.
Kahle Engrg. Co., Union City, N.J.
Lepel High Frequency Labs., Maspeth, N.Y.
Pentronix, Div., Lincoln Pk., Mich.
Red Point Corp., Burbank, Calif.
Research Devices, Berkeley Heights, N.J.
Solid State Equipment Corp., Fort Washington, Pa.
Systonics, Inc., Winchester, Mass.
Tekform Prods. Co., Anaheim, Cal.
Temptronix Inc., Newton, Mass.
Universal Instrs., Binghamton, N.Y.
Wentworth Labs, Inc., Broadfield, Conn.

Machines, Shock Testing—See Testers, Shock

Machines, Solderability Testing
Chemical Etching Equip. & Supply, Alexandria, Va.
Electrovert, Mt. Vernon, N.Y.
Freudenberg, B., Inc., New York, N.Y.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Multicore Sales Corp., Westbury, N.Y.

Machines, Soldering—See Soldering Equip.

Machines, Spinner, Photo-Resist
Headway Research, Inc., Garland, Tex.

Machines, Terminal Installing
Amp Inc., Harrisburg, Pa.
Ark-Les Switch Corp., Watertown, Mass.
Berg Electronics, New Cumberland, Pa.
Black & Webster, Inc., Waltham, Mass.
Burndy Corp., Norwalk, Conn.
Elco, Willow Grove, Pa.
Molex Inc., Lisle, Ill.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Smith, Herman H., Inc., Bklyn., N.Y.
Universal Instrs., Binghamton, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Waldom Elctrns., Inc., Chicago, Ill.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

Machines, Transistor Assembling
GTI Corp. (E), Pittsburgh, Pa.
IPT Corp., Sunnyvale, Cal.
Kahle Engrg. Co., Union City, N.J.
Solid State Equipment Corp., Fort Washington, Pa.

Machines, Vibration Fatigue Testing—See Vibration Test Systems

Machines, Wafer Alignment—See Machines, Mask Alignment & Exposure

Machines, Whiteprint—See Whiteprint Machines

Machines, Wire Marking, Hand & Automatic—See Wire Marking Machines

Machines, Wire Measuring & Cutting—See Wire Measuring & Cutting Machines

Machines, Wire Wrapping-Also See Wire Wrapping Tools
General Radio Co., Concord, Mass.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Mann, Henry Inc., Feasterville, Pa.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Standard Logic, Santa Ana, Cal.
Superior Elec., Bristol, Conn.
Universal Instrs., Binghamton, N.Y.
Zippertubing Co., Los Angeles, Calif.

Magnetic Analyzers—See Analyzers, Magnetic

Magnetic Core Testers—See Testers, Magnetic Core

Magnetic Field Indicators—See Indicators, Magnetic Field

Magnetic Foil—See Foil, Magnetic

Magnetic Iron Oxides
Indiana General, Valparaiso, Ind.

Magnetic Recording Tape—See Tapes, Recording, Magnetic

Magnetic Shields & Materials—See Shields, Magnetic

Magnetic Tape Recorders—See Recorders, Magnetic Tape-Also See Data Recorders

Magnetizers
LDJ Electronics, Troy, Mich..... Vol 1•476
RFL Inds., Instr. Div., Boonton, N.J. Vol 1•497
Thomas & Skinner, Inc., Indianapolis, Ind. ..... Vol 1•515
Advanced Kinetics, Costa Mesa, Calif.
Arnold Engineering Co., Marengo, Ill.
Barnes & Reinecke, Inc., Chicago, Ill.
Coil Co. of Amer., Northvale, N.J.
GRM Corp., Medford, N.J.
Indiana General, Valparaiso, Ind.
Mag-Con, Inc., New Brighton, Minn.
Magnaflux Corp., Chicago, Ill.
Stearns Magnetics Inc., Cudahy, Wisc.

Magnetometers
Ohio Semitronics, Columbus, Ohio Vol 1•491
RFL Inds., Instr. Div., Boonton, N.J. Vol 1•497
Advanced Kinetics, Costa Mesa, Calif.
Automation Inds., Danbury, Conn.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Electro-Mechanics Co., Austin, Tex.
Honeywell, Minneapolis, Minn.
LDJ Electronics, Troy, Mich.
Princeton Applied Resch. Corp., Princeton, N.J.
Rank Precision Inds., Des Plaines, Ill.
Schonstedt Instr. Co., Reston, Va.
Varian Assocs., Palo Alto, Cal.
O. S. Walker Co., Worcester, Mass.

Magnetoresistors, Hall
American Aerospace Controls Inc., Farmingdale, N.Y. ..... Vol 2•332
LDJ Electronics, Troy, Mich.
Oxford Instr. Corp., Annapolis, Md.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.

Magnetron Testers—See Testers, Magnetron

Magnetrons—See Tubes, Magnetron

Magnets, Electromagnetic
Advanced Kinetics, Costa Mesa, Calif.
Coil Co. of Amer., Northvale, N.J.
Component Specialties, Temple City, Cal.
High Voltage Engrg. Corp., Burlington, Mass.
LDJ Electronics, Troy, Mich.
Ogallala Elctrns., Ogallala, Neb.
Process & Instrs. Corp., Brooklyn, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Stearns Magnetics Inc., Cudahy, Wisc.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Corp., Concord, Cal.
TDK Elctrns. Corp., Long Island City, N.Y.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Varian Assocs., Palo Alto, Cal.
O. S. Walker Co., Worcester, Mass.

Magnets, Focusing—See Magnets, Permanent

Magnets (Lab. Type)
LDJ Electronics, Troy, Mich..... Vol 1•476
Coil Co. of Amer., Northvale, N.J.
Colt Industries, Elizabethtown, Ky.
General Hardware Mfg. Co., New York, N.Y.
High Voltage Engrg. Corp., Burlington, Mass.
RFL Inds., Instr. Div., Boonton, N.J.
Shigoto Inds., Ltd., New York, N.Y.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Travel Wave Tube Div., Palo Alto, Cal.
O. S. Walker Co., Worcester, Mass.

Magnets, Permanent
Arnold Engineering Co., Marengo, Ill. Vol 3•1004
Ferronics, Inc., Fairport, N.Y. Vol 3•1009
Allen-Bradley Co., Milwaukee, Wisc.
Barker Elec. Sls., Ship Bottom, NJ
Bunting Magnetics Co., Franklin Park, Ill.
Ceramic Magnetics, Inc., Fairfield, N.J.
Colt Industries, Elizabethtown, Ky.
Edmund Scientific Co., Barrington, N.J.
Ferroxcube Corp., Saugertles, N.Y.
General Hardware Mfg. Co., New York, N.Y.
General Magnetic Corp., Detroit, Mich.
Hamilton Technology, Inc., Lancaster, Pa.
Hoskins Mfg. Co., Detroit, Mich.
Hudson Wire Co, Ossining, N.Y.
Indiana General, Valparaiso, Ind.
Moody Tools, Inc., Providence, R.I.
Murata Mfg. Co. Ltd., Kyoto, Japan
Nucleonic Prods., Canoga Pk, Cal.
Ogallala Elctrns., Ogallala, Neb.
Reed Switch Dev. Co., Greenwich, Conn.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Stackpole Carbon Co., Magnet Div., Kane, Pa.
Stearns Magnetics Inc., Cudahy, Wisc.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
Thomas & Skinner, Inc., Indianapolis, Ind.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Travel Wave Tube Div., Palo Alto, Cal.

Magnets, Superconducting
Advanced Kinetics, Costa Mesa, Calif.
American Magnetics, Oak Ridge, Tenn.
Colt Industries, Elizabethtown, Ky.
Columbia Superconductor & Cryogenics Co., Allentown, Pa.
Oxford Instr. Corp., Annapolis, Md.
Rol-a-chart Div., Diamond Springs, Ca.
Varian Assocs., Palo Alto, Cal.

Magnifying Glasses, Inspection
Bausch & Lomb, Rochester, N.Y.
EG&G, Inc., Bedford, Mass.
Mann, Henry Inc., Feasterville, Pa.
Opto-Metric Tools, Rockleigh, N.J.

Marker Strips—See Strips, Marker & Fanning

Markers, Dry Transfer—See Kits, Marking

Markers, Identification—See Labels; Nameplates

Markers, R-F—See Generators, Marker

Markers, Terminal—See Kits, Marking, etc.

Markers, Wire, Tab & Sleeve—See Wire Markers

Marking Inks—See Inks, Marking

Masers
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Conforming Matrix Corp., Toledo, Ohio

Mask Alignment & Exposure Systems—See Machines, Mask Alignment & Exposure

Masking Films—See Films, Masking

Masks, Fabrication, Deposition—See Services, Mask Making

Masts, Antenna—See Antenna Towers & Supports

Materials, Graphite
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Emerson & Cuming, Inc., Canton, Mass.
Pure Carbon Co., Inc., St. Marys, Pa.
Stackpole Carbon Co., Carbon Div., St. Marys, Pa.
Union Carbide, Carbon Prods. Div., New York, N.Y.

Materials, Self-Lubricating
Basic Ceramics Inc., Hawthorne, N.J.
Carbone Corp., Boonton, N.J.
Carborundum Co., Niagara Falls, N.Y.
Cerac, Inc., Butler, Wisc.
Chemplast, Inc., Wayne, N.J.
Dixon Corp., Bristol, R.I.
E.I. DuPont DeNemours & Co., Wilmington, Del.
GAF Corp., New York, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Ohio Carbon Co., Cleveland, Ohio
Pure Carbon Co., Inc., St. Marys, Pa.
Rogers Corp., Rogers, Conn.
Thiokol Chemical Div., Trenton, N.J.
Union Carbide, Carbon Prods. Div., New York, N.Y.

Matrices, Computer-Also See Boards, Programming
AD Automation, Rochester, N.Y. Vol 1•386
Info-Lite Corp., Corona, N.Y..... Vol 2•510
Interswitch, Burlingame, Cal. Vol 2•1077
LVC Inds. Inc., Flushing, N.Y. Vol 2•1046
Mac Panel Co., High Pt., N.C.... Vol 3•701

Sealectro Corp., Mamaroneck, N.Y. Vol 2•1133
Virginia Panel Corp., Waynesboro, Va. Vol 3•972
A. D. Data Sys., Inc., Rochester, N.Y.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Trompeter Elctrns., Chatsworth, Cal.

Mechanical Readouts—See Readouts, Electromechanical

Memories, Buffer

Advanced Memory Systems, Inc., Sunnyvale, Cal
American Astrionics, Costa Mesa, Cal
Corning Glass Works, Raleigh, N.C.
Design Elements, Columbus, Ohio
Mostek Corp., Carrollton, Tex.
National Semiconductor, Santa Clara, Cal.
NES, Inc., Itasca, Ill.
Princeton Elctrn. Prods., New Brunswick, N.J.
Signetics. Corp., Sunnyvale, Calif.
Telex Comm. Div., Minneapolis, Minn.
Texas Instruments, Dallas, Tex.

Memory Systems, Delay Line

Andersen Labs. Inc., Bloomfield, Conn. Vol 3•982
Computer Devices, Commack, N.Y. Vol 3•993
Bel Fuse, Inc., Jersey City, N.J.
Bliley Electric, Erie, Pa.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Corning Glass Works, Raleigh, N.C.
Di/An Controls, Inc., Boston, Mass.
Microsonics, Inc., Weymouth, Mass.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan

Memory Systems, Core

Ampex Corp., Redwood City, Calif.
Cambridge Memories, Inc., Concord, Mass.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Data General Corp. (E), Southboro, Ma.
Datapac, Inc., Costa Mesa, Cal.
Di/An Controls, Inc., Boston, Mass.
Digital Equip. Corp., Maynard, Mass.
Elctrn. Memories, Hawthorne, Cal.
Fabri-Tek, Inc., Minneapolis, Minn.
Fabri-Tek, Inc., Memory Products Div, Minneapolis, Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Lockheed Elctrns. Co., Watchung, N.J.
Lockheed Elctrns. Co., Los Angeles, Cal.
Standard Logic, Santa Ana, Cal.
Standard Memories, Inc., Ft. Lauderdale, Fla.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
Toledo Scale, Toledo, Ohio
Varian Assocs., Palo Alto, Cal.

Memory Systems, Disc

Burroughs Corp., Pasadena, Cal. Vol 1•330
Datum, Inc., Anaheim, Calif. .... Vol 1•340
Ampex Corp., Redwood City, Calif.
Applied Magnetics Corp., Goleta, Calif.
California Computer Prods., Anaheim, Cal
Data Disc, Inc., Sunnyvale, Cal.
Data General Corp. (E), Southboro, Ma.
Digital Dev. Corp., San Diego, Calif.
Digital Equip. Corp., Maynard, Mass.
Diva, Inc., Eatontown, N.J.
Elctrn. Memories, Hawthorne, Cal.
General Instr. Corp., Hawthorne, Cal.
Gould, Inc., Cleveland, Ohio
Microdata Corp., Irvine, Cal.
NES, Inc., Itasca, Ill.
Remex, Santa Ana, Cal.
Singer Co., Glendale, Cal.
Wang Labs., Inc., Tewksbury, Mass.

Memory Systems, Drum

Datum, Inc., Anaheim, Calif. .... Vol 1•340
Digital Equip. Corp., Maynard, Mass.
General Instr. Corp., Hawthorne, Cal.
Gould, Inc., Cleveland, Ohio
Kenton Engrg. Corp., Skokie, Ill.
NES, Inc., Itasca, Ill.
RCA Govt. & Comm. Sys., Moorestown, N.J.

Memory Systems, Tape

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Datum, Inc., Anaheim, Calif. .... Vol 1•340
Telex Comm. Div., Minneapolis, Minn. Vol 1•376
Ampex Corp., Redwood City, Calif.
Bell & Howell Co., Pasadena, Calif.
Burroughs Corp., Pasadena, Cal.
California Computer Prods., Anaheim, Cal
Collins Radio Co., Dallas, Tex.
Data General Corp. (E), Southboro, Ma.
Data Recording Sys., Sunnyvale, Cal.
Datacom, Inc., Ft. Walton Bch., Fla.
Digital Equip. Corp., Maynard, Mass.
Diva, Inc., Eatontown, N.J.
Gould, Inc., Cleveland, Ohio
Int'l. Computer Prods., Dallas, Tex.
Microdata Corp., Irvine, Cal.
NES, Inc., Itasca, Ill.
Raymond Engrg. Inc., Middletown, Conn.
Remex, Santa Ana, Cal.
Texas Instruments, Inc., Houston, Tex.
3M Co., St. Paul, Minn.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Wang Labs., Inc., Tewksbury, Mass.

Memory Systems, Thin-Film, Planar

Cambridge Memories, Inc., Concord, Mass.
NES, Inc., Itasca, Ill.
Rogers Corp., Rogers, Conn.

Memory Systems, Thin-Film, Plated Wire

Berg Electronics, New Cumberland, Pa.
Honeywell, Minneapolis, Minn.
Tohoku Metal Inds., Ltd., Tokyo, Japan

Memory Systems, Semiconductor

American Astrionics, Costa Mesa, Cal Vol 1•321
Computer Devices, Commack, N.Y. Vol 3•993
Advanced Memory Systems, Inc., Sunnyvale, Cal
Ampex Corp., Redwood City, Calif.
Cambridge Memories, Inc., Concord, Mass.
Clarke - Hess, New York, N.Y.
Data General Corp. (E), Southboro, Ma.
Datapac, Inc., Costa Mesa, Cal.
Di/An Controls, Inc., Boston, Mass.
Elctrn. Memories, Hawthorne, Cal.
Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa.
Lear Siegler, Inc., Santa Monica, Calif.
Mostek Corp., Carrollton, Tex.
National Semiconductor, Santa Clara, Cal.
Pacific Technology, Renton, Wash.
Ragen Precision Inds., Inc., N. Arlington, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Signetics. Corp., Sunnyvale, Calif.
Spectrum Dynamics, Inc., Ft. Lauderdale, Fla.
Standard Logic, Santa Ana, Cal.
Standard Memories, Inc., Ft. Lauderdale, Fla.
Texas Instruments, Dallas, Tex.
Xerox Data Sys., El Segundo, Cal

Metal Compounds, Foils, Powders, Sheet, Stock

Ad-Vance Magnetics, Rochester, Ind. Vol 3•1006
CRM, Div. Consolidated Refining Co., Mamaroneck, N.Y. ..... Vol 3•1092
Alpha Metals, Inc., Jersey City, N.J.
Bram Metallurgical-Chem. Co., Phila., Pa.
Cleveland Refractory Metals Div., Solon, Ohio
Colt Industries, Elizabethtown, Ky.
Fansteel Inc., N Chicago, Ill.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
Hamilton Technology, Inc., Lancaster, Pa.
Handy & Harman, New York, N.Y.
Kawecki Berylco Inds., Inc., New York, N.Y.
Leico Inds., Inc., New York, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Materials Technology, Inc., Somerset, N.J.
NL Inds., Inc., Metal Div., New York, N.Y.
Philips Elmet Corp., Lewiston, Me.
Reynolds Metals Co., Richmond, Va.
United Mineral & Chem. Corp., New York, N.Y.

Metal Oxides

Alpha Metals, Inc., Jersey City, N.J.
Baker, J.T. Chemical Co., Phillipsburg, N.J.
Dow Chemical Co., Midland, Mich.
Goldsmith Precious Metals Div., Chicago, Ill.
GTE Sylvania, Inc., Towanda, Pa.
Handy & Harman, New York, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
Int'l. Elctrn. Resch., Burbank, Cal.
Kawecki Berylco Inds., Inc., New York, N.Y.
Leico Inds., Inc., New York, N.Y.
M & T Chemicals Inc., Rahway, N.J.
Materials Resch. Corp., Orangeburg, N.Y.
Micrite Metal Mfg., Inc., Canoga Park, Cal.
Philadelphia Quartz Co., Phila., Pa.
Union Carbide, San Diego, Cal.
United Mineral & Chem. Corp., New York, N.Y.

Metal Parts—See Services, Metal Parts Fabrication

Metals, Clad

Alpha Metals, Inc., Jersey City, N.J.
Bram Metallurgical-Chem. Co., Phila., Pa.
CRM, Div. Consolidated Refining Co., Mamaroneck, N.Y.
GTE Sylvania Inc., Newark, N.J.
Handy & Harman, New York, N.Y.
Materials Technology, Inc., Somerset, N.J.
Revere Copper and Brass, Incorporated, New York, N.Y.
Reynolds Metals Co., Richmond, Va.
Synthane Taylor Corp., Valley Forge, Pa.
Texas Instruments, Attleboro, Mass.

Metals, High Purity

CRM, Div. Consolidated Refining Co., Mamaroneck, N.Y. ..... Vol 3•1092
Alpha Metals, Inc., Jersey City, N.J.
Anchor Alloys, Inc., Brooklyn, N.Y.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Bram Metallurgical-Chem. Co., Phila., Pa.
Cerac, Inc., Butler, Wisc.
Cleveland Refractory Metals Div., Solon, Ohio
Cohn, Sigmund, Mt. Vernon, N.Y.
Goldsmith Precious Metals Div., Chicago, Ill.
GTE Sylvania Inc., Newark, N.J.
Handy & Harman, New York, N.Y.
Kawecki Berylco Inds., Inc., New York, N.Y.
Kester Solder Co, Chicago, Ill.
Leico Inds., Inc., New York, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
NL Inds., Inc., Metal Div., New York, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
United Mineral & Chem. Corp., New York, N.Y.

Metals, Precious-Also See Powders, Precious Metal

CRM, Div. Consolidated Refining Co., Mamaroneck, N.Y. ..... Vol 3•1092
Alpha Metals, Inc., Jersey City, N.J.
Anchor Alloys, Inc., Brooklyn, N.Y.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Bram Metallurgical-Chem. Co., Phila., Pa.
Cerac, Inc., Butler, Wisc.
Cohn, Sigmund, Mt. Vernon, N.Y.
Electro-Science Labs., Pennsauken, N. J.
Goldsmith Precious Metals Div., Chicago, Ill.
Gte Sylvania Inc., Belmont, Cal.
Handy & Harman, New York, N.Y.
Leico Inds., Inc., New York, N.Y.
Materials for Elctrns., Inc., Jamaica, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Technic, Inc., Providence, R.I.
United Mineral & Chem. Corp., New York, N.Y.

Metals, Rare

Alpha Metals, Inc., Jersey City, N.J.
Anchor Alloys, Inc., Brooklyn, N.Y.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Associated Engrg. & Mfg. Corp., Upper Montclair, N. J.
Bram Metallurgical-Chem. Co., Phila., Pa.
Cerac, Inc., Butler, Wisc.
Cohn, Sigmund, Mt. Vernon, N.Y.
Dow Chemical Co., Midland, Mich.
Kawecki Berylco Inds., Inc., New York, N.Y.
Leico Inds., Inc., New York, N.Y.
Materials for Elctrns., Inc., Jamaica, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Technic, Inc., Providence, R.I.
United Mineral & Chem. Corp., New York, N.Y.

Metals, Refractory

Anchor Alloys, Inc., Brooklyn, N.Y.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Bram Metallurgical-Chem. Co., Phila., Pa.
Cerac, Inc., Butler, Wisc.
Cleveland Refractory Metals Div., Solon, Ohio
Colt Industries, Elizabethtown, Ky.
Fansteel Inc., N Chicago, Ill.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
GTE Sylvania, Inc., Towanda, Pa.
Kawecki Berylco Inds., Inc., New York, N.Y.
Leico Inds., Inc., New York, N.Y.
Mallory Metallurgical, Indianapolis, Ind.
Materials Resch. Corp., Orangeburg, N.Y.
Philips Elmet Corp., Lewiston, Me.
Semicon Assoc., Inc., Lexington, Ky.
United Mineral & Chem. Corp., New York, N.Y.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Metals, Semiconductor—See Crystals, Semiconductor

Metal-To-Glass Alloys—See Seals, Glass-To-Metal

Meter Cases—See Cases, Equipment

Meter Controllers—See Relays, Meter

Meter Expanders—See Multipliers, Meter

Meter Shunts—See Shunts, Meter

Meter Testers—See Testers, Meter

Meters, A-C Leakage Including Adapters

ITT Jennings, San Jose, Cal Vol 1•458,459
ITT Jennings, Instrus. & Systems, San Jose, Calif. ..... Vol 1•458,459
Triplett Corp., Bluffton, Ohio .. Vol 1•523

Meters, Acceleration

Unholtz-Dickie Corp., Hamden, Conn. Vol 1•530
Advanced Dynamic Instrs. Div., Alexandria, Va.
Bendix Corp., Davenport, Iowa
Columbia Resch. Labs., Woodlyn, Pa.
Dytronics Co., Columbus, Ohio
Endevco, Pasadena, Calif.
Engdahl Enterprises, Costa Mesa, Cal.
General Radio Co., Concord, Mass.
IMPACT-O-GRAPH Div., Bedford, Ohio
Larson Aero Dev., Concord, Calif.
Metrix Instr. Co., Houston, Tex.
Reliance Elec. Co., Cleveland, Ohio
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Teledyne Geotech, Dallas, Tex.
Vibration Instrs. Co., Anaheim, Cal.

Meters, Admittance

Freed Transformer Co., Bklyn., N.Y. Vol 1•445
Dranetz Engrg. Labs., So. Plainfield, N.J.
General Radio Co., Concord, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.

Meters, Ampere, A-C

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
Faria Meter Corp., Uncasville, Conn. Vol 1•443
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Newport Labs., Inc., Santa Ana, Cal. Vol 4•417*
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Triplett Corp., Bluffton, Ohio Vol 1•516,519,527
Allied Elctrns., Chicago, Ill.
Ammon Instrs., Inc., Manchester, N.H.
Amprobe Instr., Lynbrook, N.Y.
Ballantine Laboratories, Inc., Boonton,, N. J.
Biddle, James G., Plymouth Meeting, Pa.
Bristol Div, Waterbury, Conn
Columbia Elec. Mfg. Co., Cleveland, Ohio
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Elec., W. Lynn, Mass.
General Rand Corp., Edison, N.J.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hoyt Elec. Instr. Works, Belmont, Mass.
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Jonard Inds. Corp., Bronx, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
Leader Instruments Corp., Long Island City, N.Y.
LFE Corp., Waltham,, Mass.
Micro Instr. Co., Hawthorne, Cal.
NES, Inc., Itasca, Ill.
Q.V.S., Inc., East Orange, N.J.
Scientific Columbus, Columbus, Ohio
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Telmar, Inc., Columbus, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Ampere, D-C

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
Faria Meter Corp., Uncasville, Conn. Vol 1•443
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Newport Labs., Inc., Santa Ana, Cal. Vol 4•417*
Ohio Semitronics, Columbus, Ohio Vol 1•491
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Triplett Corp., Bluffton, Ohio Vol 1• 519,527-529
Allied Elctrns., Chicago, Ill.
Ammon Instrs., Inc., Manchester, N.H.
Amprobe Instr., Lynbrook, N.Y.
AUL Instrs., Inc., Flushng, N.Y.
Biddle, James G., Plymouth Meeting, Pa.
Columbia Elec. Mfg. Co., Cleveland, Ohio
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Dixson Inc., Meter Div., Grand Junction, Colo.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
ESE, Inglewood, Cal.
Esterline Angus Div., Indianapolis, Ind.
Faria, Thomas G. Corp., Uncasville, Conn.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Elec., W. Lynn, Mass.
General Rand Corp., Edison, N.J.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., Columbus, Ohio
Heath Co., Benton Harbor, Mich.
Hoyt Elec. Instr. Works, Belmont, Mass.
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Jonard Inds. Corp., Bronx, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
Leader Instruments Corp., Long Island City, N.Y.
LFE Corp., Waltham,, Mass.
Micro Instr. Co., Hawthorne, Cal.
NES, Inc., Itasca, Ill.
Q.V.S., Inc., East Orange, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Schauer Mfg. Corp., Cincinnati, Ohio
Scientific Columbus, Columbus, Ohio
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Telmar, Inc., Columbus, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.

Meters, Ampere, R-F

Ballantine Laboratories, Inc., Boonton,, N. J.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Brooklyn, N. Y.
Keithley Instrs., Inc., Cleveland, Ohio
Larson Instr. Co., Inc., Orangeburg, N.Y.
LFE Corp., Waltham,, Mass.
NES, Inc., Itasca, Ill.
Q.V.S., Inc., East Orange, N.J.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Triplett Corp., Bluffton, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Ampere, True RMS

Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Ballantine Laboratories, Inc., Boonton,, N. J.
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Columbia Elec. Mfg. Co., Cleveland, Ohio
Data Technology, Santa Ana, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Esterline Angus Div., Indianapolis, Ind.
General Elec., W. Lynn, Mass.
Inservco, Inc., La Grange, Ohio
Larson Instr. Co., Inc., Orangeburg, N.Y.
Leader Instruments Corp., Long Island City, N.Y.
NES, Inc., Itasca, Ill.
Q.V.S., Inc., East Orange, N.J.
Scientific Columbus, Columbus, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Triplett Corp., Bluffton, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Ampere-Hour

Curtis Instrs., Inc., Mt. Kisco, N.Y. Vol 1•418
Ohio Semitronics, Columbus, Ohio Vol 1•491
Data Technology, Santa Ana, Cal.
General Rand Corp., Edison, N.J.
Halmar Elctrns., Inc., Columbus, Ohio
NES, Inc., Itasca, Ill.
Sangamo Elec. Co., Springfield, Ill.
Technic, Inc., Providence, R.I.
Weston Instruments, Inc., Newark, N.J.

Meters, Attenuation

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Edison Elctrns. Div., Manchester, N.H.
General Microwave Corp., Farmingdale, N.Y.
Jewell Electrical Instrs., Manchester, N.H.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Q.V.S., Inc., East Orange, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Vari-L Co., Inc., Denver, Colo.
Weinschel Engrg. Co., Gaithersburg, Md.

Meters, Audio Level

Allied Elctrns., Chicago, Ill.
AUL Instrs., Inc., Flushng, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Ballantine Laboratories, Inc., Boonton,, N. J.
Bowmar/ALI, Inc., Acton, Mass.
Columbia Resch. Labs., Woodlyn, Pa.
Dixson Inc., Meter Div., Grand Junction, Colo.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Edison Elctrns. Div., Manchester, N.H.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Leader Instruments Corp., Long Island City, N.Y.
Modutec, Inc., Norwalk, Conn.
Pulsar Instruments, Inc., Redwood City, Cal.
Q.V.S., Inc., East Orange, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
3M Co., St. Paul, Minn.
Tracor, Inc., Austin, Tex.
Triplett Corp., Bluffton, Ohio
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.

Meters, Cable Testing—See Testers, Cable

Meters, Capacitance

Boonton Elctrns., Parsippany, N.J. Vol 1•404,405
Freed Transformer Co., Bklyn., N.Y. Vol 1•445
Hickok Elect. Instr., Cleveland, Ohio Vol 1•452; Vol 4•409*
London Co., Cleveland, Ohio .. Vol 1•478
Beckman Instrs., Cedar Grove, N.J.
Boonton Electronics Corp., Parsippany, N.J.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electro Sci. Inds., Portland, Ore.
Foxboro Co., Foxboro, Mass.
General Rand Corp., Edison, N.J.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Marconi Instrs., Englewood, N.J.
Micro Instr. Co., Hawthorne, Cal.
MSI Electronics, Inc., Woodside, N.Y.
Penn Airborne Prods., Southampton, Pa.
Robertshaw Controls Co., Richmond, Va.
Rohde & Schwarz Sls., Passaic, N.J.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Sprague Elec. Co., No. Adams, Mass.
Systron-Donner Corp., Concord, Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
Tektronix, Inc., Beaverton, Ore.
Wiltron Co., Palo Alto, Calif.

Meters, Clamp-On

Triplett Corp., Bluffton, Ohio .. Vol 1•516
General Elec., W. Lynn, Mass.
Sticht, Herman H. Co., Inc., New York, N.Y.
Weston Instruments, Inc., Newark, N.J.

Meters, Conductance

Beckman Instrs., Cedar Grove, N.J.
Dranetz Engrg. Labs., So. Plainfield, N.J.
General Elec., W. Lynn, Mass.
General Radio Co., Concord, Mass.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Midland Standard Inc., Elgin, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Weston Instruments, Inc., Newark, N.J.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Meters, Counting Rate, Nuclear

Beckman Instrs., (AISSD), Fullerton, Cal.
Eldorado Electrodata, Concord, Cal.
Milletron, Inc., Pittsburgh, Pa.
NES, Inc., Itasca, Ill.
Nuclear Resch. Corp., Southampton, Pa.
NUCOR Corp., Denville, N.J.
Packard Instrument Co., Inc., Downers Grove, Ill.
Soltec Corp., No. Hollywood, Cal.
SSR Instrs. Co., Santa Monica, Cal.
Victoreen Instr., Cleveland, Ohio

Meters, Decibel Indicating

Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
B & K Instrs., Inc., Cleveland, Ohio
Ballantine Laboratories, Inc., Boonton,, N. J.
CBS Laboratories, Stamford, Conn.
Chesterfield Prods. Inc., Saddle Brook, N. J.
Dixson Inc., Meter Div., Grand Junction, Colo.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Edison Elctrns. Div., Manchester, N.H.
ESE, Inglewood, Cal.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Gotham Audio Corp., New York, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Leader Instruments Corp., Long Island City, N.Y.
NES, Inc., Itasca, Ill.
Pacific Meas., Inc., Palo Alto, Calif.
Pulsar Instruments, Inc., Redwood City, Cal.
Q.V.S., Inc., East Orange, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Triplett Corp., Bluffton, Ohio
Vari-L Co., Inc., Denver, Colo.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

Meters, Distortion & Noise

Freed Transformer Co., Bklyn., N.Y. Vol 1•446
London Co., Cleveland, Ohio .. Vol 1•478
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
General Radio Co., Concord, Mass.

Heath Co., Benton Harbor, Mich.
Marconi Instrs., Englewood, N.J.
Micro Instr. Co., Hawthorne, Cal.
Quan-Tech, Whippany, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Simpson Elec. Co., Chicago, Ill.
Soltec Corp., No. Hollywood, Cal.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Triplett Corp., Bluffton, Ohio
Vibration Instrs. Co., Anaheim, Cal.
Vu-data Corp., San Diego, Cal.

Meters, Edge-Wise

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 1•449
Larson Instr. Co., Inc., Orangeburg, N.Y. Vol 1•477
Simpson Elec. Co., Chicago, Ill. Vol 1•502
Airpax Elctrns., Ft. Lauderdale, Fla.
Allied Elctrns., Chicago, Ill.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
General Elec., W. Lynn, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Hoyt Elec. Instr. Works, Belmont, Mass.
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
LFE Corp., Waltham,, Mass.
Mura Corp., Jericho, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Telmar, Inc., Columbus, Ohio
Triplett Corp., Bluffton, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Elapsed Time—See Indicators, Elapsed Time

Meters, Electrometer

Beckman Instrs., (AISSD), Fullerton, Cal.
Bioelectric Instrs., Farmingdale, N.Y.
Corning Glass Works, Medfield, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Rand Corp., Edison, N.J.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Int'l. Instrs., Orange, Conn.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Milletron, Inc., Pittsburgh, Pa.
Packard Instrument Co., Inc., Downers Grove, Ill.
Princeton Applied Resch. Corp., Princeton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Simpson Elec. Co., Chicago, Ill.
Soltec Corp., No. Hollywood, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Telmar, Inc., Columbus, Ohio
Varian Assocs., Palo Alto, Cal.
Victoreen Instr., Cleveland, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Electronic Micrometer —See Micrometers, Electronic

Meters, Field Strength

Instrs. For Ind., Inc., Farmingdale, N.Y. Vol 1•461
LDJ Electronics, Troy, Mich. ..... Vol 1•476
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal. ..... Vol 1•507
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal. ..... Vol 1•507
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Delta-Benco Ltd., Rexdale, Ont., Can.
Edison Elctrns. Div., Manchester, N.H.
Elcom Sys., Deer Pk., N.Y.
Electro-Mechanics Co., Austin, Tex.
Honeywell, Denver, Colo.
Jerrold Electronics Corp., Philadelphia, Pa.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Leader Instruments Corp., Long Island City, N.Y.
Magnaflux Corp., Chicago, Ill.
Mobil Elctrns., Inc., Anderson, Ind.
Narda Microwave Corp., Plainview, N.Y.
Oxford Instr. Corp., Annapolis, Md.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Shurite Meters, New Haven, Conn.
Solar Elctrns. Co., Hollywood, Cal.
Varian Assocs., Palo Alto, Cal.
O. S. Walker Co., Worcester, Mass.

Meters, Fluid Flow

Airpax Elctrns., Ft. Lauderdale, Fla.
Carolina Medical Elctrns., Inc., King, N.C.
Datametrics Inc., Wilmington, Mass.
Erdco Engrg. Corp., Addison, Ill.
Lion Precision Corp, Newton, Mass.
Tylan Corp., Torrance, Calif.

Meters, Flutter & Wow

BECO, Inc., Salem, Va.
Gotham Audio Corp., New York, N.Y.
Instrumentation Prods., Camarillo, Cal.
Kenton Engrg. Corp., Skokie, Ill.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Kikusui Elctrns. Inc., New York, N.Y.
Leader Instruments Corp., Long Island City, N.Y.
RIL Elctrns., Inc., Southampton, Pa.
Video Research Corp., Gaithersburg, Md.

Meters, Flux

LDJ Electronics, Troy, Mich. ..... Vol 1•476
Thomas & Skinner, Inc., Indianapolis, Ind. ..... Vol 1•515
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
General Rand Corp., Edison, N.J.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
High Voltage Engrg. Corp., Burlington, Mass.
RFL Inds., Instr. Div., Boonton, N.J.
O. S. Walker Co., Worcester, Mass.

Meters, F-M Deviation

Marconi Instrs., Englewood, N.J. Vol 1•484
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
A.R.F. Products, Inc., Boulder, Colo.
Edison Elctrns. Div., Manchester, N.H.
Kratos, Pasadena, Cal
London Co., Cleveland, Ohio
Rohde & Schwarz Sls., Passaic, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Video Research Corp., Gaithersburg, Md.

Meters, Frequency

Arnoux Corp., Santa Barbara, Cal Vol 1•390
Biddle, James G., Plymouth Meeting, Pa. ..... Vol 1•399
Electronic Research Co., Shawnee Mission, Kan. ..... Vol 1•431
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
J-B-T Instrs., Inc., New Haven, Conn. Vol 2•1083
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
American Time Products, Woodside, N.Y.
AMF Electical Prods., Alexandria, Va.
Anadex Instrs., Inc., Van Nuys, Calif.
Avtron Mfg., Inc., Cleveland, Ohio
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
CCA Elctrns. Corp., Gloucester, N.J.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dixson Inc., Meter Div., Grand Junction, Colo.
Edison Elctrns. Div., Manchester, N.H.
Eldorado Electrodata, Concord, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
ESE, Inglewood, Cal.
Esterline Angus Div., Indianapolis, Ind.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
General Elec., W. Lynn, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Hathaway Instruments, Inc., Denver, Colo.
Heath Co., Benton Harbor, Mich.
Integrated Systems, Inc., Norcross, Ga.
Keltron Corp., Waltham, Mass.
Kratos, Pasadena, Cal
Leader Instruments Corp., Long Island City, N.Y.
Marconi Instrs., Englewood, N.J.
Matrix Corp., Beech Grove, Ind.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Q.V.S., Inc., East Orange, N.J.
Quan-Tech, Whippany, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Soltec Corp., No. Hollywood, Cal.
Sticht, Herman H. Co., Inc., New York, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Concord Instr. Div., Concord, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tempo Instrument, Inc., Plainview, N.Y.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Tracor, Inc., Austin, Tex.
TRG Prods., E. Boston, Mass.
Tucker Electronics Co., Garland, Tex.
UTE Microwave, Asbury Park, N.J.
Video Research Corp., Gaithersburg, Md.
Waters Mfg., Inc., Wayland, Mass.
Waveline, Inc., W. Caldwell, N.J.
Western Reserve Elctrns., Twinsburg, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Frequency Deviation

Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
American Time Products, Woodside, N.Y.
AMF Electical Prods., Alexandria, Va.
Anadex Instrs., Inc., Van Nuys, Calif.
Avtron Mfg., Inc., Cleveland, Ohio
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Edison Elctrns. Div., Manchester, N.H.
Frequency Elctrns., New Hyde Pk., N.Y.
Hathaway Instruments, Inc., Denver, Colo.
Kratos, Pasadena, Cal
Microwave/Sys., Inc., E. Syracuse, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Solidstate Controls, Inc., Columbus, Ohio
Soltec Corp., No. Hollywood, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tracor, Inc., Austin, Tex.
Video Research Corp., Gaithersburg, Md.
Weston Instruments, Inc., Newark, N.J.

Meters, Frequency (Digital)

Berkeley Instrs., Inc., Santa Ana, Cal. Vol 1•392
Electronic Research Co., Shawnee Mission, Kan. ..... Vol 1•431
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Newport Labs., Inc., Santa Ana, Cal. Vol 4•419*
North Atlantic Inds., Plainview, N.Y. Vol 1•365
American Time Products, Woodside, N.Y.
Anadex Instrs., Inc., Van Nuys, Calif.
Avtron Mfg., Inc., Cleveland, Ohio
Ballantine Laboratories, Inc., Boonton,, N. J.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Calico Div., San Diego, Cal.
California Instrs. Co., San Diego, Cal.
Dana Labs., Inc., Irvine, Calif.
Eldorado Electrodata, Concord, Cal.
ESE, Inglewood, Cal.
Frequency Elctrns., New Hyde Pk., N.Y.
General Radio Co., Concord, Mass.
Heath Co., Benton Harbor, Mich.
Integrated Systems, Inc., Norcross, Ga.
Keltron Corp., Waltham, Mass.
Leader Instruments Corp., Long Island City, N.Y.
Marconi Instrs., Englewood, N.J.
Milletron, Inc., Pittsburgh, Pa.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
Quan-Tech, Whippany, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Sequential Information Systems, Elmsford, N.Y.
Simpson Elec. Co., Chicago, Ill.
Speed Detectors, Bedford, Ohio
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tektronix, Inc., Beaverton, Ore.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Tracor, Inc., Austin, Tex.
Tucker Electronics Co., Garland, Tex.
Vibration Instrs. Co., Anaheim, Cal.

Meters, Galvanometer

Electronic Dev. Corp., Boston, Mass. Vol 1•429
Hathaway Industries Inc., Tulsa, Okla. Vol 1•451
Hathaway Instruments, Inc., Denver, Colo. ..... Vol 1•451
Shallcross, Selma, N.C. ..... Vol 1•501
Beckman Instrs., Cedar Grove, N.J.
Bell & Howell Co., Pasadena, Calif.
Coleman Instr. Div., Oak Brook, Ill.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Rand Corp., Edison, N.J.
Geo Space, Houston, Tex.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Honeywell, Denver, Colo.
Keithley Instrs., Inc., Cleveland, Ohio
Larson Instr. Co., Inc., Orangeburg, N.Y.
NES, Inc., Itasca, Ill.
Penn Airborne Prods., Southampton, Pa.
Photron Instr. Co., Cleveland, Ohio
Q.V.S., Inc., East Orange, N.J.
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Weston Instruments, Inc., Newark, N.J.

Meters, Gauss

RFL Inds., Instr. Div., Boonton, N.J. Vol 1•497
Thomas & Skinner, Inc., Indianapolis, Ind. ..... Vol 1•515
Electro-Mechanics Co., Austin, Tex.
LDJ Electronics, Troy, Mich.
Matheson Gas Products, East Rutherford, N.J.
Ohio Semitronics, Columbus, Ohio
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Corp., Concord, Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
O. S. Walker Co., Worcester, Mass.

Meters, Grid Dip

Millen, James Mfg., Malden, Mass. Vol 1•482
Edison Elctrns. Div., Manchester, N.H.
Leader Instruments Corp., Long Island City, N.Y.
Millen, James Mfg., Malden, Mass.

Meters, Illuminated Scale

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Hickok Elect. Instr., Cleveland, Ohio
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Kratos, Pasadena, Cal

LFE Corp., Waltham,, Mass.
Modutec, Inc., Norwalk, Conn.
NES, Inc., Itasca, Ill.
Q.V.S., Inc., East Orange, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Triplett Corp., Bluffton, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Impedance

Bafco, Inc., Warminster, Pa. .... Vol 1•393
Alford Mfg. Co., Winchester, Mass.
Beckman Instrs., Cedar Grove, N.J.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Freed Transformer Co., Bklyn., N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Leader Instruments Corp., Long Island City, N.Y.
London Co., Cleveland, Ohio
Marconi Instrs., Englewood, N.J.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
NES, Inc., Itasca, Ill.
PRD Elctrns., Inc., Westbury, N.Y.
RFL Inds., Instr. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Triplett Corp., Bluffton, Ohio
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.

Meters, Inductance

Boonton Elctrns., Parsippany, N.J. Vol 1•403-405
Freed Transformer Co., Bklyn., N.Y. Vol 1•445
London Co., Cleveland, Ohio .. Vol 1•478
Beckman Instrs., Cedar Grove, N.J.
Boonton Electronics Corp., Parsippany, N.J.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electro-Mechanical Instr. Div., Perkasie, Pa.
General Radio Co., Concord, Mass.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Marconi Instrs., Englewood, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Sprague Elec. Co., No. Adams, Mass.
Systron-Donner Corp., Concord, Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
Tektronix, Inc., Beaverton, Ore.

Meters, Infrared

Barnes Engrg. Co., Stamford, Conn.
Mikron Instr. Co., Ridgewood, N.J.
Omega Engrg., Inc., Stamford, Conn.

Meters, Intermodulation

Edison Elctrns. Div., Manchester, N.H.
Marconi Instrs., Englewood, N.J.

Meters, Kilovolt

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Hipotronics, Inc., Brewster, N.Y. Vol 1•455
ITT Jennings, San Jose, Cal Vol 1•458,459
ITT Jennings, Instrus. & Systems, San Jose, Calif. ..... Vol 1•458,459
Ross Engrg. Corp., Campbell, Cal. Vol 2•871
Associated Resch., Chicago, Ill.
Ballantine Laboratories, Inc., Boonton,, N. J.
Beckman Instrs., Cedar Grove, N.J.
Bertan Assocs., Inc., Hicksville, N.Y.
Biddle, James G., Plymouth Meeting, Pa.
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Digilin, Inc., Glendale, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec., W. Lynn, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Brooklyn, N. Y.
J-Omega Co., Mountain View, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Kilovolt Corp., Hackensack, N.J.
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
Megavolt, Inc., New York, N.Y.
Modutec, Inc., Norwalk, Conn.
NES, Inc., Itasca, Ill.
Peschel Instrs., Cape Coral, Fla.
Plastic Capacitors, Inc., Chicago, Ill.
Pomona Elctrns. Co., Inc., Pomona, Cal.
Q.V.S., Inc., East Orange, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Triplett Corp., Bluffton, Ohio
Universal Voltronics Corp., Mt. Kisco, N.Y.
Venus Scientific, Farmingdale, N.Y.
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Kilowatt

Bird Elctrn., Cleveland, Ohio.... Vol 1•396
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Ohio Semitronics, Columbus, Ohio Vol 1•491
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec., W. Lynn, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., Columbus, Ohio
Kratos, Pasadena, Cal
NES, Inc., Itasca, Ill.
Sangamo Elec. Co., Springfield, Ill.
Scientific Columbus, Columbus, Ohio
Scientific Educational Prods., N.Y., N.Y.
Simpson Elec. Co., Chicago, Ill.
Triplett Corp., Bluffton, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Laser Energy—See Monitors, Laser Energy

Meters, Light (Non Photographic)

K. C. C. Shokai Ltd., Nada-ku, Kobe 657, Japan ..... Vol 2•512
Vactec, Maryland Hgts., Mo..... Vol 2•679
Atlas Electric Devices, Chicago, Ill.
Bendix Corp., Sturbridge, Mass.
Davidson Elctrn. Dev. Co., Erie, Pa.
EG & G, Inc., Salem, Mass.
Gamma Sci., San Diego, Cal.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Oriel Corp. of America, Stamford, Conn.
Photo Resch. Corp., Burbank, Calif.
Process & Instrs. Corp., Brooklyn, N.Y.
Shurite Meters, New Haven, Conn.
SSR Instrs. Co., Santa Monica, Cal.
United Detector Technology Inc., Santa Monica, Cal.
Weston Instruments, Inc., Newark, N.J.
Zoomar, Inc., Glen Cove, N.Y.

Meters, Megohm

Associated Resch., Chicago, Ill. Vol 1•389
Freed Transformer Co., Bklyn., N.Y. Vol 1•444
Hickok Elect. Instr., Cleveland, Ohio Vol 1•452,453
London Co., Cleveland, Ohio .. Vol 1•478
Slaughter Co., Ardmore, Okla. Vol 1•505
B & K Instrs., Inc., Cleveland, Ohio
Beckman Instrs., Cedar Grove, N.J.
Biddle, James G., Plymouth Meeting, Pa.
Calico Div., San Diego, Cal.
California Instrs. Co., San Diego, Cal.
Data Precision Corporation, Wakefield, Mass.
Digilin, Inc., Glendale, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Radio Co., Concord, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hipotronics, Inc., Brewster, N.Y.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
J-Omega Co., Mountain View, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Mura Corp., Jericho, N.Y.
Penn Airborne Prods., Southampton, Pa.
Q.V.S., Inc., East Orange, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Ross Engrg. Corp., Campbell, Cal.
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Sticht, Herman H. Co., Inc., New York, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Triplett Corp., Bluffton, Ohio
Western Reserve Elctrns., Twinsburg, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Microampere

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
Faria Meter Corp., Uncasville, Conn. Vol 1•443
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Triplett Corp., Bluffton, Ohio Vol 1•519,527-529
Airpax Elctrns., Ft. Lauderdale, Fla.
Allied Elctrns., Chicago, Ill.
Ammon Instrs., Inc., Manchester, N.H.
Amprobe Instr., Lynbrook, N.Y.
AUL Instrs., Inc., Flushng, N.Y.
Ballantine Laboratories, Inc., Boonton,, N. J.
Biddle, James G., Plymouth Meeting, Pa.
Data Precision Corporation, Wakefield, Mass.
Digilin, Inc., Glendale, Cal.
Dixson Inc., Meter Div., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Esterline Angus Div., indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Elec., W. Lynn, Mass.
General Radio Co., Concord, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hoyt Elec. Instr. Works, Belmont, Mass.
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Keithley Instrs., Inc., Cleveland, Ohio
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
LFE Corp., Waltham,, Mass.
Mura Corp., Jericho, N.Y.
Q.V.S., Inc., East Orange, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Victoreen Instr., Cleveland, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Micro-Microampere—See Meters, Nanoampere

Meters, Micro-Nanovolt—See Meters, Nanovolt

Meters, Microhm

Hickok Elect. Instr., Cleveland, Ohio Vol 1•452
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Associated Resch., Chicago, Ill.
Biddle, James G., Plymouth Meeting, Pa.
General Radio Co., Concord, Mass.
Gotham Audio Corp., New York, N.Y.
Int'l. Instrs., Orange, Conn.
Keithley Instrs., Inc., Cleveland, Ohio
Mura Corp., Jericho, N.Y.
NES, Inc., Itasca, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Weston Instruments, Inc., Newark, N.J.

Meters, Microvolt

Boonton Elctrns., Parsippany, N.J. Vol 1•406,407
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Allied Elctrns., Chicago, Ill.
Ballantine Laboratories, Inc., Boonton,, N. J.
Biddle, James G., Plymouth Meeting, Pa.
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Data Technology, Santa Ana, Cal.
Digilin, Inc., Glendale, Cal.
Doric Sci. Corp., San Diego, Calif.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Electro-Numerics, Santa Clara, Cal.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Microwave Corp., Farmingdale, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Hy-Cal Engrg., Santa Fe Springs, Cal.
Innovatek Enterprise, Millerton, N.Y.
Instrument Displays, Waltham, Mass.
Int'l. Instrs., Orange, Conn.
Keithley Instrs., Inc., Cleveland, Ohio
Kratos, Pasadena, Cal
Mura Corp., Jericho, N.Y.
NES, Inc., Itasca, Ill.
Newport Labs., Inc., Santa Ana, Cal.
North Atlantic Inds., Plainview, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Educational Prods., N.Y., N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Telmar, Inc., Columbus, Ohio
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Victoreen Instr., Cleveland, Ohio
Western Reserve Elctrns., Twinsburg, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Microwave

Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
Instrument Displays, Waltham, Mass.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
NES, Inc., Itasca, Ill.
Pacific Meas., Inc., Palo Alto, Calif.
Polarad Elctrn. Instrs., Lake Success, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Systron-Donner Concord Instr. Div., Concord, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.
Vari-L Co., Inc., Denver, Colo.
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Western Reserve Elctrns., Twinsburg, Ohio

Meters, Milliampere

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
Faria Meter Corp., Uncasville, Conn. Vol 1•443
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Hoyt Elec. Instr. Works, Belmont, Mass. Vol 1•456,457
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Triplett Corp., Bluffton, Ohio Vol 1•519,527-529
Airpax Elctrns., Ft. Lauderdale, Fla.
Allied Elctrns., Chicago, Ill.
Ammon Instrs., Inc., Manchester, N.H.
Amprobe Instr., Lynbrook, N.Y.
Ballantine Laboratories, Inc., Boonton,, N. J.
Biddle, James G., Plymouth Meeting, Pa.
Data Precision Corporation, Wakefield, Mass.
Data Technology, Santa Ana, Cal.
Digilin, Inc., Glendale, Cal.
Dixson Inc., Meter Div., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Esterline Angus Div., Indianapolis, Ind.
General Elec., W. Lynn, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Rand Corp., Edison, N.J.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Honeywell, Ft. Washington, Pa.
Ideal Precision Meter Co., Brooklyn, N. Y.
Instrument Displays, Waltham, Mass.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
LFE Corp., Waltham,, Mass.
Mura Corp., Jericho, N.Y.
NES, Inc., Itasca, Ill.
Q.V.S., Inc., East Orange, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Taylor Instr. Process Control Div., Rochester, N.Y.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Western Reserve Elctrns., Twinsburg, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.

Meters, Milliohm

Hickok Elect. Instr., Cleveland, Ohio Vol 1•452,453
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Associated Resch., Chicago, Ill.
Biddle, James G., Plymouth Meeting, Pa.
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Data Technology, Santa Ana, Cal.
Electro-Numerics, Santa Clara, Cal.
General Radio Co., Concord, Mass.
Innovatek Enterprise, Millerton, N.Y.
Int'l. Instrs., Orange, Conn.
Keithley Instrs., Inc., Cleveland, Ohio
Mura Corp., Jericho, N.Y.
NES, Inc., Itasca, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Triplett Corp., Bluffton, Ohio
Western Reserve Elctrns., Twinsburg, Ohio

Meters, Millivolt

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Boonton Elctrns., Parsippany, N.J. Vol 1•406,407
Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Newport Labs., Inc., Santa Ana, Cal. Vol 4•417*
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Triplett Corp., Bluffton, Ohio Vol 1•528,529
Airpax Elctrns., Ft. Lauderdale, Fla.
Allied Elctrns., Chicago, Ill.
AMF Electical Prods., Alexandria, Va.
Ammon Instrs., Inc., Manchester, N.H.
Amprobe Instr., Lynbrook, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Ballantine Laboratories, Inc., Boonton,, N. J.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Biddle, James G., Plymouth Meeting, Pa.
Bristol Div, Waterbury, Conn
Coleman Instr. Div., Oak Brook, Ill.
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Data Technology, Santa Ana, Cal.
Digilin, Inc., Glendale, Cal.
Doric Sci. Corp., San Diego, Calif.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec., W. Lynn, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Rand Corp., Edison, N.J.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Honeywell, Ft. Washington, Pa.
Hoyt Elec. Instr. Works, Belmont, Mass.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Ideal Precision Meter Co., Brooklyn, N. Y.
Ind'l. Test Equip., Clifton, NJ
Innovatek Enterprise, Millerton, N.Y.
Instrument Displays, Waltham, Mass.
Int'l. Instrs., Orange, Conn.
J-Omega Co., Mountain View, Calif.
Jewell Electrical Instrs., Manchester, N.H.
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Kratos, Pasadena, Cal
LFE Corp., Waltham,, Mass.
Mura Corp., Jericho, N.Y.
London Co., Cleveland, Ohio
Marconi Instrs., Englewood, N.J.
Micro Instr. Co., Hawthorne, Cal.
Mura Corp., Jericho, N.Y.
NES, Inc., Itasca, Ill.
North Atlantic Inds., Plainview, N.Y.
Q.V.S., Inc., East Orange, N.J.
Radiation Devices Co., Baltimore, Md.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Telmar, Inc., Columbus, Ohio
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Trio Labs, Inc., Plainview, N.Y.
Western Reserve Elctrns., Twinsburg, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Modulation

London Co., Cleveland, Ohio .. Vol 1•478
Marconi Instrs., Englewood, N.J. Vol 1•484
Avtron Mfg., Inc., Cleveland, Ohio
CCA Elctrns. Corp., Gloucester, N.J.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Edison Elctrns. Div., Manchester, N.H.
Kratos, Pasadena, Cal
NES, Inc., Itasca, Ill.
Zoomar, Inc., Glen Cove, N.Y.

Meters, Moving Scale

Jonard Inds. Corp., Bronx, N.Y.
Q.V.S., Inc., East Orange, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Weston Instruments, Inc., Newark, N.J.

Meters, Multitester

GC Electronics, Rockford, Ill.. Vol 3•679
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Test & Measuring Instrs. Inc., Hicksville, N.Y. ..... Vol 4•423*
Triplett Corp., Bluffton, Ohio Vol 1•516-518,520-523,525
Amprobe Instr., Lynbrook, N.Y.
Associated Resch., Chicago, Ill.
Biddle, James G., Plymouth Meeting, Pa.
Components Specialties, Freeport, N.Y.
Data Precision Corporation, Wakefield, Mass.
Data Technology, Santa Ana, Cal.
Doric Sci. Corp., San Diego, Calif.
Epic, Inc., New York, N.Y.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Freed Transformer Co., Bklyn., N.Y.
General Rand Corp., Edison, N.J.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Int'l. Components Corp., Farmingdale, N. Y.
J-Omega Co., Mountain View, Calif.
Jewell Electrical Instrs., Manchester, N.H.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Leader Instruments Corp., Long Island City, N.Y.
London Co., Cleveland, Ohio
Mura Corp., Jericho, N.Y.
Q.V.S., Inc., East Orange, N.J.
Radiation Devices Co., Baltimore, Md.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Schauer Mfg. Corp., Cincinnati, Ohio
Scientific Columbus, Columbus, Ohio
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Weston Instruments, Inc., Newark, N.J.

Meters, Multitester (Digital)

Allied Elctrns., Chicago, Ill. ..... Vol 1•387
California Instrs. Co., San Diego, Cal. Vol 1•409
Data Precision Corporation, Wakefield, Mass. ..... Vol 1•419
Dynascan Corp., Chicago, Ill. .. Vol 1•401
Hickok Elect. Instr., Cleveland, Ohio Vol 4•409*
Julie Research Lab., New York, N.Y. Vol 1•465
Simpson Elec. Co., Chicago, Ill. Vol 1•503
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Tektronix, Inc., Beaverton, Ore. Vol 1• 513
Triplett Corp., Bluffton, Ohio Vol 1•524; Vol 4•427*
Calico Div., San Diego, Cal.
Cubic Corp., San Diego, Cal.
Dana Labs., Inc., Irvine, Calif.
Data Technology, Santa Ana, Cal.
Digilin, Inc., Glendale, Cal.
Dixson Inc., Meter Div., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Dytro Corp., Hicksville, N.Y.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
ESE, Inglewood, Cal.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Rand Corp., Edison, N.J.
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Leader Instruments Corp., Long Island City, N.Y.
NES, Inc., Itasca, Ill.
NOBEX Div., Burlingame, Cal.
Rohde & Schwarz Sls., Passaic, N.J.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Test & Measuring Instrs. Inc., Hicksville, N.Y.
United Sys. Corp., Dayton, Ohio
Western Reserve Elctrns., Twinsburg, Ohio
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.

Meters, Multitester (Potentiometric)

Allied Elctrns., Chicago, Ill. ..... Vol 1•387
Biddle, James G., Plymouth Meeting, Pa. ..... Vol 1•399
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Doric Sci. Corp., San Diego, Calif.
Esterline Angus Div., Indianapolis, Ind.
Guildline Instrs., Inc., Larchmont, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Western Reserve Elctrns., Twinsburg, Ohio

Meters, Nanampere

Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Doric Sci. Corp., San Diego, Calif.
Elcor Prods. Welex Elctrns., Silver Spring, Md.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec., W. Lynn, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Simpson Elec. Co., Chicago, Ill.
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Victoreen Instr., Cleveland, Ohio

Meters, Nanovolt

Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Doric Sci. Corp., San Diego, Calif.
General Elec., W. Lynn, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Quan-Tech, Whippany, N.J.
Simpson Elec. Co., Chicago, Ill.
Systron-Donner Concord Instr. Div., Concord, Cal.
Test & Measuring Instrs. Inc., Hicksville, N.Y.

Meters, Noise-Figure

Kay Elemetrics, Pine Brook, N.J. Vol 1•472
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal. ..... Vol 1•507
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal. ..... Vol 1•507
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
B & K Instrs., Inc., Cleveland, Ohio
Elcom Sys., Deer Pk., N.Y.

General Microwave Corp., Farmingdale, N.Y.
Metrix Instr. Co., Houston, Tex.
Quan-Tech, Whippany, N.J.
Solatron Enterprises, Inglewood, Calif.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Triplett Corp., Bluffton, Ohio
Vari-L Co., Inc., Denver, Colo.

Meters, Null

Brown Electro-Meas. Corp., Kirkland, Wash. ..... Vol 1•398
Freed Transformer Co., Bklyn., N.Y. Vol 1•445
Jewell Electrical Instrs., Manchester, N.H. ..... Vol 1•463
Julie Research Lab., New York, N.Y. Vol 1•467
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Triplett Corp., Bluffton, Ohio .. Vol 1•527
Ammon Instrs., Inc., Manchester, N.H.
AUL Instrs., Inc., Flushng, N.Y.
Ballantine Laboratories, Inc., Boonton,, N. J.
Dixson Inc., Meter Div., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electro Sci. Inds., Portland, Ore.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Hoyt Elec. Instr. Works, Belmont, Mass.
Ideal Precision Meter Co., Brooklyn, N. Y.
Ind'l. Test Equip., Clifton, NJ
Int'l. Instrs., Orange, Conn.
Keithley Instrs., Inc., Cleveland, Ohio
Larson Instr. Co., Inc., Orangeburg, N.Y.
LFE Corp., Waltham,, Mass.
McKee-Pedersen Instrs., Danville, Calif.
Mura Corp., Jericho, N.Y.
North Atlantic Inds., Plainview, N.Y.
Q.V.S., Inc., East Orange, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Trio Labs, Inc., Plainview, N.Y.
Weinschel Engrg. Co., Gaithersburg, Md.
Western Reserve Elctrns., Twinsburg, Ohio
Zi-Tech Div., Palo Alto, Cal.

Meters, Ohm

California Instrs. Co., San Diego, Cal. Vol 1•409
Freed Transformer Co., Bklyn., N.Y. Vol 1•445,447
Hickok Elect. Instr., Cleveland, Ohio Vol 1•452,453
Hipotronics, Inc., Brewster, N.Y. Vol 1•454,455
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London Co., Cleveland, Ohio .. Vol 1•478
Shallcross, Selma, N.C. ..... Vol 1•501
Slaughter Co., Ardmore, Okla. Vol 1•505
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Triplett Corp., Bluffton, Ohio Vol 1•519,527
Amprobe Instr., Lynbrook, N.Y.
Anderson, W.E., Inc., Kansas City, Mo.
Associated Resch., Chicago, Ill.
Beckman Instrs., Cedar Grove, N.J.
Biddle, James G., Plymouth Meeting, Pa.
Components Specialties, Freeport, N.Y.
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Digilin, Inc., Glendale, Cal.
Eldorado Electrodata, Concord, Cal.
Electro-Numerics, Santa Clara, Cal.
Electro Sci. Inds., Portland, Ore.
ESE, Inglewood, Cal.
GC Electronics, Rockford, Ill.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Int'l. Instrs., Orange, Conn.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
J-Omega Co., Mountain View, Calif.
Jewell Electrical Instrs., Manchester, N.H.
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Leader Instruments Corp., Long Island City, N.Y.
Mura Corp., Jericho, N.Y.
Q.V.S., Inc., East Orange, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sticht, Herman H. Co., Inc., New York, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Thomas & Betts Co., Elizabeth, N.J.
Western Reserve Elctrns., Twinsburg, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Panel (D'Arsonval Movement)

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
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Faria Meter Corp., Uncasville, Conn. Vol 1•443
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. Vol 1•448,449
Hickok Elect. Instr., Cleveland, Ohio Vol 4•411*
Hoyt Elec. Instr. Works, Belmont, Mass. Vol 1•456,457
Jewell Electrical Instrs., Manchester, N.H. ..... Vol 1•463
Simpson Elec. Co., Chicago, Ill. Vol 1•502
Triplett Corp., Bluffton, Ohio Vol 1•526,527
Airpax Elctrns., Ft. Lauderdale, Fla.
Ammon Instrs., Inc., Manchester, N.H.
Dixson Inc., Meter Div., Grand Junction, Colo.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Esterline Angus Div., Indianapolis, Ind.
General Elec., W. Lynn, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
LFE Corp., Waltham,, Mass.
Modutec, Inc., Norwalk, Conn.
Mura Corp., Jericho, N.Y.
Q.V.S., Inc., East Orange, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Telmar, Inc., Columbus, Ohio
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Panel (Digital)

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•395
California Instrs. Co., San Diego, Cal. Vol 1•409
Datascan, Inc., Clifton, N.J. ..... Vol 1•421
Datel Systems Inc., Canton, Mass. Vol 1•339
Electro-Numerics, Santa Clara, Cal. Vol 1•434
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 1•448
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y. ..... Vol 1•450
Newport Labs., Inc., Santa Ana, Cal. Vol 4•417*
Simpson Elec. Co., Chicago, Ill. Vol 1• 502
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Triplett Corp., Bluffton, Ohio Vol 1•528,529
Ametek/Instrs. & Controls, Feasterville, Pa.
Analogic, Wakefield, Mass.
Calico Div., San Diego, Cal.
Computer Prods., Ft. Lauderdale, Fla.
Data Technology, Santa Ana, Cal.
Digilin, Inc., Glendale, Cal.
Dixson Inc., Meter Div., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Electronic Research Co., Shawnee Mission, Kan.
Foxboro Co., Foxboro, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Rand Corp., Edison, N.J.
Honeywell, Denver, Colo.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Instrument Displays, Waltham, Mass.
LFE Corp., Waltham,, Mass.
NES, Inc., Itasca, Ill.
RDF Corp., Hudson, N.H.
Schaevitz Engrg., Pennsauken, N.J.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
United Sys. Corp., Dayton, Ohio
Velonex, Santa Clara, Calif.
Weston Instruments, Inc., Newark, N.J.

Meters, Peak Power

Bird Elctrn., Cleveland, Ohio.... Vol 1•396
Pioneer/Instrumentation, Cleveland, Ohio ..... Vol 1•494
Bendix, Franklin, Ind.
Electro Impulse, Inc., Red Bank, N.J.
Emergency Beacon Corp., New Rochelle, N. Y.
General Microwave Corp., Farmingdale, N.Y.
Micro Instr. Co., Hawthorne, Cal.
Narda Microwave Corp., Plainview, N.Y.
Ohio Semitronics, Columbus, Ohio
Pacific Meas., Inc., Palo Alto, Calif.
PRD Elctrns., Inc., Westbury, N.Y.
Weinschel Engrg. Co., Gaithersburg, Md.

Meters, Period

Compuline Corp., Paoli, Pa.
Hickok Elect. Instr., Cleveland, Ohio
Simpson Elec. Co., Chicago, Ill.
Speed Detectors, Bedford, Ohio
Systron-Donner Concord Instr. Div., Concord, Cal.

Meters, Permeameter

LDJ Electronics, Troy, Mich..... Vol 1•476
Thomas & Skinner, Inc., Indianapolis, Ind. ..... Vol 1•515
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
O. S. Walker Co., Worcester, Mass.

Meters, Phase-Angle

Dranetz Engrg. Labs., So. Plainfield, N.J. ..... Vol 1•423-426
Dytronics Co., Columbus, Ohio Vol 1•422
Freed Transformer Co., Bklyn., N.Y. Vol 1•447
North Atlantic Inds., Plainview, N.Y. Vol 1•365
Alford Mfg. Co., Winchester, Mass.
Chesterfield Prods. Inc., Saddle Brook, N. J.
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., East Northport, N.Y.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Feedback, Inc., Berkeley Hghts., N.J.
General Elec., W. Lynn, Mass.
General Rand Corp., Edison, N.J.
Hathaway Instruments, Inc., Denver, Colo.
Ind'l. Test Equip., Clifton, NJ
Kratos, Pasadena, Cal
Krohn-Hite, Cambridge, Mass.
Quan-Tech, Whippany, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Columbus, Columbus, Ohio
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Theta Instr. Corp., Fairfield, N.J.
Tracor, Inc., Austin, Tex.
Trio Labs, Inc., Plainview, N.Y.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Vibration Instrs. Co., Anaheim, Cal.
Video Research Corp., Gaithersburg, Md.
Wavetek, San Diego, Cal.
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

Meters, Phase Vector Volt

Dranetz Engrg. Labs., So. Plainfield, N.J. ..... Vol 1•423,426
Dytronics Co., Columbus, Ohio
Ind'l. Test Equip., Clifton, NJ
Ithaco, Inc., Ithaca, N.Y.
Kratos, Pasadena, Cal
Krohn-Hite, Cambridge, Mass.
NH Research, Inc., Santa Ana, Calif.
North Atlantic Inds., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Theta Instr. Corp., Fairfield, N.J.
Tracor, Inc., Austin, Tex.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
Wiltron Co., Palo Alto, Calif.

Meters, Picoampere

Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Doric Sci. Corp., San Diego, Calif.
General Microwave Corp., Farmingdale, N.Y.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
Keithley Instrs., Inc., Cleveland, Ohio
London Co., Cleveland, Ohio
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Victoreen Instr., Cleveland, Ohio

Meters, Power Factor

Dranetz Engrg. Labs., So. Plainfield, N.J. ..... Vol 1•426
Associated Resch., Chicago, Ill.
Beckman Instrs., Cedar Grove, N.J.
Davidson Elctrn. Dev. Co., Erie, Pa.
Edison Elctrns. Div., Manchester, N.H.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Esterline Angus Div., Indianapolis, Ind.
General Elec., W. Lynn, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Test Equip., Clifton, NJ
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Kratos, Pasadena, Cal
NH Research, Inc., Santa Ana, Calif.
Q.V.S., Inc., East Orange, N.J.
Scientific Columbus, Columbus, Ohio
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Weston Instruments, Inc., Newark, N.J.

Meters, Power, R-F

Bendix, Franklin, Ind. ..... Vol 2•609
Bird Elctrn., Cleveland, Ohio.... Vol 1•396
Boonton Elctrns., Parsippany, N.J. Vol 1•407
Systron-Donner Corp., Concord, Cal. Vol 1•510
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•510
Systron-Donner Datapulse Div., Culver City, Cal. ..... Vol 1•510
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal. ..... Vol 1•510
Systron-Donner Microwave Div., Van Nuys, Cal. ..... Vol 1•510
Ailtech, City of Industry, Cal.

Ballantine Laboratories, Inc., Boonton,, N. J.
Comdel, Inc., Beverly, Mass.
Drake, R.L., Co., Miamisburg, Ohio
Electro Impulse, Inc., Red Bank, N.J.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Emergency Beacon Corp., New Rochelle, N. Y.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Microwave Corp., Farmingdale, N.Y.
Heath Co., Benton Harbor, Mich.
Mobil Elctrns., Inc., Anderson, Ind.
Narda Microwave Corp., Plainview, N.Y.
NES, Inc., Itasca, Ill.
Pacific Meas., Inc., Palo Alto, Calif.
PRD Elctrns., Inc., Westbury, N.Y.
Q.V.S., Inc., East Orange, N.J.
RCA Corp., Camden, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Triplett Corp., Bluffton, Ohio
Vari-L Co., Inc., Denver, Colo.

Meters, Pyrometer

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•395
Newport Labs., Inc., Santa Ana, Cal. Vol 4•418*
Triplett Corp., Bluffton, Ohio .. Vol 1•527
Alnor Instr. Co., Chicago, Ill.
Amprobe Instr., Lynbrook, N.Y.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bristol Div, Waterbury, Conn
Caig Labs., Inc., Westbury, N.Y.
Cole-Parmer Instr. Co., Chicago, Ill.
Doric Sci. Corp., San Diego, Calif.
Edison, Instr. Div., W. Orange, N.J.
Epic, Inc., New York, N.Y.
General Elec., W. Lynn, Mass.
Int'l. Instrs., Orange, Conn.
J-B-T Instrs., Inc., New Haven, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
LFE Corp., Waltham,, Mass.
Modutec, Inc., Norwalk, Conn.
Omega Engrg., Inc., Stamford, Conn.
Pacific Transducer Corp., Los Angeles, Calif.
Pioneer/Instrumentation, Cleveland, Ohio
Raytek, Inc., Mountain View, Cal.
Simpson Elec. Co., Chicago, Ill.
Sticht, Herman H. Co., Inc., New York, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Telmar, Inc., Columbus, Ohio
Thermo Elec. Co., Inc., Saddle Brook, N.J.

Meters, Q

Freed Transformer Co., Bklyn., N.Y. Vol 1•445
Marconi Instrs., Englewood, N.J. Vol 1•485
Dranetz Engrg. Labs., So. Plainfield, N.J.
Hy-Cal Engrg., Santa Fe Springs, Cal.
J-Omega Co., Mountain View, Calif.
Rohde & Schwarz Sls., Passaic, N.J.

Meters, Ratio

Freed Transformer Co., Bklyn., N.Y. Vol 1•446,447
Ithaco, Inc., Ithaca, N.Y. ..... Vol 2•317
Weinschel Engrg. Co., Gaithersburg, Md. ..... Vol 1•534
Bailey Meter Co., Wickliffe, Ohio
Computer Instrs., Hempstead, N.Y.
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Data Technology, Santa Ana, Cal.
Digilin, Inc., Glendale, Cal.
Doric Sci. Corp., San Diego, Calif.
Dytro Corp., Hicksville, N.Y.
Edison, Instr. Div., W. Orange, N.J.
Electric Tachometer Corp., Philadelphia, Pa.
Electro-Numerics, Santa Clara, Cal.
Electro Sci. Inds., Portland, Ore.
Esterline Angus Div., Indianapolis, Ind.
General Microwave Corp., Farmingdale, N.Y.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Innovatek Enterprise, Millerton, N.Y.
MSI Electronics, Inc., Woodside, N.Y.
North Atlantic Inds., Plainview, N.Y.
Pacific Meas., Inc., Palo Alto, Calif.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Vari-L Co., Inc., Denver, Colo.

Meters, Recording

Amprobe Instr., Lynbrook, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., (AISSD), Fullerton, Cal.
Bristol Div, Waterbury, Conn
Dytro Corp., Hicksville, N.Y.
Electronic Dev. Corp., Boston, Mass.
Esterline Angus Div., Indianapolis, Ind.
Foxboro Co., Foxboro, Mass.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Elec., W. Lynn, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Honeywell, Ft. Washington, Pa.
Leeds & Northrup Corp., No. Wales, Pa.
Omega Engrg., Inc., Stamford, Conn.
Pacific Transducer Corp., Los Angeles, Calif.
Recorder Systems Div., E. Greenwich, R.I.
Schaevitz Engrg., Pennsauken, N.J.
Simpson Elec. Co., Chicago, Ill.
Singer Co., Philadelphia, Pa.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Sticht, Herman H. Co., Inc., New York, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Texas Instruments, Inc., Houston, Tex.
Veeder-Root, Hartford, Conn.
Vu-data Corp., San Diego, Cal.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.

Meters, Reflectometer

Tektronix, Inc., Beaverton, Ore. Vol 1•513
Beckman Instrs., (AISSD), Fullerton, Cal.
Emergency Beacon Corp., New Rochelle, N. Y.
Gamma Sci., San Diego, Cal.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Lion Precision Corp, Newton, Mass.
Narda Microwave Corp., Plainview, N.Y.
New-Tronics Corp., Brookpark, Ohio
Rohde & Schwarz Sls., Passaic, N.J.
Vari-L Co., Inc., Denver, Colo.
Weinschel Engrg. Co., Gaithersburg, Md.

Meters, R-F

Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Ballantine Laboratories, Inc., Boonton,, N. J.
Bendix, Franklin, Ind.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Emergency Beacon Corp., New Rochelle, N. Y.
General Microwave Corp., Farmingdale, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Brooklyn, N. Y.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Pacific Meas., Inc., Palo Alto, Calif.
Q.V.S., Inc., East Orange, N.J.
Simpson Elec. Co., Chicago, Ill.
Triplett Corp., Bluffton, Ohio
Vari-L Co., Inc., Denver, Colo.

Meters, RFI

Instrs. For Ind., Inc., Farmingdale, N.Y. Vol 1•461
Astro Comm. Lab., Gaithersburg, Md.
Electro/Data, Inc., Garland, Tex.
Electro-Mechanics Co., Austin, Tex.
Honeywell, Denver, Colo.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Tucker Electronics Co., Garland, Tex.

Meters, S-Unit

Allied Elctrns., Chicago, Ill.
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Hoyt Elec. Instr. Works, Belmont, Mass.
Mura Corp., Jericho, N.Y.
Shurite Meters, New Haven, Conn.

Meters, Snap-Around

Amprobe Instr., Lynbrook, N.Y.
Columbia Elec. Mfg. Co., Cleveland, Ohio
Esterline Angus Div., Indianapolis, Ind.
Simpson Elec. Co., Chicago, Ill.
Sticht, Herman H. Co., Inc., New York, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Triplett Corp., Bluffton, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Standing Wave Ratio

Bird Elctrn., Cleveland, Ohio.... Vol 1•396
Alford Mfg. Co., Winchester, Mass.
Bendix, Franklin, Ind.
Drake, R.L., Co., Miamisburg, Ohio
Dynascan Corp., Chicago, Ill.
Emergency Beacon Corp., New Rochelle, N. Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Heath Co., Benton Harbor, Mich.
Johnson E. F. Co., Waseca, Minn.
Narda Microwave Corp., Plainview, N.Y.
New-Tronics Corp., Brookpark, Ohio
PRD Elctrns., Inc., Westbury, N.Y.
Radiation Devices Co., Baltimore, Md.
Rank Precision Inds., Des Plaines, Ill.
Telonic Inds., Inc., Laguna Beach, Calif.
Vari-L Co., Inc., Denver, Colo.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

Meters, Temperature (Contacting)

Electronic Research Co., Shawnee Mission, Kan. ..... Vol 1•431
Harrel, Inc., E. Norwalk, Conn. Vol 2•1163
NES, Inc., Itasca, Ill. ..... Vol 1•363
Newport Labs., Inc., Santa Ana, Cal. Vol 4•418*
Omega Engrg., Inc., Stamford, Conn. Vol 2•1173
Triplett Corp., Bluffton, Ohio Vol 1•519,524
Aerotronic Assocs., Inc., Contoocook, N.H.
Amprobe Instr., Lynbrook, N.Y.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bailey Meter Co., Wickliffe, Ohio
Bay Labs., Inc., Cleveland, Ohio
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Datametrics Inc., Wilmington, Mass.
Digilin, Inc., Glendale, Cal.
Doric Sci. Corp., San Diego, Calif.
Esterline Angus Div., Indianapolis, Ind.
Faria, Thomas G. Corp., Uncasville, Conn.
General Elec., W. Lynn, Mass.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Jewell Electrical Instrs., Manchester, N.H.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Mann, Henry Inc., Feasterville, Pa.
Modutec, Inc., Norwalk, Conn.
NL Inds., Inc., Hightstown, N.J.
Pacific Transducer Corp., Los Angeles, Calif.
RDF Corp., Hudson, N.H.
Relco Prods., Denver, Colo.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Rosemount Nashville Inc., Lavergne, Tenn.
Stow Labs., Inc., Hudson, Mass.
Telmar, Inc., Columbus, Ohio
VirTis Co., Gardiner, N.Y.
Wahl, Wm. Corp., Los Angeles, Cal.
Westronics, Inc., Ft. Worth, Tex.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Meters, Temperature, Dial-Type (Non-Contacting) —See Pyrometers

Meters, Thermal Transfer

Ballantine Laboratories, Inc., Boonton,, N. J.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Holt Instr. Labs., Oconto, Wisc.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Julie Research Lab., New York, N.Y.
NES, Inc., Itasca, Ill.
Precision Timer Co., Westbrook, Conn.
RDF Corp., Hudson, N.H.
Thermo Sys., Inc., St. Paul, Minn.

Meters, Time Interval—See Timers, Interval

Meters, Vacuum Tube Volt (VTVM)

Dynascan Corp., Chicago, Ill. .. Vol 1•401
Ballantine Laboratories, Inc., Boonton,, N. J.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Test Equip., Clifton, NJ
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Leader Instruments Corp., Long Island City, N.Y.
Marconi Instrs., Englewood, N.J.
North Atlantic Inds., Plainview, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Ross Engrg. Corp., Campbell, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Trio Labs, Inc., Plainview, N.Y.
Triplett Corp., Bluffton, Ohio

Meters, Vibration

Dytronics Co., Columbus, Ohio Vol 1•422
Unholtz-Dickie Corp., Hamden, Conn. Vol 1•530
Advanced Dynamic Instrs. Div., Alexandria, Va.
Bell & Howell Co., Pasadena, Calif.
Biddle, James G., Plymouth Meeting, Pa.
Columbia Resch. Labs., Woodlyn, Pa.
Endevco, Pasadena, Calif.
Epic, Inc., New York, N.Y.
General Radio Co., Concord, Mass.
Ithaco, Inc., Ithaca, N.Y.
Kaman Sciences Corp., Colorado Springs, Colo.
L.A.B. Corp., Skaneateles, N.Y.
Larson Aero Dev., Concord, Calif.
Metra Instruments, Inc., Mt. View, Cal.
Metrix Instr. Co., Houston, Tex.
PCB Piezotronics, Inc., Depew, N.Y.
Reliance Elec. Co., Cleveland, Ohio
Robertshaw Controls Co., Richmond, Va.
Rohde & Schwarz Sls., Passaic, N.J.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Tech Serv., Inc., Fogelsville, Pa.
United Detector Technology Inc., Santa Monica, Cal.
Vibra-Metrics, Inc., E. Haven, Conn.
Vibration Instrs. Co., Anaheim, Cal.

Meters, Volt

Beede Electrical Instr. Co., Inc., Penacook, N.H. ..... Vol 1•394
Boonton Elctrns., Parsippany, N.J. Vol 1•406-408
Electro-Mechanical Instr. Div., Perkasie, Pa. ..... Vol 1•433
Electronic Dev. Corp., Boston, Mass. Vol 1•429
Faria Meter Corp., Uncasville, Conn. Vol 1•443

Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
ITT Jennings, San Jose, Cal Vol 1•458,459
ITT Jennings, Instrus. & Systems, San Jose, Calif. ..... Vol 1•458,459
Julie Research Lab., New York, N.Y. Vol 1•467,469
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Pioneer/Instrumentation, Cleveland, Ohio ..... Vol 1•494
Precision Standards Corp., Santa Ana, Cal. ..... Vol 1•495
Ross Engrg. Corp., Campbell, Cal. Vol 2•871
Systron-Donner Corp., Concord, Cal. Vol 1•511
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•511
Test & Measuring Instrs. Inc., Hicksville, N.Y. ..... Vol 4•423*
Triplett Corp., Bluffton, Ohio Vol 1•519,525,527,529
Airpax Elctrns., Ft. Lauderdale, Fla.
Allied Elctrns., Chicago, Ill.
Ammon Instrs., Inc., Manchester, N.H.
Amprobe Instr., Lynbrook, N.Y.
AUL Instrs., Inc., Flushng, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Ballantine Laboratories, Inc., Boonton,, N. J.
Biddle, James G., Plymouth Meeting, Pa.
Bristol Div, Waterbury, Conn
Data Precision Corporation, Wakefield, Mass.
Data Technology, Santa Ana, Cal.
Digilin, Inc., Glendale, Cal.
Dixson Inc., Meter Div., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Dranetz Engrg. Labs., So. Plainfield, N.J.
E-H Resch. Labs., Inc., Oakland, Cal.
Eldorado Electrodata, Concord, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec., W. Lynn, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Rand Corp., Edison, N.J.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hoyt Elec. Instr. Works, Belmont, Mass.
Ideal Precision Meter Co., Brooklyn, N. Y.
Ind'l. Test Equip., Clifton, NJ
Instrument Displays, Waltham, Mass.
Int'l. Instrs., Orange, Conn.
J-Omega Co., Mountain View, Calif.
Jewell Electrical Instrs., Manchester, N.H.
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Kratos, Pasadena, Cal
Lambda Elctrns., Melville, N.Y.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Leader Instruments Corp., Long Island City, N.Y.
LFE Corp., Waltham,, Mass.
London Co., Cleveland, Ohio
Marconi Instrs., Englewood, N.J.
Mura Corp., Jericho, N.Y.
NES, Inc., Itasca, Ill.
Newport Labs., Inc., Santa Ana, Cal.
North Atlantic Inds., Plainview, N.Y.
Q.V.S., Inc., East Orange, N.J.
Radiation Devices Co., Baltimore, Md.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Columbus, Columbus, Ohio
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Telmar, Inc., Columbus, Ohio
Trio Labs, Inc., Plainview, N.Y.
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Volt, Deviation

Dranetz Engrg. Labs., So. Plainfield, N.J. ..... Vol 1•427
AMF Electical Prods., Alexandria, Va.
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Doric Sci. Corp., San Diego, Calif.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Electronic Dev. Corp., Boston, Mass.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Rand Corp., Edison, N.J.
Int'l. Instrs., Orange, Conn.
Keithley Instrs., Inc., Cleveland, Ohio
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
NES, Inc., Itasca, Ill.
Precision Standards Corp., Santa Ana, Cal.
Simpson Elec. Co., Chicago, Ill.
Voltex Co., Inc., Farmingdale, N.Y.
Weston Instruments, Inc., Newark, N.J.

Meters, Volt, Differential—See Meters, Volt

Meters, Volt, Digital (DVM) & Accessories

Biddle, James G., Plymouth Meeting, Pa. ..... Vol 1•399
Boonton Elctrns., Parsippany, N.J. Vol 1•406,407
Dytro Corp., Hicksville, N.Y. .... Vol 1•342
Hickok Elect. Instr., Cleveland, Ohio Vol 1•452,453; Vol 4•407-409*
NES, Inc., Itasca, Ill. ..... Vol 1•363
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Systron-Donner Corp., Concord, Cal. Vol 1•511
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Test & Measuring Instrs. Inc., Hicksville, N.Y. ..... Vol 4•423*
Triplett Corp., Bluffton, Ohio Vol 1•528,529
Astrosystems, Inc., Lake Success, N.Y.
Ballantine Laboratories, Inc., Boonton,, N. J.
Bay Labs., Inc., Cleveland, Ohio
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Bristol Div, Waterbury, Conn
Calico Div., San Diego, Cal.
California Instrs. Co., San Diego, Cal.
Computer Prods., Ft. Lauderdale, Fla.
Dana Labs., Inc., Irvine, Calif.
Data Precision Corporation, Wakefield, Mass.
Data Technology, Santa Ana, Cal.
Datascan, Inc., Clifton, N.J.
Digilin, Inc., Glendale, Cal.
Dixson Inc., Meter Div., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Dynascan Corp., Chicago, Ill.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Electronic Dev. Corp., Boston, Mass.
Electronic Research Co., Shawnee Mission, Kan.
ESE, Inglewood, Cal.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Microwave Corp., Farmingdale, N.Y.
General Rand Corp., Edison, N.J.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Heath Co., Benton Harbor, Mich.
IEC Electronics Corp., E. Rochester, N.Y.
Innovatek Enterprise, Millerton, N.Y.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
J-Omega Co., Mountain View, Calif.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Leader Instruments Corp., Long Island City, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Leeds & Northrup Corp., No. Wales, Pa.
LFE Corp., Waltham,, Mass.
Micro Instr. Co., Hawthorne, Cal.
Monitor Labs, Inc., San Diego, Cal.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
Pacific Meas., Inc., Palo Alto, Calif.
Penn Airborne Prods., Southampton, Pa.
Phoenix Data Inc., Phoenix, Ariz.
Practical Automation, Inc., Shelton, Conn.
Rohde & Schwarz Sls., Passaic, N.J.
Ross Engrg. Corp., Campbell, Cal.
Sensor Corp., Scottsdale, Pa.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Datapulse Div., Culver City, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Systron-Donner Microwave Div., Van Nuys, Cal.
Systron Donner Trygon Elctrns. Sub., Westbury, N.Y.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tektronix, Inc., Beaverton, Ore.
Transducer Controls Corp., Covina, Calif.
United Sys. Corp., Dayton, Ohio
Vidar Corp., Mountain View, Cal.
Western Reserve Elctrns., Twinsburg, Ohio
Weston Instruments, Inc., Newark, N.J.
Wiltron Co., Palo Alto, Calif.

Meters, Volt, Electrostatic

Custom Sci. Instrs., Inc., Whippany, N.J.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Weston Instruments, Inc., Newark, N.J.

Meters, Volt, Frequency Selective

Dranetz Engrg. Labs., So. Plainfield, N.J. ..... Vol 1•427
B & K Instrs., Inc., Cleveland, Ohio
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Elcom Sys., Deer Pk., N.Y.
Kratos, Pasadena, Cal
Marconi Instrs., Englewood, N.J.
Princeton Applied Resch. Corp., Princeton, N.J.
Quan-Tech, Whippany, N.J.
Railway Comm., Raytown, Mo.
Rohde & Schwarz Sls., Passaic, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Weston Instruments, Inc., Newark, N.J.

Meters, Volt, Log-Conversion

Ballantine Laboratories, Inc., Boonton,, N. J.
Dranetz Engrg. Labs., So. Plainfield, N.J.
General Microwave Corp., Farmingdale, N.Y.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Kratos, Pasadena, Cal
Modutec, Inc., Norwalk, Conn.
NES, Inc., Itasca, Ill.
Pacific Meas., Inc., Palo Alto, Calif.
Q.V.S., Inc., East Orange, N.J.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Wiltron Co., Palo Alto, Calif.

Meters, Volt, Potentiometric

Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bristol Div, Waterbury, Conn
Doric Sci. Corp., San Diego, Calif.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro Sci. Inds., Portland, Ore.
Electronic Dev. Corp., Boston, Mass.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Keithley Instrs., Inc., Cleveland, Ohio
Precision Standards Corp., Santa Ana, Cal.
Telmar, Inc., Columbus, Ohio

Meters, Volt, R-F

Boonton Elctrns., Parsippany, N.J. Vol 1•407
ITT Jennings, San Jose, Cal Vol 1• 458,459
ITT Jennings, Instrus. & Systems, San Jose, Calif. ..... Vol 1•458,459
Triplett Corp., Bluffton, Ohio Vol 1• 519,527
B & K Instrs., Inc., Cleveland, Ohio
Ballantine Laboratories, Inc., Boonton,, N. J.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Microwave Corp., Farmingdale, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Jerrold Electronics Corp., Philadelphia, Pa.
Marconi Instrs., Englewood, N.J.
Micro Instr. Co., Hawthorne, Cal.
Q.V.S., Inc., East Orange, N.J.
Radiation Devices Co., Baltimore, Md.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Ross Engrg. Corp., Campbell, Cal.
Simpson Elec. Co., Chicago, Ill.
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Volt, Sampling

Dranetz Engrg. Labs., So. Plainfield, N.J. ..... Vol 1•427
Automated Meas., Oakland, Calif.
E-H Resch. Labs., Inc., Oakland, Cal.
Micro Instr. Co., Hawthorne, Cal.
NES, Inc., Itasca, Ill.

Meters, Volt, True RMS

Boonton Elctrns., Parsippany, N.J. Vol 1•406-408
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
AMF Electical Prods., Alexandria, Va.
B & K Instrs., Inc., Cleveland, Ohio
Ballantine Laboratories, Inc., Boonton,, N. J.
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Data Technology, Santa Ana, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Numerics, Santa Clara, Cal.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Elec., W. Lynn, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Holt Instr. Labs., Oconto, Wisc.
Ind'l. Test Equip., Clifton, NJ
Inservco, Inc., La Grange, Ohio
Intronics, Inc., Newton, Mass.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Jewell Electrical Instrs., Manchester, N.H.
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
Leader Instruments Corp., Long Island City, N.Y.
Marconi Instrs., Englewood, N.J.
Q.V.S., Inc., East Orange, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Columbus, Columbus, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Thermo Sys., Inc., St. Paul, Minn.
Triplett Corp., Bluffton, Ohio
Western Reserve Elctrns., Twinsburg, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Volt-Ohm-Milliampere (VOM)

Allied Elctrns., Chicago, Ill. ..... Vol 1•387
Dynascan Corp., Chicago, Ill. Vol 1•400,401
Hickok Elect. Instr., Cleveland, Ohio Vol 1•453
Simpson Elec. Co., Chicago, Ill. Vol 1•503
Triplett Corp., Bluffton, Ohio Vol 1•516-518,520-525; Vol 4•426,428*
Amprobe Instr., Lynbrook, N.Y.
AUL Instrs., Inc., Flushng, N.Y.
Ballantine Laboratories, Inc., Boonton,, N. J.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Data Technology, Santa Ana, Cal.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
ESE, Inglewood, Cal.
General Rand Corp., Edison, N.J.
Heath Co., Benton Harbor, Mich.

Keithley Instrs., Inc., Cleveland, Ohio
Mura Corp., Jericho, N.Y.
Q.V.S., Inc., East Orange, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron-Donner Concord Instr. Div., Concord, Cal.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Western Reserve Elctrns., Twinsburg, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, VU

Jewell Electrical Instrs., Manchester, N.H. ..... Vol 1•463
Modutec, Inc., Norwalk, Conn. Vol 1•486-489
Triplett Corp., Bluffton, Ohio .. Vol 1•527
Allied Elctrns., Chicago, Ill.
Altec Div., Anaheim, Calif.
Ammon Instrs., Inc., Manchester, N.H.
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Dixson Inc., Meter Div., Grand Junction, Colo.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Edison Elctrns. Div., Manchester, N.H.
Electro-Mechanical Instr. Div., Perkasie, Pa.
Hoyt Elec. Instr. Works, Belmont, Mass.
Ideal Precision Meter Co., Brooklyn, N. Y.
Int'l. Instrs., Orange, Conn.
Larson Instr. Co., Inc., Orangeburg, N.Y.
LFE Corp., Waltham,, Mass.
Mura Corp., Jericho, N.Y.
Q.V.S., Inc., East Orange, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Shurite Meters, New Haven, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Vu-data Corp., San Diego, Cal.
Weston Instruments, Inc., Newark, N.J.

Meters, Watt

Bendix, Franklin, Ind. ..... Vol 2•609
Bird Elctrn., Cleveland, Ohio.... Vol 1•396
Clarke - Hess, New York, N.Y. Vol 1•411
Ohio Semitronics, Columbus, Ohio Vol 1•491
Triplett Corp., Bluffton, Ohio .. Vol 1•519
Ailtech, City of Industry, Cal.
Barnes & Reinecke, Inc., Chicago, Ill.
Cubic Corp., San Diego, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Esterline Angus Div., Indianapolis, Ind.
General Elec., W. Lynn, Mass.
General Microwave Corp., Farmingdale, N.Y.
General Rand Corp., Edison, N.J.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Test Equip., Clifton, NJ
Intronics, Inc., Newton, Mass.
Kratos, Pasadena, Cal
Larson Instr. Co., Inc., Orangeburg, N.Y.
LFE Corp., Waltham,, Mass.
Marconi Instrs., Englewood, N.J.
NH Research, Inc., Santa Ana, Calif.
Proto Matic Co., Cincinnati,, Ohio
Scientific Columbus, Columbus, Ohio
Scientific Educational Prods., N.Y., N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Meters, Watt-Hour

Ohio Semitronics, Columbus, Ohio Vol 1•491
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., Columbus, Ohio
Hickok Elect. Instr., Cleveland, Ohio
NES, Inc., Itasca, Ill.
Sangamo Elec. Co., Springfield, Ill.
Scientific Columbus, Columbus, Ohio
Weston Instruments, Inc., Newark, N.J.

Meters, Wave

Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
Marconi Instrs., Englewood, N.J.
Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Quan-Tech, Whippany, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.

Meters, Waveguide—See Meters, Microwave

Microcircuit Production Equip.

Baron-Blakeslee, Div. Purex Corp., Chicago, Ill.
CGS Units, Inc., Rochester, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
Circon Corp., Santa Barbara, Ca.
Electro Sci. Inds., Portland, Ore.
Environmental Communications Inc., Santa Ana, Cal.
GTI Corp. (E), Pittsburgh, Pa.
Hadron Inc., Westbury, N.Y.
Hull Corp., Hatboro, Pa.
IPT Corp., Sunnyvale, Cal.
Mann, David W. Co., Burlington, Mass.
Materials Resch. Corp., Orangeburg, N.Y.
Podgor, Joseph Co., Pennsauken, N.J.
Sprague Elec. Co., No. Adams, Mass.
TRW Instrs., El Segundo, Cal.
Uthe Technology Int'l., Sunnyvale, Cal.

Microcircuits—See Circuits, Integrated; Circuits, Hybrid

Microfilm Production Equipment

W-F Products, Inc., Denver, Co. Vol 1•934

Microfilm Retrieval Systems

W-F Products, Inc., Denver, Co. Vol 1•934
Hadron Inc., Westbury, N.Y.
Johnson Research Corp., Farmingdale, N.Y.
3M Co., St. Paul, Minn.
Varian Assocs., Palo Alto, Cal.
Western Reserve Elctrns., Twinsburg, Ohio

Micrometers, Electronic

Kaman Sciences Corp., Colorado Springs, Colo.
Lion Precision Corp, Newton, Mass.
Minnetech Labs, Minneapolis, Minn.
Opto-Metric Tools, Rockleigh, N.J.
Sensor Corp., Scottsdale, Pa.
Spatial Data Systems, Inc., Goleta, Cal.
Transducer Controls Corp., Covina, Calif.

Microphone Accessories (Including Stands, Holders, Booms)

Atlas Sound Div., Parsippany, N.J.
General Radio Co., Concord, Mass.
Primo Company Ltd., Tokyo, Japan
Turner Div., Cedar Rapids, Iowa

Microphones, Carbon

Astatic Corp., Conneaut, Ohio
Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
GC Electronics, Rockford, Ill.
ISC/Telephonics Div, Huntington, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shure Bros., Inc., Evanston, Ill.
Telex Comm. Div., Minneapolis, Minn.
Turner Div., Cedar Rapids, Iowa

Microphones, Cardioid

AKG, New York, N.Y.
Allied Elctrns., Chicago, Ill.
Altec Div., Anaheim, Calif.
Astatic Corp., Conneaut, Ohio
Audiotronics, N. Hollywood, Cal.
Bogen Div., Paramus, N.J.
Concord Communications Sys., Farmingdale, N.Y.
Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
Executone, Inc., Long Island City, N.Y.
GC Electronics, Rockford, Ill.
Gotham Audio Corp., New York, N.Y.
Knowles Elctrns., Inc., Franklin Park, Ill.
Mura Corp., Jericho, N.Y.
RCA Corp., Camden, N.J.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.
Shure Bros., Inc., Evanston, Ill.
Turner Div., Cedar Rapids, Iowa
University Sound, Anaheim, Cal.

Microphones, Ceramic

Astatic Corp., Conneaut, Ohio
B & K Instrs., Inc., Cleveland, Ohio
Chesapeake Instr. Corp., Shadyside, Md.
Columbia Resch. Labs., Woodlyn, Pa.
Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
GC Electronics, Rockford, Ill.
General Radio Co., Concord, Mass.
Knowles Elctrns., Inc., Franklin Park, Ill.
Linden Labs., Inc., State College, Pa.
Primo Company Ltd., Tokyo, Japan
Saxton Prods., Congers, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shure Bros., Inc., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.
Telex Comm. Div., Minneapolis, Minn.
Turner Div., Cedar Rapids, Iowa

Microphones, Condenser

Primo Company Ltd., Tokyo, Japan Vol 1•317
AKG, New York, N.Y.
Altec Div., Anaheim, Calif.
B & K Instrs., Inc., Cleveland, Ohio
Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
GC Electronics, Rockford, Ill.
General Radio Co., Concord, Mass.
Gotham Audio Corp., New York, N.Y.
Knowles Elctrns., Inc., Franklin Park, Ill.
Mura Corp., Jericho, N.Y.
Sennheiser Elctrn. Corp., New York, NY

Microphones, Contact

Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.

Microphones, Crystal

Astatic Corp., Conneaut, Ohio
Columbia Resch. Labs., Woodlyn, Pa.
Components Specialties, Freeport, N.Y.
Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
GC Electronics, Rockford, Ill.
Primo Company Ltd., Tokyo, Japan
RCA Corp., Camden, N.J.
Saxton Prods., Congers, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shure Bros., Inc., Evanston, Ill.

Microphones, Dynamic

AKG, New York, N.Y.
Allied Elctrns., Chicago, Ill.
Altec Div., Anaheim, Calif.
Astatic Corp., Conneaut, Ohio
Audiotronics, N. Hollywood, Cal.
Bogen Div., Paramus, N.J.
Components Specialties, Freeport, N.Y.
Concord Communications Sys., Farmingdale, N.Y.
Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
Executone, Inc., Long Island City, N.Y.
GC Electronics, Rockford, Ill.
ISC/Telephonics Div, Huntington, N.Y.
Javelin Div., Apollo Lasers, Inc., Los Angeles, Ca.
Kulite Semiconductor Prod., Ridgefield, N.J.
Mura Corp., Jericho, N.Y.
Primo Company Ltd., Tokyo, Japan
RCA Corp., Camden, N.J.
Saxton Prods., Congers, N.Y.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.
Shure Bros., Inc., Evanston, Ill.
Telex Comm. Div., Minneapolis, Minn.
Turner Div., Cedar Rapids, Iowa
University Sound, Anaheim, Cal.

Microphones, Magnetic

Bogen Div., Paramus, N.J.
Conrac Corp., Cedar Rapids, Iowa
Knowles Elctrns., Inc., Franklin Park, Ill.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.
Shure Bros., Inc., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.

Microphones, Noise-Cancelling

AKG, New York, N.Y.
Altec Div., Anaheim, Calif.
Astatic Corp., Conneaut, Ohio
Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
Executone, Inc., Long Island City, N.Y.
Heitz, Karl, Inc., New York, N.Y.
ISC/Telephonics Div, Huntington, N.Y.
Knowles Elctrns., Inc., Franklin Park, Ill.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
Sennheiser Elctrn. Corp., New York, NY
Shure Bros., Inc., Evanston, Ill.
Telex Comm. Div., Minneapolis, Minn.
Turner Div., Cedar Rapids, Iowa

Microphones, Omnidirectional

Columbia Resch. Labs., Woodlyn, Pa.
Primo Company Ltd., Tokyo, Japan
Turner Div., Cedar Rapids, Iowa

Microphones, Pressure

AKG, New York, N.Y.
Altec Div., Anaheim, Calif.
B & K Instrs., Inc., Cleveland, Ohio
Columbia Resch. Labs., Woodlyn, Pa.
Conrac Corp., Cedar Rapids, Iowa
Electro-Voice, Inc., Buchanan, Mich.
Kistler Instr. Co., Redmond, Wash.
Knowles Elctrns., Inc., Franklin Park, Ill.
RCA Corp., Camden, N.J.
Sennheiser Elctrn. Corp., New York, NY
Shure Bros., Inc., Evanston, Ill.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Stow Labs., Inc., Hudson, Mass.
Turner Div., Cedar Rapids, Iowa

Microphones, Ribbon

Conrac Corp., Cedar Rapids, Iowa
RCA Corp., Camden, N.J.
Shure Bros., Inc., Evanston, Ill.

Microphones, Sound-Powered

Columbia Resch. Labs., Woodlyn, Pa.
Conrac Corp., Cedar Rapids, Iowa
ISC/Telephonics Div, Huntington, N.Y.

Microphones, Throat

Conrac Corp., Cedar Rapids, Iowa
Sennheiser Elctrn. Corp., New York, NY
Sonotone Corp., Elmsford, N.Y.

Microphones, Velocity

Altec Div., Anaheim, Calif.
RCA Corp., Camden, N.J.
Sennheiser Elctrn. Corp., New York, NY
Shure Bros., Inc., Evanston, Ill.

Microphones, Wireless

Concord Communications Sys., Farmingdale, N.Y.
Mura Corp., Jericho, N.Y.
Primo Company Ltd., Tokyo, Japan
RCA Corp., Camden, N.J.
Ryka Scientific, Inc., Sunnyvale, Cal.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.

Microscopes

Bausch & Lomb, Rochester, N.Y.
Christie Elec., Los Angeles, Cal.
Edmund Scientific Co., Barrington, N.J.
Esco Products, Oak Ridge, NJ
Gaertner Scientific Corp., Chicago, Ill.
Gamma Sci., San Diego, Cal.
Hacker Instrs., Inc., Fairfield, N.J.
Heitz, Karl, Inc., New York, N.Y.
Jonard Inds. Corp., Bronx, N.Y.
Lenox Instr. Co., Philadelphia, Pa.
Nikon, Inc., Instr. Div., Ehrenreich Photo-Optical Ind., Garden City, N.Y.
Olympus Corp. America, New Hyde Park, N.Y.
Pacific Transducer Corp., Los Angeles, Calif.
Stereotronics Television Co., Sherman Oaks, Cal.
Techni-Tool, Inc., Philadelphia, Pa.
Titan Tool Supply Co., Inc., Buffalo, N.Y.

Unitron Instr. Co., Newton Highlands, Mass.
Wild Heerbrugg Instrs., Farmingdale, N.Y.

Microscopes, Electron

Bausch & Lomb, Rochester, N.Y.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.

Microscopes, Infrared

Barnes Engrg. Co., Stamford, Conn.
Research Devices, Berkeley Heights, N.J.
Wild Heerbrugg Instrs., Farmingdale, N.Y.

Microscopes, Measuring

Bausch & Lomb, Rochester, N.Y.
CELCO, Mahwah, N.J.
Edmund Scientific Co., Barrington, N.J.
Gaertner Scientific Corp., Chicago, Ill.
Hacker Instrs., Inc., Fairfield, N.J.
Lenox Instr. Co., Philadelphia, Pa.
Nikon, Inc., Instr. Div., Ehrenreich Photo-Optical Ind., Garden City, N.Y.
Olympus Corp. America, New Hyde Park, N.Y.
Opto-Metric Tools, Rockleigh, N.J.
Rank Precision Inds., Des Plaines, Ill.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Unitron Instr. Co., Newton Highlands, Mass.

Microscopes, Ultraviolet

Black Light Corp. Amer., San Gabriel, Cal.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Wild Heerbrugg Instrs., Farmingdale, N.Y.

Microwave Duplexers

Systron-Donner Corp., Concord, Cal. Vol 1•510
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•510
Systron-Donner Datapulse Div., Culver City, Cal. ..... Vol 1•510
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal. ..... Vol 1•510
Systron-Donner Microwave Div., Van Nuys, Cal. ..... Vol 1•510
Americon Microwave Inds., Inc., Waltham, Mass.
Arra Inc., Bay Shore, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Norsal Industries, Inc., Brentwood, N.Y.
OPtimax Inc., Colmar, Pa.
Technical Research & Mfg. Co., Manchester, N.H.
Theta-Com CATV, Phoenix, Ariz
UTE Microwave, Asbury Park, N.J.
Varian Assocs., Palo Alto, Cal.

Microwave Line Stretchers

Systron-Donner Corp., Concord, Cal. Vol 1•510
Systron-Donner Concord Instr. Div., Concord, Cal. ..... Vol 1•510
Systron-Donner Datapulse Div., Culver City, Cal. ..... Vol 1•510
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal. ..... Vol 1•510
Systron-Donner Microwave Div., Van Nuys, Cal. ..... Vol 1•510
Aircom, Inc., Union, N.H.
Alford Mfg. Co., Winchester, Mass.
Arra Inc., Bay Shore, N.Y.
General Radio Co., Concord, Mass.
Lorch Elctrns. Corp., Englewood, N.J.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.

Mismatches, Microwave, Precision

Texscan Corp., Indianapolis, Ind. Vol 1•514
Weinschel Engrg. Co., Gaithersburg, Md. ..... Vol 1•534
Aircom, Inc., Union, N.H.
Alford Mfg. Co., Winchester, Mass.
Americon Microwave Inds., Inc., Waltham, Mass.
Arra Inc., Bay Shore, N.Y.
General Radio Co., Concord, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.

Mixer-Preamplifiers, Microwave

Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Airtron, Morris Plains, N.J.
American Elctrn. Labs., Inc., Lansdale, Pa.
Anzac Elctrns., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
E & M Laboratories, Inc., Westlake Village, Cal.
Environmental Communications Inc., Santa Ana, Cal.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
LNR Communications, Inc., Farmingdale, N.Y.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Omni-Spectra, Inc., Tempe, Ariz.
OPtimax Inc., Colmar, Pa.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Scientific Communications, Garland, Tex.
Sierra Sys., Mountain View, Cal.
Spectra Sonics, Ogden, Utah
Technical Research & Mfg. Co., Manchester, N.H.
Transco Prods., Inc., Venice, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Mixers, Audio

Solid State Elctrns. Corp., Sepulveda, Cal. ..... Vol 1•937
Altec Div., Anaheim, Calif.
Ampex Corp., Redwood City, Calif.
Bogen Div., Paramus, N.J.
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Davis J.W. & Co., Dallas, Texas
Edison Elctrns. Div., Manchester, N.H.
Fairchild Sound Equip., Commack, N.Y.
Gotham Audio Corp., New York, N.Y.
Lithic Systems, Inc., Cupertino, Cal.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Shure Bros., Inc., Evanston, Ill.
Spectra Sonics, Ogden, Utah

Mixers, Microwave

Anaren Microwave, Inc., Syracuse, N.Y. Vol 4•438*
Lorch Elctrns. Corp., Englewood, N.J. Vol 2•615
RHG Elctrns. Lab., Deer Park, N.Y. Vol 2•619
R L C Elctrns., Inc., Mt. Kisco, N.Y. Vol 2•620
Vari-L Co., Inc., Denver, Colo. Vol 2•623-626
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Americon Microwave Inds., Inc., Waltham, Mass.
Anzac Elctrns., Waltham, Mass.
CES Elctrns., Brooklyn, N.Y.
Collins Radio Co., Dallas, Tex.
E & M Laboratories, Inc., Westlake Village, Cal.
Elcom Sys., Deer Pk., N.Y.
Engelmann Microwave, Montville, N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Radio Co., Concord, Mass.
HRB-Singer, Inc., State College, Pa.
LNR Communications, Inc., Farmingdale, N.Y.
Loral Elctrn. Sys., Bronx, N.Y.
Merrimac Inds., Inc., West Caldwell, N.J.
Micro-Now Instr., Chicago, Ill.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Prods., Inc., Chatsworth, Cal.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Mini-Circuits Lab., Brooklyn, N.Y.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
Omni-Spectra, Inc., Tempe, Ariz.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Raytheon Co., Waltham, Mass.
Rodelco, Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Systron-Donner Microwave Div., Van Nuys, Cal.
Technical Research & Mfg. Co., Manchester, N.H.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Vector Industries, Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.

Mixers, R-F

Anaren Microwave, Inc., Syracuse, N.Y. Vol 4•438*
Lorch Elctrns. Corp., Englewood, N.J. Vol 2•615
Mini-Circuits Lab., Brooklyn, N.Y. Vol 2•616,617
R L C Elctrns., Inc., Mt. Kisco, N.Y. Vol 2•620
Vari-L Co., Inc., Denver, Colo. Vol 2•623-626
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Americon Microwave Inds., Inc., Waltham, Mass.
Anzac Elctrns., Waltham, Mass.
C-COR Elctrns., State College, Pa.
Comdel, Inc., Beverly, Mass.
E & M Laboratories, Inc., Westlake Village, Cal.
Edison Elctrns. Div., Manchester, N.H.
Elcom Sys., Deer Pk., N.Y.
Engelmann Microwave, Montville, N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
General Radio Co., Concord, Mass.
HRB-Singer, Inc., State College, Pa.
Lithic Systems, Inc., Cupertino, Cal.
Merrimac Inds., Inc., West Caldwell, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Miteq Inc., Hauppauge, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Omni-Spectra, Inc., Tempe, Ariz.
OPtimax Inc., Colmar, Pa.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Sierra Sys., Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
Summit Engrg. Corp., Bozeman, Mont.
Systron-Donner Microwave Div., Van Nuys, Cal.
Transco Prods., Inc., Venice, Cal.
Varian, Beverly, Mass.
Vector Industries, Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.
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Hathaway Instruments, Inc., Denver, Colo.
Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Integrated Systems, Inc., Norcross, Ga.
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Elctrn. Enterprises, Newark, N.J.
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GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
GHZ Devices, Inc., So. Chelmsford, Mass.
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Kilovolt Corp., Hackensack, N.J.
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Microlab/FXR, Livingston, N.J.
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R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
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RHG Elctrns. Lab., Deer Park, N.Y.
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General Microwave Corp., Farmingdale, N.Y.
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GTE Lenkurt Inc., San Carlos, Calif.
Jerrold Electronics Corp., Philadelphia, Pa.
Lorch Elctrns. Corp., Englewood, N.J.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave, Port Chester, N.Y.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
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Singer Co., Little Falls, N.J.
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Control Data Corp., Minneapolis, Minn.
Cramer Division, Old Saybrook, Conn.
Dale Elctrns., Inc., Yankton, S.D.
Doerr Electric Corp., Cedarburg, Wisc.
Eagle Signal, Davenport, Iowa
ECM Motor Co., Chicago, Ill.
Electric Indicator Co., Inc., Norwalk, Conn.
General Time Corp., Thomaston, Conn.
Hale Instrs., Inc., Houston, Tex.
Hansen Mfg. Co., Princeton, Ind.
Harowe Servo Controls, W. Chester, Pa.
Haydon Switch & Instr., Waterbury, Conn.
Headway Research, Inc., Garland, Tex.
Honeywell, Ft. Washington, Pa.
Hurst Mfg. Corp., Princeton, Ind.
IMC Magnetics Corp., Rochester, N.H.
IMC Magnetics Corp., Maywood, Cal.
Ingraham Inds., Controls Div., Elizabethtown, Ky.
ITT Jennings, San Jose, Cal
Japanese Prods. Corp., New Rochelle, N. Y.
Kato Engrg. Co., Mankato, Minn.
Kollsman Instr. Co., Syosset, N.Y.
Landis & Gyr, Inc., Elmsford, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Mallory Timers, Indpls., Ind.
Mitsumi Elec. Co., Ltd., Kitatamagun, Tokyo, Japan
Molon Motors & Coil, Rolling Meadows, Ill.
MPC Prods. Corp., Chicago, Ill.
Photocircuits Div., Kollmorgen Corp., Glen Cove, N.Y.
Precision Timer Co., Westbrook, Conn.
Reliance Elec. Co., Cleveland, Ohio
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Sigma Instrs., Inc., Braintree, Mass.
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Stock Drive Prods., New Hyde Pk., N.Y.
Transicoil, Inc., Worcester, Pa.
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Western Gear Corp., Pasadena, Cal.
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B & B Motor & Control, New York, NY
Bristol Saybrook Co., Old Saybrook, Conn.
Clifton Precision, Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Doerr Electric Corp., Cedarburg, Wisc.
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Superior Elec., Bristol, Conn.
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Electric Indicator Co., Inc., Norwalk, Conn.
ITT Jennings, San Jose, Cal
Jones Motrola Corp., Stamford, Conn.
Sawyer Inds., Arcadia, Cal.
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Aeroflex Labs., Plainview, N.Y.
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Craig Sys. Corp., Lawrence, Mass.
Datron Systems, Chatsworth, Cal.
Electro-Mechanics Co., Austin, Tex.
GC Electronics, Rockford, Ill.
Hunter Spring, Hatfield, Pa.
IE Mfg. Co., Chicago, Ill.
Jerrold Electronics Corp., Philadelphia, Pa.
K-W Engrg. Works, Menomonee Falls, Wisc.
Lord Kinematics, Erie, Pa.
Microflect Co., Salem, Ore.
New-Tronics Corp., Brookpark, Ohio
Nurad, Inc., Baltimore, Md.
Phelps Dodge Comm., North Haven, Conn.
Premax Prods. Div., Niagara Falls, N.Y.
RF Systems, Inc., Cohasset, Mass.
Rohn Mfg., Peoria, Ill.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sinclair Radio Labs., Maple, Ont., Can.
Sitco Antennas, Portland, Ore.
South River Metal Prods. Co., South River, N.J.
TRG Prods., E. Boston, Mass.
Tri-Ex Tower Corp., Visalia, Calif.

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Conrac Div., Covina, Calif.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Gould Data Systems, Newton Upper Falls, Mass.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Waterbury Pressed Metal Co., Waterbury, Conn.

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Aircom, Inc., Union, N.H.
CES Elctrns., Brooklyn, N.Y.
General Microwave Corp., Farmingdale, N.Y.
GTI Corp. (E), Pittsburgh, Pa.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Quaker Elctrns., Hunlock Creek, Pa.
Robinson-Nugent, New Albany, Ind.
Systron-Donner Microwave Div., Van Nuys, Cal.
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Maury Microwave Corp., Cucamonga, Calif.
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Premier Microwave, Port Chester, N.Y.
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Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
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Aeroflex Labs., Plainview, N.Y.
Air-Loc Products, Franklin, Mass.
Collins Radio Co., Cedar Rapids, Iowa
GAF Corp., New York, N.Y.
Grant Hardware Co., W. Nyack, N.Y.
Lord Kinematics, Erie, Pa.
Nikon, inc., Instr. Div., Ehrenreich Photo-Optical Ind., Garden City, N.Y.
Stock Drive Prods., New Hyde Pk., N.Y.
TA Mfg. Corp., Los Angeles, Cal.
3M Co., St. Paul, Minn.
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General Microwave Corp., Farmingdale, N.Y.
Honeywell, Ft. Washington, Pa.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
Omega Engrg., Inc., Stamford, Conn.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
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ABA Industries, Inc., Pinellas Pk., Fla.
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Bay Labs., Inc., Cleveland, Ohio
Burr-Brown Resch. Corp., Tucson, Ariz.
Counterscan Systems, Sutton, Neb.
Datametrics Inc., Wilmington, Mass.
Datum, Inc., Anaheim, Calif.
ILC Data Device Corp., Hicksville, N.Y.
Metra Instruments, Inc., Mt. View, Cal.
Transmagnetics Inc., Farmingdale, N. Y.

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Bendix Corp, Towson, Md.
Bramco Controls, Piqua, Ohio
Counterscan Systems, Sutton, Neb.
Data General Corp. (E), Southboro, Ma.
Datum, Inc., Anaheim, Calif.
Instrumentation Tech. Corp., Northbridge, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Theta Instr. Corp., Fairfield, N.J.
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Bramco Controls, Piqua, Ohio
Microphase Corp., Cos Cob, Conn.
Norsal Industries, Inc., Brentwood, N.Y.

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Clarke - Hess, New York, N.Y. Vol 1•411
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Intronics, Inc., Newton, Mass. Vol 2•316
Transmagnetics Inc., Farmingdale, N. Y. Vol 1•379
Ailtech, City of Industry, Cal.
American Aerospace Controls Inc., Farmingdale, N.Y.
Analogic, Wakefield, Mass.
Bell & Howell, Bridgeport, Conn.
Dynalab Corp., Van Nuys, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
General Magnetics, Bloomfield, N.J.
GPS Corp., Framingham, Mass.
Ind'l. Test Equip., Clifton, NJ
Intech, Santa Clara, Cal.
Neff Instr. Corp., Duarte, Calif.
NES, Inc., Itasca, Ill.
Princeton Applied Resch. Corp., Princeton, N.J.
Systron Donner Computer Systems Div., Concord, Cal.
Teledyne Philbrick, Dedham, Mass.
Zeltex, Inc., Concord, Calif.

Multipliers, Crystal

Collins Radio Co., Dallas, Tex.
General Microwave Corp., Farmingdale, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Microlab/FXR, Livingston, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Somerset Radiation Lab., Arlington, Va.
Trak Microwave, Tampa, Fla.
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BF Elctrns., Solana Beach, Calif.
Dynalab Corp., Van Nuys, Cal.
Electro/Data, Inc., Garland, Tex.
Elctrn. Devices, Yonkers, N.Y.
Environmental Communications Inc., Santa Ana, Cal.
AFI Industries Inc., Long Branch, N. J.
GPS Corp., Framingham, Mass.
Greenray Inds., Inc., Mechanicsburg, Pa.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
RHG Elctrns. Lab., Deer Park, N.Y.
Semtech Corp., Newbury Pk., Cal.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Varo Semiconductor, Inc., Garland, Tex.
Vector Industries, Palo Alto, Cal.

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Anadex Instrs., Inc., Van Nuys, Calif.
Anzac Elctrns., Waltham, Mass.
Beukers Labs., Inc., Hauppauge, N.Y.
BF Elctrns., Solana Beach, Calif.
Collins Radio Co., Dallas, Tex.
Dynalab Corp., Van Nuys, Cal.
Electrac, Inc., Anaheim, Calif.
Environmental Communications Inc., Santa Ana, Cal.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Frequency Sources, No. Chelmsford, Mass.
Greenray Inds., Inc., Mechanicsburg, Pa.
Interstate Elctrns. Corp., Anaheim, Cal.
Matrix Corp., Beech Grove, Ind.
MCL, Inc., La Grange, Ill.
Meloy Laboratories Inc., Springfield, Va.
Microlab/FXR, Livingston, N.J.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Mini-Circuits Lab., Brooklyn, N.Y.
Miteq Inc., Hauppauge, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mu-Del Elctrns., Silver Spring, Md.
National Semiconductor, Santa Clara, Cal.
Polarad Elctrn. Instrs., Lake Success, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
Resdel Engrg. Corp., Arcadia, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Scientific Communications, Garland, Tex.
Sierra Sys., Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
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Trak Microwave, Tampa, Fla.
Union Carbide, San Diego, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Vector Industries, Palo Alto, Cal.
Vibration Instrs. Co., Anaheim, Cal.

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Ohio Semitronics, Columbus, Ohio
Scientific Columbus, Columbus, Ohio

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Transmagnetics Inc., Farmingdale, N. Y.
O. S. Walker Co., Worcester, Mass.

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Edison Elctrns. Div., Manchester, N.H.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Esterline Angus Div., Indianapolis, Ind.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Mepco, Inc., Morristown, N.J.
Ross Engrg. Corp., Campbell, Cal.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Weston Instruments, Inc., Newark, N.J.

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Control Technology Co., L.I.C., N.Y.
Gap Instr. Corp., Hauppauge, N.Y.
General Magnetics, Bloomfield, N.J.
Glentek, Inc., Santa Monica, Calif.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Transicoil, Inc., Worcester, Pa.

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Central Plastics Dists., Chicago, Ill.
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Hermes Plastics, Inc., New York, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Laminated Fabricators, San Bruno, Calif.
Matthews, Jas & Co., Pittsburgh, Pa.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Panelgraphic Corp., Caldwell, N.J.
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PIC Design Division, Ridgefield,, Conn.
Shigoto Inds., Ltd., New York, N.Y.
Smith, Herman H., Inc., Bklyn., N.Y.
Sterling Instr., New Hyde Pk., NY
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3M Co., St. Paul, Minn.
Topflight Corp., York, Pa.
Waldom Elctrns., Inc., Chicago, Ill.

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ADC Prods., Minneapolis, Minn.
Altec Div., Anaheim, Calif.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Dale Elctrns., Inc., Columbus, Neb.
Dietz Design, Inc., Belton, Mo.
El-Rad Mfg. Co., Chicago, Ill.
Electro-Voice, Inc., Buchanan, Mich.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
Kelvin, Van Nuys, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Sennheiser Elctrn. Corp., New York, NY
Spectra Sonics, Ogden, Utah
Standard Condenser Corp., Chicago, Ill.
TT Elctrns., Inc., Los Angeles, Cal.
University Sound, Anaheim, Cal.

Utah Elctrns., Huntington, Ind.

Networks, Directional Antenna Phasing

Anaren Microwave, Inc., Syracuse, N.Y.
Anzac Elctrns., Waltham, Mass.
Artronic Instr. Co., Silver Spring, Md.
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Datron Systems, Chatsworth, Cal.
Dynalab Corp., Van Nuys, Cal.
GAF Corp., New York, N.Y.
ILC Data Device Corp., Hicksville, N.Y.
Merrimac Inds., Inc., West Caldwell, N.J.
Premier Microwave, Port Chester, N.Y.
RCA Missile & Surface Radar Div., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
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Artronic Instr. Co., Silver Spring, Md.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
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Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Components, Inc., Biddeford, Me.
Composite Microcircuits, Waltham, Mass.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Data Delay Devices, Clifton, N.J.
Dietz Design, Inc., Belton, Mo.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Assocs., W. Long Branch, N.J.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
Electronic Research Co., Shawnee Mission, Kan.
ESC Elctrns. Corp., Palisades Pk., N.J.
General Resistance, Inc., Mt. Vernon, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Halex, Inc., Torrance, Cal.
HEI, Inc., Chaska, Minn.
Hisonic, Inc., Olathe, Kans.
HyComp Inc., Maynard, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Julie Research Lab., New York, N.Y.
Kelvin, Van Nuys, Cal.
Marstan Resistor, Orange, N.J.
Mepco, Inc., Morristown, N.J.
Micro Networks, Worcester, Mass.
Pyrofilm Corp., Whippany, N.J.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCL Elctrns., Inc., Irvington, N.J.
Reon Resistor Corp., Frazer, Pa.
Sprague Elec. Co., No. Adams, Mass.
Tech Labs., Inc., Palisades Pk., N.J.
Tel Labs., Manchester, N.H.
TRW/IRC Fixed Resistors, Philadelphia, Pa.
TT Elctrns., Inc., Los Angeles, Cal.
Ultronix, Inc., Grand Junction, Colo.
Ward Leonard Hagerstown Div., Hagerstown, Md.

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Artronic Instr. Co., Silver Spring, Md.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Centralab Elctrns Div., Milwaukee, Wisc
Columbia Components, Hempstead, N.Y.
Computer Devices, Commack, N.Y.
Computer Instrs., Hempstead, N.Y.
Data Delay Devices, Clifton, N.J.
Dietz Design, Inc., Belton, Mo.
Dynalab Corp., Van Nuys, Cal.
Electrocom Inds., So. Bend, Indiana
Electronic Research Co., Shawnee Mission, Kan.
ESC Elctrns. Corp., Palisades Pk., N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
Kappa Networks, Inc., Carteret, N.J.
Maxwell Labs., Inc., San Diego, Calif.
Microtran Co. Inc., Valley Stream, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
Raytheon Co., Quincy, Mass.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCL Elctrns., Inc., Irvington, N.J.
RtroN Corp., Skokie, Ill.
Standard Condenser Corp., Chicago, Ill.
TMC Systems (Ariz.), Tempe, Ariz.
Torotel, Inc., Grandview, Mo.
TT Elctrns., Inc., Los Angeles, Cal.

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Gamble, Charles T. Inds., Riverside, N.J.
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GRM Corp., Medford, N.J.
Hisonic, Inc., Olathe, Kans.
Jerrold Electronics Corp., Philadelphia, Pa.
Julie Research Lab., New York, N.Y.
Kelvin, Van Nuys, Cal.
Marstan Resistor, Orange, N.J.
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Micro Networks, Worcester, Mass.
Mu-Del Elctrns., Silver Spring, Md.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Nytronics Inc., Darlington, S.C.
Premier Microwave, Port Chester, N.Y.
Pyrofilm Corp., Whippany, N.J.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCL Elctrns., Inc., Irvington, N.J.
Resistance Prods., Harrisburg, Pa.
Standard Condenser Corp., Chicago, Ill.
TRW/IRC Fixed Resistors, Burlington, Iowa
TT Elctrns., Inc., Los Angeles, Cal.
Vari-L Co., Inc., Denver, Colo.
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Kappa Networks, Inc., Carteret, N.J.
Kelvin, Van Nuys, Cal.
Marstan Resistor, Orange, N.J.
Merrimac Inds., Inc., West Caldwell, N.J.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
RCL Elctrns., Inc., Irvington, N.J.
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Collins Radio Co., Dallas, Tex.
Columbia Components, Hempstead, N.Y.
Computer Devices, Commack, N.Y.
Computer Instrs., Hempstead, N.Y.
Condenser Prods. Corp., Brooksville, Fla.
Custom Elctrns., Oneonta, N.Y.
Datalight Inc., Bloomfield, Conn.
Del Electronics Corp., Mt. Vernon, N.Y.
Edison Elctrns. Div., Manchester, N.H.
El-Rad Mfg. Co., Chicago, Ill.
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
General Lab. Assocs., Norwich, N.Y.
Hipotronics, Inc., Brewster, N.Y.
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Kappa Networks, Inc., Carteret, N.J.
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Kelvin, Van Nuys, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
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Pulse Engrg., Inc., San Diego, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCL Elctrns., Inc., Irvington, N.J.
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Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Centralab Elctrns Div., Milwaukee, Wisc
Composite Microcircuits, Waltham, Mass.
Custom Elctrns., Oneonta, N.Y.
Del Electronics Corp., Mt. Vernon, N.Y.
Dietz Design, Inc., Belton, Mo.
Dynalab Corp., Van Nuys, Cal.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Assocs., W. Long Branch, N.J.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
ESC Elctrns. Corp., Palisades Pk., N.J.
Gamble, Charles T. Inds., Riverside, N.J.
General Resistance, Inc., Mt. Vernon, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hybrid Technology Corp., Arlington, Tex.
Kelvin, Van Nuys, Cal.
Marstan Resistor, Orange, N.J.
Maxwell Labs., Inc., San Diego, Calif.
Mepco, Inc., Morristown, N.J.
Midwec Corp., Scottsbluff, Neb.
Murata Mfg. Co. Ltd., Kyoto, Japan
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Plastic Capacitors, Inc., Chicago, Ill.
Plessey Ceramic Div., Frenchtown, N.J.
Presin Co., Inc., Shelton, Conn.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCL Elctrns., Inc., Irvington, N.J.
Resistance Prods., Harrisburg, Pa.
RtroN Corp., Skokie, Ill.
Seacor, Inc., Norwood, N.J.
Shallco, Inc., Smithfield, N.C.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Tel Labs., Manchester, N.H.
TT Elctrns., Inc., Los Angeles, Cal.
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Arcidy Assocs., Manchester, N. H.
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Burr-Brown Resch. Corp., Tucson, Ariz.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Components, Inc., Biddeford, Me.
Composite Microcircuits, Waltham, Mass.
Computer Devices, Commack, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Electro Sci. Inds., Portland, Ore.
Elctrn. Assocs., W. Long Branch, N.J.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
General Resistance, Inc., Mt. Vernon, N.Y.
GRM Corp., Medford, N.J.
Halex, Inc., Torrance, Cal.
HEI, Inc., Chaska, Minn.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Julie Research Lab., New York, N.Y.
Kelvin, Van Nuys, Cal.
Keystone Carbon Co., St. Marys, Pa.
Marstan Resistor, Orange, N.J.
Mepco, Inc., Morristown, N.J.
Mini-Systems, Inc, North Attleboro, Mass.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
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Plessey Ceramic Div., Frenchtown, N.J.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Reon Resistor Corp., Frazer, Pa.
RFL Inds., Comms. Div., Boonton, N.J.
Rodan Ind's., Anaheim, Ca.
Seacor, Inc., Norwood, N.J.
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Sprague Elec. Co., No. Adams, Mass.
Statek Corp., Orange, Cal.
Tech Labs., Inc., Palisades Pk., N.J.
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Thin Film Services, Gile, Wisc.
TRW/IRC Fixed Resistors, Philadelphia, Pa.
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Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
AMF Electical Prods., Alexandria, Va.
Austron, Inc., Austin, Tex.
Beckman Instrs., (AISSD), Fullerton, Cal.
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Bendix Corp. Environmtl. Sci., Baltimore, Md.
Benthos, Inc., N. Falmouth, Mass.
Beukers Labs., Inc., Hauppauge, N.Y.
Bunker-Ramo Corp., Westlake Village, Cal
Channel Inds., Santa Barbara, Cal.
Chesapeake Instr. Corp., Shadyside, Md.
Cole Instrument Corp., Costa Mesa, Cal.
Del Electronics Corp., Mt. Vernon, N.Y.
Digitron Corp., Norristown, Pa.
Dranetz Engrg. Labs., So. Plainfield, N.J.
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Guildline Instrs., Inc., Larchmont, N.Y.
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Ind'l. Control Co., Farmingdale, N.Y.
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ITT Gilfillan Div. of ITT, Van Nuys, Calif.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Marconi Elctrns. Inc., Elmsford, N.Y.
Micro Instr. Co., Hawthorne, Cal.
NES, Inc., Itasca, Ill.
NUSonics, Inc., Paramus, N.J.
Plessey Enviromental Sys., San Diego, Cal.
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RCA Govt. & Comm. Sys., Moorestown, N.J.
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Arra Inc., Bay Shore, N.Y.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
Clarke - Hess, New York, N.Y.
Connor-Winfield Corp., West Chicago, Ill.
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynamic Measurements Corp., Winchester, Ma.
Fairchild Sound Equip., Commack, N.Y.
Ind'l. Test Equip., Clifton, NJ
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
National Semiconductor, Santa Clara, Cal.
Q-Tech Corp., Los Angeles, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Signetics. Corp., Sunnyvale, Calif.
Tektronix, Inc., Beaverton, Ore.
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American Time Products, Woodside, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
Arvin Frequency Devices, Columbus, Ind.
B & K Instrs., Inc., Cleveland, Ohio
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Frequency Elctrns., New Hyde Pk., N.Y.
General Radio Co., Concord, Mass.
Hope Elctrns., Clifton, N.J.
Kay Elemetrics, Pine Brook, N.J.
Marconi Instrs., Englewood, N.J.
National Semiconductor, Santa Clara, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
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American Time Products, Woodside, N.Y.
Arvin Frequency Devices, Columbus, Ind.
Connor-Winfield Corp., West Chicago, Ill.
Nortronics, Mpls., Minn.
Opamp Labs. Inc., Los Angeles, Cal.

Oscillators, Bridge (Test)

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Arvin Frequency Devices, Columbus, Ind.
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Dynalab Corp., Van Nuys, Cal.
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Croven, Ltd., Whitby, Ont., Can.
Crystal Network Prods. Corp., Erie, Pa.
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Gorman-Redlich Mfg. Co., Athens, Ohio
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NH Research, Inc., Santa Ana, Calif.
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Trak Microwave, Tampa, Fla.
Varian, Beverly, Mass.
Wavetek Indiana, Inc., Beech Grove, Ind.

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Ailtech, City of Industry, Cal.
Arvin Frequency Devices, Columbus, Ind.
Clarke - Hess, New York, N.Y.
Exact Elctrns., Inc., Hillsboro, Ore.
Fork Standards, W. Chicago, Ill.
General Radio Co., Concord, Mass.
Ind'l. Test Equip., Clifton, NJ
NH Research, Inc., Santa Ana, Calif.

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Burr-Brown Resch. Corp., Tucson, Ariz.
Douglas Randall Div., Pawcatuck, Conn.
Dynamic Measurements Corp., Winchester, Ma.
Electronic Research Co., Shawnee Mission, Kan.
Frequency Elctrns., New Hyde Pk., N.Y.
Ind'l. Test Equip., Clifton, NJ
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Motorola Inc., Chicago, Ill.
Signetics. Corp., Sunnyvale, Calif.
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Ailtech, City of Industry, Cal.
Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Amperex Electronic Corp., Hicksville, N.Y.
Arvin Frequency Devices, Columbus, Ind.
Avantek, Inc., Santa Clara, Cal.
Collins Radio Co., Dallas, Tex.
Dynalab Corp., Van Nuys, Cal.
E-H Resch. Labs., Inc., Oakland, Cal.
Environmental Communications Inc., Santa Ana, Cal.
Frequency Sources, No. Chelmsford, Mass.
GAF Corp., New York, N.Y.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Hope Elctrns., Clifton, N.J.
ITT Electron Tube, Easton, Pa.
KMC Semiconductor Corp., Long Valley, N.J.
Litton Inds., San Carlos, Calif.
Marconi Instrs., Englewood, N.J.
Maury Microwave Corp., Cucamonga, Calif.
Micro-Now Instr., Chicago, Ill.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Narda Microwave Corp., Plainview, N.Y.
Omni-Spectra, Inc., Tempe, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Physical Elctrn. Labs., Menlo Park, Calif.
Plessey Semiconductors, Farmingdale, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCA Elctrns. Comps., Harrison, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Ryka Scientific, Inc., Sunnyvale, Cal.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Sperry Elctrn. Tube, Gainesville, Fla.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Eastern Tube Div., Beverly, Mass.
Varian, Beverly, Mass.
Vega Precision Labs., Vienna, Va.
Watkins Johnson Co., Palo Alto, Cal.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

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American Time Products, Woodside, N.Y.
Applied Microwave, Westwood, Mass.
Arvin Frequency Devices, Columbus, Ind.
California Instrs. Co., San Diego, Cal.
Clarke - Hess, New York, N.Y.
Dynalab Corp., Van Nuys, Cal.
Dynamic Measurements Corp., Winchester, Ma.
Ferwalt, W.H., Inc., Lapwai, Idaho
Ind'l. Test Equip., Clifton, NJ
Miteq Inc., Hauppauge, N.Y.
NH Research, Inc., Santa Ana, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.

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Arra Inc., Bay Shore, N.Y.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Cermetek, Inc., Mountain View, Cal.
Electronic Research Co., Shawnee Mission, Kan.
Ferwalt, W.H., Inc., Lapwai, Idaho
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Q-Tech Corp., Los Angeles, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
Texscan Corp., Indianapolis, Ind.
Transystems Elctrn. Co., Fort Lee, N.J.

Oscillators, Pulse (Test)—See Generators, Pulse

Oscillators, Reed

American Time Products, Woodside, N.Y.
Biddle, James G., Plymouth Meeting, Pa.
Bramco Controls, Piqua, Ohio
Motorola Inc., Chicago, Ill.

Oscillators, RC (Module)

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Applied Microwave, Westwood, Mass.
Arra Inc., Bay Shore, N.Y.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Sources, No. Chelmsford, Mass.
Gorman-Redlich Mfg. Co., Athens, Ohio
MCL, Inc., La Grange, Ill.
Miteq Inc., Hauppauge, N.Y.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Sierra Sys., Mountain View, Cal.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
Soltec Corp., No. Hollywood, Cal.
Spectrum Technology, Goleta, Cal.
Sperry Elctrn. Tube, Gainesville, Fla.
Texscan Corp., Indianapolis, Ind.
TRW Elctrnc. Functions, Candem, N.J.
Wavetek Indiana, Inc., Beech Grove, Ind.

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Arnold Magnetics, Culver City, Cal.
Behlman Engrg. Corp., Santa Barbara, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Dynamic Measurements Corp., Winchester, Ma.
Frequency Elctrns., New Hyde Pk., N.Y.
Gorman-Redlich Mfg. Co., Athens, Ohio
Ind'l. Test Equip., Clifton, NJ
MCL, Inc., La Grange, Ill.
NH Research, Inc., Santa Ana, Calif.
Optimation, Inc., Chatsworth, Cal.
Q-Tech Corp., Los Angeles, Cal.
Signetics. Corp., Sunnyvale, Calif.
Tektronix, Inc., Beaverton, Ore.
Transystems Elctrn. Co., Fort Lee, N.J.

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Cermetek, Inc., Mountain View, Cal.
Comaltest, Danbury, Conn.
Electronic Research Co., Shawnee Mission, Kan.
Frequency Elctrns., New Hyde Pk., N.Y.
Ind'l. Test Equip., Clifton, NJ
M F Elctrns. Corp., New York, N.Y.
Motorola Inc., Chicago, Ill.
NH Research, Inc., Santa Ana, Calif.
Precision Dynamics Corp., Burbank, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Signetics. Corp., Sunnyvale, Calif.
Tektronix, Inc., Beaverton, Ore.
Transystems Elctrn. Co., Fort Lee, N.J.

Oscillators, Square-Wave (Test)—See Generators, Function

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Almond Instrs. Co., Covina, Cal
Arra Inc., Bay Shore, N.Y.
Arvin Frequency Devices, Columbus, Ind.
Avtel Corp., Covina, Cal.
Beukers Labs., Inc., Hauppauge, N.Y.
Biocom, Inc., Culver City, Cal.
Bramco Controls, Piqua, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
Connor-Winfield Corp., West Chicago, Ill.
Data-Control Systems, Danbury, Conn.
Electronic Research Co., Shawnee Mission, Kan.
Exact Elctrns., Inc., Hillsboro, Ore.
Ferwalt, W.H., Inc., Lapwai, Idaho
Fork Standards, W. Chicago, Ill.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Sources, No. Chelmsford, Mass.
General Devices, Inc., Princeton, N.J.
Greenray Inds., Inc., Mechanicsburg, Pa.
Gulton Inds., Inc., Metuchen, N.J.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
M F Elctrns. Corp., New York, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
Q-Tech Corp., Los Angeles, Cal.
Scientific-Atlanta, Inc., Atlanta, Ga.
Special Microwave Devices Oper., Waltham, Mass.
Statek Corp., Orange, Cal.
T-F Electronics, Inc., Austin, Tex.
Texscan Corp., Indianapolis, Ind.
Trak Microwave, Tampa, Fla.
Transystems Elctrn. Co., Fort Lee, N.J.
Video Research Corp., Gaithersburg, Md.
Watkins Johnson Co., Palo Alto, Cal.
Wavetek, San Diego, Cal.

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Arra Inc., Bay Shore, N.Y.
Arvin Sys., Inc., Dayton, Ohio
Behlman Engrg. Corp., Santa Barbara, Cal.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Croven, Ltd., Whitby, Ont., Can.
Dynalab Corp., Van Nuys, Cal.
Dynamic Measurements Corp., Winchester, Ma.
Electronic Research Co., Shawnee Mission, Kan.
Frequency Elctrns., New Hyde Pk., N.Y.
Microphase Corp., Cos Cob, Conn.
National Semiconductor, Santa Clara, Cal.
NH Research, Inc., Santa Ana, Calif.
Omni-Spectra, Inc., Tempe, Ariz.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Snelgrove, C. R. Ltd., Don Mills 404 Ont., Ont. Can.
Sperry Elctrn. Tube, Gainesville, Fla.
Tedford Crystal Labs., Cincinnati, Ohio
Trak Microwave, Tampa, Fla.
Varian, Solid State West Division, Palo Alto, Cal.

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Biddle, James G., Plymouth Meeting, Pa.
Bramco Controls, Piqua, Ohio
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Collins Radio Co., Dallas, Tex.
Fork Standards, W. Chicago, Ill.
Ind'l. Test Equip., Clifton, NJ
Murata Mfg. Co. Ltd., Kyoto, Japan
NH Research, Inc., Santa Ana, Calif.
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Dynalab Corp., Van Nuys, Cal.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Sources, No. Chelmsford, Mass.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Polarad Elctrn. Instrs., Lake Success, N.Y.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Sierra Sys., Mountain View, Cal.
Soltec Corp., No. Hollywood, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
T-F Electronics, Inc., Austin, Tex.
Texscan Corp., Indianapolis, Ind.
Wavetek Indiana, Inc., Beech Grove, Ind.

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Oscillators, Ultrasonic (Module)

Arvin Frequency Devices, Columbus, Ind.
Connor-Winfield Corp., West Chicago, Ill.
Ferwalt, W.H., Inc., Lapwai, Idaho
Fork Standards, W. Chicago, Ill.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
T-F Electronics, Inc., Austin, Tex.
Tektronix, Inc., Beaverton, Ore.

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Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Sources, No. Chelmsford, Mass.
Ind'l. Test Equip., Clifton, NJ
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microphase Corp., Cos Cob, Conn.
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NH Research, Inc., Santa Ana, Calif.
Omni-Spectra, Inc., Tempe, Ariz.
Physical Elctrn. Labs., Menlo Park, Calif.
Precision Dynamics Corp., Burbank, Cal.
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Signetics. Corp., Sunnyvale, Calif.
Sperry Elctrn. Tube, Gainesville, Fla.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
T-F Electronics, Inc., Austin, Tex.
Texscan Corp., Indianapolis, Ind.
Transystems Elctrn. Co., Fort Lee, N.J.
Varian, Solid State West Division, Palo Alto, Cal.
Vidar Corp., Mountain View, Cal.
Watkins Johnson Co., Palo Alto, Cal.
Wiltron Co., Palo Alto, Calif.

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Gould, Inc., Cleveland, Ohio .. Vol 4•431*
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B & F Instrs., Inc., Cornwells Hgts., Pa.
Beckman Instrs., (AISSD), Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
BLH Elctrns., Inc., Waltham, Mass.
Dixson Inc., Meter Div., Grand Junction, Colo.
Geo Space, Houston, Tex.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Honeywell, Denver, Colo.
MFE Corporation, Salem, N.H.
Photron Instr. Co., Cleveland, Ohio
Soltec Corp., No. Hollywood, Cal.
Teledyne Geotech, Dallas, Tex.
Varian Data Machines, Palo Alto, Cal.

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Oscilloscope Image Expanders

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Oscilloscope Plug-Ins

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Leader Instruments Corp., Long Island City, N.Y.
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Tucker Electronics Co., Garland, Tex.

Oscilloscope Probes

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Active Control Instrumentation, E. Northport, NY
Ballantine Laboratories, Inc., Boonton,, N. J.
Circon Corp., Santa Barbara, Ca.
Dumont Oscilloscope Labs., Inc., W. Caldwell, N.J.
Dynascan Corp., Chicago, Ill.
E-H Resch. Labs.,Inc., Oakland, Cal.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Leader Instruments Corp., Long Island City, N.Y.
Millen, James Mfg., Malden, Mass.
Norsal Industries, Inc., Brentwood, N.Y.
Projects Unlimited, Inc., Dayton, Ohio
Tektronix, Inc., Beaverton, Ore.

Texscan Corp., Indianapolis, Ind.

Oscilloscopes, Digital Readout

Automated Meas., Oakland, Calif.
Dynascan Corp., Chicago, Ill.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
Nicolet Instr. Corp., Madison, Wisc.
Tektronix, Inc., Beaverton, Ore.

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Dumont Oscilloscope Labs., Inc., W. Caldwell, N.J.
Heath Co., Benton Harbor, Mich.
Infodex, Inc., Waterbury, Conn.
ITI Electronics, Inc., Clifton, N.J.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Kikusui Elctrns. Inc., New York, N.Y.
Leader Instruments Corp., Long Island City, N.Y.
Millen, James Mfg., Malden, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Simpson Elec. Co., Chicago, Ill.
Soltec Corp., No. Hollywood, Cal.
Tektronix, Inc., Beaverton, Ore.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Tucker Electronics Co., Garland, Tex.
Vu-data Corp., San Diego, Cal.

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Ballantine Laboratories, Inc., Boonton,, N. J.
Dumont Oscilloscope Labs., Inc., W. Caldwell, N.J.
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E-H Resch. Labs., Inc., Oakland, Cal.
Infodex, Inc., Waterbury, Conn.
Soltec Corp., No. Hollywood, Cal.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Texscan Corp., Indianapolis, Ind.
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Oscilloscopes, Low-Frequency (D-C to 3 MHZ)

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Dumont Oscilloscope Labs., Inc., W. Caldwell, N.J.
Electro-Optical Inds., Inc., Santa Barbara, Cal.
Infodex, Inc., Waterbury, Conn.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Kikusui Elctrns. Inc., New York, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Tucker Electronics Co., Garland, Tex.
Vu-data Corp., San Diego, Cal.

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Ballantine Laboratories, Inc., Boonton,, N. J.
Beckman Instrs., (AISSD), Fullerton, Cal.
Calico Div., San Diego, Cal.
Dumont Oscilloscope Labs., Inc., W. Caldwell, N.J.
Gould, Inc., Cleveland, Ohio
Heath Co., Benton Harbor, Mich.
Infodex, Inc., Waterbury, Conn.
Kikusui Elctrns. Inc., New York, N.Y.
Metra Instruments, Inc., Mt. View, Cal.
Precision Standards Corp., Santa Ana, Cal.
Tektronix, Inc., Beaverton, Ore.
Telonic Inds., Inc., Laguna Beach, Calif.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Texscan Corp., Indianapolis, Ind.
Tucker Electronics Co., Garland, Tex.
Voltex Co., Inc., Farmingdale, N.Y.
Vu-data Corp., San Diego, Cal.

Oscilloscopes, Portable, Battery Operated

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AUL Instrs., Inc., Flushng, N.Y.
Biocom, Inc., Culver City, Cal.
Infodex, Inc., Waterbury, Conn.
Texscan Corp., Indianapolis, Ind.
Tucker Electronics Co., Garland, Tex.
Vu-data Corp., San Diego, Cal.

Oscilloscopes, Programmable

Automated Meas., Oakland, Calif.
Tektronix, Inc., Beaverton, Ore.

Oscilloscopes, Sampling

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E-H Resch. Labs., Inc., Oakland, Cal.
Tucker Electronics Co., Garland, Tex.

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Applied Magnetics Corp., Goleta, Calif.
Princeton Elctrn. Prods., New Brunswick, N.J.
Tucker Electronics Co., Garland, Tex.

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Oscilloscopes, Three-Dimensional

Stereotronics Television Co., Sherman Oaks, Cal.
Tektronix, Inc., Beaverton, Ore.

Ovens, Aging, Burn-In, Life Test

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Accutronics, Geneva, Ill.
American Time Products, Woodside, N.Y.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
Baron-Blakeslee, Div. Purex Corp., Chicago, Ill.
Bliley Electric, Erie, Pa.
Blue M Engrg. Co., Blue Island, Ill.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Collins Radio Co., Dallas, Tex.
Electronic Research Co., Shawnee Mission, Kan.
Frequency Elctrns., New Hyde Pk., N.Y.
Glentronics, Div. Sawyer Inds., Glendora, Cal.
Hope Elctrns., Clifton, N.J.
Hotpack Corp., Phila., Pa.
Kahle Engrg. Co., Union City, N.J.
Master Appliance Corp., Racine, Wisc.
Materials Resch. Corp., Orangeburg, N.Y.
Monitor Prods., S. Pasadena, Cal.
Murata Mfg. Co. Ltd., Kyoto, Japan
N.Y. Testing Labs., Inc., Westbury, N.Y.
Sawyer Inds., Arcadia, Cal.
Signet Scientific Co., Burbank, Cal.
Snelgrove, C. R. Ltd., Don Mills 404 Ont., Ont. Can.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Thermal Sys., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.

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Ovens, Infrared Drying

Blue M Engrg. Co., Blue Island, Ill.
Caig Labs., Inc., Westbury, N.Y.
Casso-Solar Inc., Kew Gardens, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
Despatch Oven Co., Minneapolis, Minn.
Forma Scientific, Marietta, Ohio
Hotpack Corp., Phila., Pa.
Kepro Cir. Sys., Inc., St. Louis, Mo.
OAL Assocs., Inc., Westbury, N.Y.
Podgor, Joseph Co., Pennsauken, N.J.
Precision Sci. Co., Chicago, Ill.
Research, Inc., Minneapolis, Minn.

Ovens, Laboratory

American Instr. Co., Silver Spring, Md.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Baron-Blakeslee, Div. Purex Corp., Chicago, Ill.
Blue M Engrg. Co., Blue Island, Ill.
Caig Labs., Inc., Westbury, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
Custom Sci. Instrs., Inc., Whippany, N.J.
Delta Design, San Diego, Cal
Despatch Oven Co., Minneapolis, Minn.
Fisher Sci. Co., Pittsburgh, Pa.
Forma Scientific, Marietta, Ohio
Hotpack Corp., Phila., Pa.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Master Appliance Corp., Racine, Wisc.
Materials Resch. Corp., Orangeburg, N.Y.
N.Y. Testing Labs., Inc., Westbury, N.Y.
OAL Assocs., Inc., Westbury, N.Y.
Precision Sci. Co., Chicago, Ill.
Sara Scientific Co., San Francisco, Calif.
Standard Environmental Systems, Inc., Totowa, N.J.
Watkins Johnson Co., Palo Alto, Cal.

Ovens, Particle Reduction

Despatch Oven Co., Minneapolis, Minn.

Ovens, Vacuum

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Fisher Sci. Co., Pittsburgh, Pa.
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High Vacuum Equip. Corp., Hingham, Mass.
Hotpack Corp., Phila., Pa.
Hull Corp., Hatboro, Pa.
Kahle Engrg. Co., Union City, N.J.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Materials Resch. Corp., Orangeburg, N.Y.
OAL Assocs., Inc., Westbury, N.Y.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
Precision Sci. Co., Chicago, Ill.
Red Point Corp., Burbank, Calif.
Standard Environmental Systems, Inc., Totowa, N.J.
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Varian Assocs., Palo Alto, Cal.

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Cincinnati Elctrns. Corp., Cincinnati, Ohio
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Coors Porcelain Co., Golden, Colo.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Hermetic Seal Corp., Rosemead, Cal.
Ind'l. Control Co., Farmingdale, N.Y.
Metalized Ceramics, Providence, R.I.
Mini-Systems, Inc, North Attleboro, Mass.
Modpak, Waltham, Mass.
National Beryllia Corp., Haskell, N.J.
Spec Plastics Inc., No. Hollywood, Cal.
Stevens Prods., Inc., E. Orange, N.J.
Tekform Prods. Co., Anaheim, Cal.
Texas Instruments, Dallas, Tex.
Texas Instruments, Attleboro, Mass.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
United Mineral & Chem. Corp., New York, N.Y.
Varian, Beverly, Mass.
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Watkins Johnson Co., Palo Alto, Cal.

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Christiansen Radio Inc., Laguna Beach, Cal.
Cinch-Monadnock, Oper. of TRW Elctrn. Comps., City of Industry, Cal.
Circuit Structures Lab., Burbank, Calif.
D-Cemco, Inc., Burbank, Calif.
Delbert Blinn. Co., Pomona, Calif.
Elctrn. Molding Corp., Woonsocket, R.I.
Globe Plastics, Pomona, Cal.
Grayhill Moldtronics, Inc., Downers Grove, Ill.
Int'l. Elctrn. Resch., Burbank, Cal.
Keystone Elctrns. Corp., New York, N.Y.
Mann, Henry Inc., Feasterville, Pa.
National Beryllia Corp., Haskell, N.J.
Nippert Co., Delaware, Ohio

Robison Elctrns., Gardena, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Spec-Plastics Inc., No. Hollywood, Cal.
Staver Co., Inc., Bay Shore, N.Y.
Union Carbide, Carbon Prods. Div., New York, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Weckesser Co., Inc., Chicago, Ill.
Zippertubing Co., Los Angeles, Calif.

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Paints, Luminous

Black Light Corp. Amer., San Gabriel, Cal.
Edmund Scientific Co., Barrington, N.J.
N L Inds., Inc., Paint Div., New York, N. Y.
Shannon Luminous Mat'ls., Hollywood, Cal.
3M Co., St. Paul, Minn.
Ultra-Violet Prods., Inc., San Gabriel, Cal.

Paints, Metallic

Chomerics, Inc., Woburn, Mass.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Electro-Science Labs., Pennsauken, N. J.
LPS Research Labs., Los Angeles, Cal.
Micro-Circuits Co., New Buffalo, Mich.
N L Inds., Inc., Paint Div., New York, N. Y.
Randolph Prods. Co., Carlstadt, N.J.

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N L Inds., Inc., Paint Div., New York, N. Y.
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General Elec., Insulating Matl's., Schenectady, N.Y.
Methode Elctrns., Inc., Chicago, Ill.
Murata Mfg. Co. Ltd., Kyoto, Japan
N L Inds., Inc., Paint Div., New York, N. Y.
Pennsylvania Ind'l. Chem. Corp., Clairton, Pa.
Podgor, Joseph Co., Pennsauken, N.J.
Randolph Prods. Co., Carlstadt, N.J.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
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Lear Siegler, Grand Rapids, Mich.
Panelgraphic Corp., Caldwell, N.J.
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Singer Co., Little Falls, N.J.
TEC, Inc., Tucson, Ariz.

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Connector Corp., Chicago, Ill.
Littelfuse, Inc., Des Plaines, Ill.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Mobil Elctrns., Inc., Anderson, Ind.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Singer - Tele-Signal, Woodbury, N.Y.
Taylor Industries Inc., Howell, Mich.
Underwriters Safety Device Co., Chicago, Ill.
Wadsworth Elec. Mfg. Co., Inc., Covington, Ky.

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Accurate Elctrns. Corp., Elyria, Ohio
Allied Systems Corp., Greensboro, N.C.
Altec Div., Anaheim, Calif.
Amp Inc., Harrisburg, Pa.
Anchor Specialty Mfg., Teterboro, N.J.
Apahouser Corp. of N.E., Boston, Mass.
Artisan Elctrns. Corp., Parsippany, N.J.
Birnbach Co., Inc., Freeport, N.Y.
Bud Radio, Willoughby, Ohio
Connector Corp., Chicago, Ill.
Drake Mfg., Harwood Hgts., Ill.
Elctrn. Molding Corp., Woonsocket, R.I.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Honeywell, Ft. Washington, Pa.
Info-Lite Corp., Corona, N.Y.
International Data Sciences, Providence, R.I.
Interswitch, Burlingame, Cal.
Johnson E. F. Co., Waseca, Minn.
Liberty Controls, Inc., Shorewood, Ill.
LVC Inds. Inc., Flushing, N.Y.
Lynn Elctrns. Corp., Feasterville, Pa.
Mac Panel Co., High Pt., N.C.
Marlin Mfg. Corp., Cleveland, Ohio
Mechanical Engraving Co., Inc., Bronx, N.Y.
Methode Elctrns., Inc., Chicago, Ill.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Mobil Elctrns., Inc., Anderson, Ind.
Mupac Corp., Brockton, Mass.
National Tel-Tronics, Meadville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Omega Engrg., Inc., Stamford, Conn.
Paraplegics Mfg., Bensenville, Ill.
Priority Services, Burbank, Cal.
RCA Corp., Camden, N.J.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., Bklyn., N.Y.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Switchcraft, Inc., Chicago, Ill.
Technical Mat'l., Mamaroneck, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Virginia Panel Corp., Waynesboro, Va.

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Panels, Meter—See Cases, Equipment, Instrument, Meter

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Anchor Specialty Mfg., Teterboro, N.J.
Chem Aero, Inc., Wilmington, Cal.
Cutler-Hammer, Milwaukee, Wisc.
GRM Corp., Medford, N.J.
Hartman Electrical Mfg., Mansfield, Ohio
Mechanical Engraving Co., Inc., Bronx, N.Y.
Methode Elctrns., Inc., Chicago, Ill.
Mupac Corp., Brockton, Mass.

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ADC Prods., Minneapolis, Minn.
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Bud Radio, Willoughby, Ohio
Cabtron Sys., Inc., Northbrook, Ill.
Elctrn. Molding Corp., Woonsocket, R.I.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hartman Electrical Mfg., Mansfield, Ohio
Hoffman Engrg. Co., Anoka, Minn.
Honeywell, Ft. Washington, Pa.
Honeywell, Inc., Wabash, Ind.
Ingersoll Prods., Chicago, Ill.
Interswitch, Burlingame, Cal.
Liberty Controls, Inc., Shorewood, Ill.
Matrix Engineering Corp., Gardena, Calif.
Metal Works, Inc., Herman, Mo.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Mobil Elctrns., Inc., Anderson, Ind.
Mupac Corp., Brockton, Mass.
Par-Metal Prods. Div., Brooklyn, N.Y.
Paraplegics Mfg., Bensenville, Ill.
Scientific-Atlanta, Inc., Atlanta, Ga.
Techmar Corp., Los Angeles, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
Zero Mfg. Co., Burbank, Cal.

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Paper Shredders

Chemical Etching Equip. & Supply, Alexandria, Va.

Paper-Tape Preparation Systems

Data Specialties Inc., Highland Park, Ill.
Demex, Inc., Kansas City, Mo.
NES, Inc., Itasca, Ill.

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AGFA-Gevaert, Inc., Teterboro, N.J.
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Beckman Instrs., (AISSD), Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bristol Div, Waterbury, Conn
California Computer Prods., Anaheim, Cal
Computer Instrs., Hempstead, N.Y.
Dietzgen Corp., Chicago, Ill.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Esterline Angus Div., Indianapolis, Ind.
Fitchburg Coated Products, Scranton, Pa.
Foxboro Co., Foxboro, Mass.
General Elec., W. Lynn, Mass.
General Radio Co., Concord, Mass.
Gould, Inc., Cleveland, Ohio
Graphic Controls Corp., Buffalo, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Honeywell, Ft. Washington, Pa.
Honeywell, Denver, Colo.
Houston Instr., Bellaire, Tex.
Keuffel & Esser Co., Morristown, N.J.
Laboratory Data Control, Riviera Beach, Fla.
Leeds & Northrup Corp., No. Wales, Pa.
LFE Corp., Waltham,, Mass.
Linear Instrs. Corp., Costa Mesa, Cal.
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Recorder Systems Div., E. Greenwich, R.I.
Schweitzer, Peter J. Div., Lee, Mass.
Soltec Corp., No. Hollywood, Cal.
Texas Instruments, Inc., Houston, Tex.
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Varian Data Machines, Palo Alto, Cal.
Westronics, Inc., Ft. Worth, Tex.

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ABA Industries, Inc., Pinellas Pk., Fla.
Aeroflex Labs., Plainview, N.Y.
Andrew Corp., Orland Pk., Ill.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Datron Systems, Chatsworth, Cal.
Emerson & Cuming, Inc., Canton, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Robicon Corp., Pittsburgh, Pa.
Scientific-Atlanta, Inc., Atlanta, Ga.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Tasker Systems, Chatsworth, Cal.
Teledyne Micronetics, San Diego, Calif.

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Burroughs Corp., Pasadena, Cal.
Chalco Engrg. Corp., Gardena, Cal.
Data General Corp. (E), Southboro, Ma.
Data Specialties Inc., Highland Park, Ill.
Digitronics Corp., Albertson, N.Y.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Facit-Addo, Inc., Secaucus, N.J.
Precision Mechanisms Corp., Westbury, N.Y.
Remex, Santa Ana, Cal.
Teletype Corp., Skokie, Ill.
United Sys. Corp., Dayton, Ohio

Perforators, Paper Tape (Manually Operated)

Burroughs Corp., Pasadena, Cal.

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Audiotronics, N. Hollywood, Cal.
Electro-Voice, Inc., Buchanan, Mich.
GC Electronics, Rockford, Ill.
Gotham Audio Corp., New York, N.Y.
Merix Chem. Co., Chicago, Ill.
Molex Inc., Lisle, Ill.
Robins Ind's. Corp., Consumer Products Div., Commack, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Thomson-CSF Inc., New York, N.Y.

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Amperex Electronic Corp., Hicksville, N.Y.
Bendix Corp., Sturbridge, Mass.
Gamma Sci., San Diego, Cal.
Hamamatsu Corp. (E), Middlesex, N. J.
Heath Co., Benton Harbor, Mich.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Oriel Corp. of America, Stamford, Conn.
Products for Research, Inc., Danvers, Mass.
SSR Instrs. Co., Santa Monica, Cal.

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Altec Div., Anaheim, Calif.
Electrocom Inds., So. Bend, Indiana
GC Electronics, Rockford, Ill.
Microtran Co. Inc., Valley Stream, N.Y.
NES, Inc., Itasca, Ill.
Saxton Prods., Congers, N.Y.
Shigoto Inds., Ltd., New York, N.Y.

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Air-O-Tronics Prods., Morrisville, N.Y.
GC Electronics, Rockford, Ill.
Jonard Inds. Corp., Bronx, N.Y.
Methode Elctrns., Inc., Chicago, Ill.
Sperry Information Displays Div., Scottsdale, Ariz.

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Accurate Elctrns. Corp., Elyria, Ohio
Airborn, Inc., Dallas, Tex.
Art Wire & Stamping Co., Cedar Knolls, N.J.
Bead Elctrns., Bridgeport, Conn.
Beman Mfg., Inc., New Cumberland, Pa.
Berg Electronics, New Cumberland, Pa.
Chem Aero, Inc., Wilmington, Cal.
Circuit Assembly Corp., Santa Ana, Cal.
Connector Corp., Chicago, Ill.
Dit-MCO International, Kansas City, Mo.
Flex-Link Products, Inc., San Fernando, Cal.
GTE Sylvania Inc., Warren, Pa.
GTI Corp. (E), Pittsburgh, Pa.
LVC Inds. Inc., Flushing, N.Y.
Precision Metal Prods. Co., Stoneham, Mass.
Pylon Co., Inc., Attleboro, Mass.
Robinson-Nugent, New Albany, Ind.
Useco Div., Van Nuys, Cal.
Viking Inds., Inc., Chatsworth, Calif.
Waldom Elctrns., Inc., Chicago, Ill.

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Allen Mfg. Co., Hartford, Conn.
Art Wire & Stamping Co., Cedar Knolls, N.J.
Avibank Mfg. Inc., Burbank, Calif.
Bead Elctrns., Bridgeport, Conn.
Bird, Richard H. & Co., Inc., Waltham, Mass.
Control Inds. Inc., Inwood, N.Y.
Deutsch Fastener Corp., Los Angeles, Cal.
Elastic Stop Nut Div., Union, N.J.
Groov-Pin Corp., Ridgefield, N.J.
GTI Corp. (E), Pittsburgh, Pa.
Hartwell Corp., Los Angeles, Calif.
Keystone Elctrns. Corp., New York, N.Y.
Norelcom Inds., Inc., Farmingdale, N.Y.
PIC Design Division, Ridgefield,, Conn.
Precision Metal Prods. Co., Stoneham, Mass.
Sterling Instr., New Hyde Pk., NY
Tridair Inds., Torrance, Calif.

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Plastic Films, Rods, Sheets, etc.

Blum, Julius & Co., Inc., Carlstadt, N.J.
Budd Co., Bridgeport, Pa.
Cadilac Plastics & Chems., Detroit, Mich.
Central Plastics Dists., Chicago, Ill.
Chemplast, Inc., Wayne, N.J.
Cincinnati Dev. & Mfg. Co., Cincinnati, Ohio
Cole-Flex Corp., W. Babylon, N.Y.
Comco Plastics, Inc., Richmond Hill, N.Y.
Communications Technology Corp., Los Angeles, Cal.
Conap, Inc., Allegany, N.Y.
Dixon Corp., Bristol, R.I.
Dow Chemical Co., Midland, Mich.
Eastman Chem. Prods., Kingsport, Tenn.
Emerson & Cuming, Inc., Canton, Mass.
General Elec., Pittsfield, Mass.
Goodrich B. F. Chem. Co., Cleveland, Ohio
Hysol Div., Olean, N.Y.
Ico/Rally, Palo Alto, Cal.
Laminated Fabricators, San Bruno, Calif.
Natvar Corp., Rahway, N.J.
New England Laminates Co., Inc., Glenbrook, Conn.
Penn Fibre & Specialty, Phila., Pa.
Precision Paper Tube Co., Wheeling, Ill.
Reynolds Metals Co., Richmond, Va.
Rogers Corp., Rogers, Conn.
Schweitzer, Peter J. Div., Lee, Mass.
Synthane Taylor Corp., Valley Forge, Pa.
Thiokol Chemical Div., Trenton, N.J.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Transcon Mfg. Co., Dallas, Tex.
Union Carbide, Chicago, Ill.
Westinghouse Elec., W. Mifflin, Pa.
Whittaker Corp., Los Angeles, Cal.
Zippertubing Co., Los Angeles, Calif.

Plastic Raw Materials, Liquids, Pellets, Powders, Resins

Adhesive Prods. Corp., Bronx, N.Y.
Allaco Prods Div., Watertown, Mass.
Amoco Chemicals Corp., Chicago, Ill
Bacon Inds., Watertown, Mass.
Cadilac Plastics & Chems., Detroit, Mich.
Chemical Prods. Corp., E. Providence, R.I.
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Plastic Capacitors, Inc., Chicago, Ill.
Power Designs, Westbury, N.Y.
Power Technology, Inc., Little Rock, Ark.
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Del Electronics Corp., Mt. Vernon, N.Y.
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Eimac, San Carlos, Calif.

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Electro-Module, Inc., Pomona, Cal.
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Illumination Inds., Inc., Sunnyvale, Cal.
Ionics, Inc., Watertown, Mass
Kilovolt Corp., Hackensack, N.J.
Mag-Con, Inc., New Brighton, Minn.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Maxwell Labs., Inc., San Diego, Calif.
Megavolt, Inc., New York, N.Y.
Mid-Eastern Inds., Scotch Plains, N.J.
NWL Transformers, Trenton, N.J.
Opad Elec. Co., Inc., New York, N.Y.
Power Conversion Prods. Inc., Crystal Lake, Ill.
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ITT Jennings, San Jose, Cal
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
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Microtran Co. Inc., Valley Stream, N.Y.
MIL Electronics, Lowell, Mass.
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NUCOR Corp., Denville, N.J.
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Opamp Labs. Inc., Los Angeles, Cal.
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Firing Circuits, Norwalk, Conn.
Georator Corporation, Manassas, Va.
Lambda Elctrns., Melville, N.Y.
LH Research, Inc., Santa Ana, Cal.
Mag-Con, Inc., New Brighton, Minn.
Marathon Electric, Norwalk, Conn.
MIL Electronics, Lowell, Mass.
National Power Prods. Inc., Haverhill, Mass.
NES, Inc., Itasca, Ill.
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Static Products, Inc., Garland, Tex.
Stevens-Arnold, Inc., So. Boston, Mass.
Tele-Dynamics/Wanlass, Fort Washington, Pa.
Triad-Utrad Div., Huntington, Ind.
Trio Labs, Inc., Plainview, N.Y.
Universal Elctrns. Co., Irvine, Cal.
Viking Modules, Waltham, Mass.
Xentek, Inc., Santa Fe Springs, Calif.

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Anadyne, Santa Fe Springs, Cal.
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CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
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EI Instruments, Derby, Conn.
Electro Development Corp., Lynnwood, Wash.
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Firing Circuits, Norwalk, Conn.
Frequency Devices, Inc., Haverhill, Mass.
Junction Modules, Inc., Irvine, Cal.
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Intronics, Inc., Newton, Mass.
ITT Jennings, San Jose, Cal
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Lambda Elctrns., Melville, N.Y.
LH Research, Inc., Santa Ana, Cal.
Marathon Electric, Norwalk, Conn.
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NH Research, Inc., Santa Ana, Calif.
Novatronics, Inc., Pompano Beach, Fla.
NWL Transformers, Trenton, N.J.
Pioneer Magnetics, Santa Monica, Cal.
Power Designs, Westbury, N.Y.
Power-Matic, Inc., San Diego, Cal.
Power Technology, Inc., Little Rock, Ark.
Rosemount Nashville Inc., Lavergne, Tenn.
Sierra Sys., Mountain View, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Stevens-Arnold, Inc., So. Boston, Mass.
Teledyne-Philbrick, Dedham, Mass.
Trio Labs, Inc., Plainview, N.Y.
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Bertan Assocs., Inc., Hicksville, N.Y.
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Del Electronics Corp., Mt. Vernon, N.Y.
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Electronic Resch. Assocs., Moonachie, N.J.
Elgin Elctrns. Inc., Waterford, Pa.
Energy Systems, Palo Alto, Cal.
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Hipotronics, Inc., Brewster, N.Y.
Honeywell, Minneapolis, Minn.
Hughes Aircraft Co., Welding Equip./Ind'l. Prods. Div., Oceanside, Calif.
Interelectronics Corp., Congers, N.Y.
Ionics, Inc., Watertown, Mass
Kilovolt Corp., Hackensack, N.J.
LDJ Electronics, Troy, Mich.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Maxwell Labs., Inc., San Diego, Calif.
Megavolt, Inc., New York, N.Y.
Mid-Eastern Inds., Scotch Plains, N.J.
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Power Designs, Westbury, N.Y.
Power Inc., Burnsville, Minn.
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Power Technology, Inc., Little Rock, Ark.
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American Power Systems Corp., Worcester, Mass.
American Time Products, Woodside, N.Y.
American Vector Inc., Springfield, N.J.
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Arnold Magnetics, Culver City, Cal.
Astro-Metrix, Burbank, Cal.
AUL Instrs., Inc., Flushng, N.Y.
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Control Data Corp., Minneapolis, Minn.
Cross Electronics Inc., Warrendale, Pa.
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Digital Equip. Corp., Maynard, Mass.
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Dynamic Measurements Corp., Winchester, Ma.
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Electro Development Corp., Lynnwood, Wash.
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Electronic Resch. Assocs., Moonachie, N.J.
Electrostatics, Inc., San Diego, CA
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American Vector Inc., Springfield, N.J.
Amp Inc., Harrisburg, Pa.
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Arnold Magnetics, Culver City, Cal.
Berkeley Nucleonics Corp., Berkeley, Calif.
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Power-Matic, Inc., San Diego, Cal.
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Standard Power, Inc., Santa Ana, Cal.
Stevens-Arnold, Inc., So. Boston, Mass.
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Gould Data Systems, Newton Upper Falls, Mass.
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Tele-Dynamics/Wanlass, Fort Washington, Pa.
Todd Products Corp., Farmingdale, N.Y.
Topaz Electronics, San Diego, Cal.
Trio Labs, Inc., Plainview, N.Y.
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Arvee Engrg. Co., Torrance, Calif.
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Crown Int'l., Elkhart, Ind.
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EI Instruments, Derby, Conn.
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Lambda Elctrns., Melville, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
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North Hills Elctrns., Inc., Glen Cove, N.Y.
Novatronics, Inc., Pompano Beach, Fla.
Opamp Labs. Inc., Los Angeles, Cal.
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Perry Amplifier, Brookline, Mass.
POWERTEC INC., Chatsworth, Cal.
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Spectra Sonics, Ogden, Utah
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
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Amperex Elctrn., Slatersville, R.I.
Arvee Engrg. Co., Torrance, Calif.
Bell & Howell Co., Pasadena, Calif.
Bogen Div., Paramus, N.J.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
CCA Elctrns. Corp., Gloucester, N.J.
Control Technology Co., L.I.C., N.Y.
Doric Sci. Corp., San Diego, Calif.
Dynaco, Inc., Philadelphia, Pa.
Dynamic Measurements Corp., Winchester, Ma.
Dynamics Elctrnc. Prods., Inc., Santa Fe Springs, Cal.
Ectron Corp., San Diego, Cal.
Esterline Angus Div., Indianapolis, Ind.
Fairchild Sound Equip., Commack, N.Y.
Junction Modules, Inc., Irvine, Cal.
General Radio Co., Concord, Mass.
Glentek, Inc., Santa Monica, Calif.
Hybrid Sys. Corp., Burlington, Mass.
ILC Data Device Corp., Hicksville, N.Y.
Intech, Santa Clara, Cal.
Keithley Instrs., Inc., Cleveland, Ohio
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Milletron, Inc., Pittsburgh, Pa.
National Semiconductor, Santa Clara, Cal.
Neff Instr. Corp., Duarte, Calif.
Perry Amplifier, Brookline, Mass.
Princeton Applied Resch. Corp., Princeton, N.J.
Raytheon, Mt. View, Calif.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Signetics. Corp., Sunnyvale, Calif.
Solid State Elctrns. Corp., Sepulveda, Cal.
Soltec Corp., No. Hollywood, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
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Junction Modules, Inc., Irvine, Cal.
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National Semiconductor, Santa Clara, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
United Detector Technology Inc., Santa Monica, Cal.

Preamplifiers, I-F
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
AMF Electical Prods., Alexandria, Va.
Anzac Elctrns., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif.
Avantek, Inc., Santa Clara, Cal.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Dynalab Corp., Van Nuys, Cal.
Electro/Data, Inc., Garland, Tex.
Environmental Communications Inc., Santa Ana, Cal.
Hope Elctrns., Clifton, N.J.
Keithley Instrs., Inc., Cleveland, Ohio
Lorch Elctrns. Corp., Englewood, N.J.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microphase Corp., Cos Cob, Conn.
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Mu-Del Elctrns., Silver Spring, Md.
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RHG Elctrns. Lab., Deer Park, N.Y.
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Sierra Sys., Mountain View, Cal.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Preamplifiers, Meter
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Doric Sci. Corp., San Diego, Calif.
ILC Data Device Corp., Hicksville, N.Y.
Ithaco, Inc., Ithaca, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
National Semiconductor, Santa Clara, Cal.
Newport Labs., Inc., Santa Ana, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.

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Applied Research Inc., Port Washington, N.Y.
Avantek, Inc., Santa Clara, Cal.
Dynalab Corp., Van Nuys, Cal.
Electro/Data, Inc., Garland, Tex.
HRB-Singer, Inc., State College, Pa.
LNR Communications, Inc., Farmingdale, N.Y.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Power Devices, Plainview, N. Y.
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Mu-Del Elctrns., Silver Spring, Md.
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R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Scientific Communications, Garland, Tex.
Special Microwave Devices Oper., Waltham, Mass.
Technical Research & Mfg. Co., Manchester, N.H.
Teledyne Mec., Palo Alto, Cal.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
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Preamplifiers, Receiver
Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Anzac Elctrns., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif.
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BF Elctrns., Solana Beach, Calif.
C-COR Elctrns., State College, Pa.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Dynalab Corp., Van Nuys, Cal.
Electro/Data, Inc., Garland, Tex.
Environmental Communications Inc., Santa Ana, Cal.
Honeywell, Denver, Colo.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Ithaco, Inc., Ithaca, N.Y.
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LNR Communications, Inc., Farmingdale, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
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Microwave Power Devices, Plainview, N. Y.
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Resdel Engrg. Corp., Arcadia, Cal.
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Dynalab Corp., Van Nuys, Cal.
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Elctrn. Navigation Inds., Inc., Rochester, N.Y.
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Honeywell, Denver, Colo.
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Jerrold Electronics Corp., Philadelphia, Pa.
Keithley Instrs., Inc., Cleveland, Ohio
Lear Siegler, Inc., Santa Monica, Calif.
Lorch Elctrns. Corp., Englewood, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Power Devices, Plainview, N. Y.
Miteq Inc., Hauppauge, N.Y.
Mu-Del Elctrns., Silver Spring, Md.
National Semiconductor, Santa Clara, Cal.
OPtimax Inc., Colmar, Pa.
Perry Amplifier, Brookline, Mass.
Radiation Devices Co., Baltimore, Md.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Resdel Engrg. Corp., Arcadia, Cal.
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Winegard Co., Burlington, Iowa

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CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Control Technology Co., L.I.C., N.Y.
Gould, Inc., Cleveland, Ohio
ILC Data Device Corp., Hicksville, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Ithaco, Inc., Ithaca, N.Y.
McFadden Elctrns. Co., South Gate, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Cal.

Perry Amplifier, Brookline, Mass.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
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Biocom, Inc., Culver City, Cal.
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Cincinnati Elctrns. Corp., Cincinnati, Ohio
Dynalab Corp., Van Nuys, Cal.
Electro/Data, Inc., Garland, Tex.
Emergency Beacon Corp., New Rochelle, N. Y.
Gould, Inc., Cleveland, Ohio
Gulton Inds., Inc., Metuchen, N.J.
Hybrid Sys. Corp., Burlington, Mass.
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Ithaco, Inc., Ithaca, N.Y.
LNR Communications, Inc., Farmingdale, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Microphase Corp., Cos Cob, Conn.
Mu-Del Elctrns., Silver Spring, Md.
National Semiconductor, Santa Clara, Cal.
Neff Instr. Corp., Duarte, Calif.
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Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Scientific Communications, Garland, Tex.
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Arvee Engrg. Co., Torrance, Calif.
B & K Instrs., Inc., Cleveland, Ohio
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Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
Chesapeake Instr. Corp., Shadyside, Md.
Columbia Resch. Labs., Woodlyn, Pa.
Control Technology Co., L.I.C., N.Y.
Cycon, Inc., Sunnyvale, Cal.
Doric Sci. Corp., San Diego, Calif.
Dynamic Measurements Corp., Winchester, Ma.
Edo Western Corp., Salt Lake City, Utah
Electronic Modules, Inc., Pasadena, Cal.
Endevco, Pasadena, Calif.
Junction Modules, Inc., Irvine, Cal.
General Radio Co., Concord, Mass.
Glentek, Inc., Santa Monica, Calif.
Gould, Inc., Cleveland, Ohio
Gulton Inds., Inc., Metuchen, N.J.
Hawkeye Instrus., Inc., Marion, Iowa
Honeywell, Denver, Colo.
Hy-Cal Engrg., Santa Fe Springs, Cal.
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ILC Data Device Corp., Hicksville, N.Y.
Inservco, Inc., La Grange, Ohio
Intech, Santa Clara, Cal.
Ithaco, Inc., Ithaca, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Natel Engrg. Co., Canoga Pk., Cal.
National Semiconductor, Santa Clara, Cal.
Neff Instr. Corp., Duarte, Calif.
Newport Labs., Inc., Santa Ana, Cal.
PCB Piezotronics, Inc., Depew, N.Y.
PPM, Inc., Bedford, Ohio
Princeton Applied Resch. Corp., Princeton, N.J.
Santa Barbara Resch. Ctr., Goleta, Calif.
Sensor Corp., Scottsdale, Pa.
Sensotec, Inc., Columbus, Ohio
Solid State Elctrns. Corp., Sepulveda, Cal.
Spectra Sonics, Ogden, Utah
Tektronix, Inc., Beaverton, Ore.
Teledyne Geotech, Dallas, Tex.
Telex Comm. Div., Minneapolis, Minn.
Telmar, Inc., Columbus, Ohio
United Detector Technology Inc., Santa Monica, Cal.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.
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Dynalab Corp., Van Nuys, Cal.
General Rand Corp., Edison, N.J.
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IEC Electronics Corp., E. Rochester, N.Y.
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Rodelco, Deer Park, N.Y.
Ryka Scientific, Inc., Sunnyvale, Cal.
Sierra Sys., Mountain View, Cal.
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Vari-L Co., Inc., Denver, Colo.
Vector Industries, Palo Alto, Cal.

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American Elctrn. Labs., Inc., Lansdale, Pa.
Arvin Sys., Inc., Dayton, Ohio
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Electro/Data, Inc., Garland, Tex.
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Maury Microwave Corp., Cucamonga, Calif.
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Microwave Filter Co., Inc., East Syracuse, N.Y.
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A.R.F. Products, Inc., Boulder, Colo.
Augat Inc., Attleboro, Mass.
Automation Services Div., Windsor, N. Y.
BECO, Inc., Salem, Va.
Bendix Corp., Detroit, Mich.
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Bureau Engraving, Inc., Minneapolis, Minn.
Cambridge Thermionic, Cambridge, Mass
Chem Aero, Inc., Wilmington, Cal.
Chemical Etching Equip. & Supply, Alexandria, Va.
Chicago Dynamic Inds., Chicago, Ill.
Christiansen Radio Inc., Laguna Beach, Cal.
Circuit-Stik, Inc., Torrance, Cal.
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Collins Radio Co., Cedar Rapids, Iowa
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Int'l. Elctrn. Resch., Burbank, Cal.
Jordan Controls, Milwaukee, Wisc.
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Mid-West Metal Prods., Inc., Kansas City, Kans.
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Automation Services Div., Windsor, N. Y.
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Cinch-Graphik, Oper. of TRW Elctrn. Comps., City of Industry, Cal.
Kepro Cir. Sys., Inc., St. Louis, Mo.
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Anadex Instrs., Inc., Van Nuys, Calif.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bay Labs., Inc., Cleveland, Ohio
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
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California Computer Prods., Anaheim, Cal
Clary Corp., San Gabriel, Calif.
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Data General Corp. (E), Southboro, Ma.
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Datalog Div., Litton Sys., Melville, N.Y.
Datum, Inc., Anaheim, Calif.
Detecto Scales, Inc., Brooklyn, N.Y.
Di/An Controls, Inc., Boston, Mass.
Digital Equip. Corp., Maynard, Mass.
Digitron Corp., Norristown, Pa.
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Electro-Numerics, Santa Clara, Cal.
Esterline Angus Div., Indianapolis, Ind.
Facit-Addo, Inc., Secaucus, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
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International Data Sciences, Providence, R.I.
ITT General Controls, Glendale, Cal.
Leeds & Northrup Corp., No. Wales, Pa.
Metra Instruments, Inc., Mt. View, Cal.
Monitor Labs, Inc., San Diego, Cal.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
NES, Inc., Itasca, Ill.
Practical Automation, Inc., Shelton, Conn.
Presin Co., Inc., Shelton, Conn.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
Tech Serv., Inc., Fogelsville, Pa.
Teletype Corp., Skokie, Ill.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Texas Instruments, Inc., Houston, Tex.
Toledo Scale, Toledo, Ohio
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Varian Assocs., Palo Alto, Cal.
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Veeder-Root, Hartford, Conn.
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Weston Instruments, Inc., Newark, N.J.

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LDJ Electronics, Troy, Mich.
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Scientific Columbus, Columbus, Ohio
Tektronix, Inc., Beaverton, Ore.
Thomas & Skinner, Inc., Indianapolis, Ind.
O. S. Walker Co., Worcester, Mass.

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Dynascan Corp., Chicago, Ill.
GC Electronics, Rockford, Ill.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Hipotronics, Inc., Brewster, N.Y.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Micro Instr. Co., Hawthorne, Cal.
Peschel Instrs., Cape Coral, Fla.
RCA Elctrns. Comps., Harrison, N.J.
Ross Engrg. Corp., Campbell, Cal.
Rowe Inds., Div., Toledo, Ohio
Simpson Elec. Co., Chicago, Ill.
Slaughter Co., Ardmore, Okla.
Smith, Herman H., Inc., Bklyn., N.Y.
Tektronix, Inc., Beaverton, Ore.
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Alert Technology, Inc., Northbrook, Ill.
EI Instruments, Derby, Conn.
Microdynamics, So. El Monte, Cal.
Program Data Co., Carson, Cal.
Tektronix, Inc., Beaverton, Ore.

Probes, Microwave

Aircom, Inc., Union, N.H.
CES Elctrns., Brooklyn, N.Y.
General Microwave Corp., Farmingdale, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Microdynamics, So. El Monte, Cal.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Waveline, Inc., W. Caldwell, N.J.

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Heath Co., Benton Harbor, Mich.
Honeywell, Minneapolis, Minn.
Honeywell, Denver, Colo.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Kay Elemetrics, Pine Brook, N.J.
Microdynamics, So. El Monte, Cal.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
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Pylon Co., Inc., Attleboro, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
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Smith, Herman H., Inc., Bklyn., N.Y.
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Bristol Div, Waterbury, Conn
Burns Engrg., Inc., Minneapolis, Minn.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
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Conax Corp., Buffalo, N.Y.
Conklin Instr. Corp., Pleasant Valley, N.Y.
Consolidated Controls Corp., Bethel, Conn.
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Gow-Mac Instr. Co., Madison, N.J.
Gulton Inds., Inc., Metuchen, N.J.
Heath Co., Benton Harbor, Mich.
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Larson Instr. Co., Inc., Orangeburg, N.Y.
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Mura Corp., Jericho, N.Y.
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Syscon Int'l., Inc., So. Bend, Ind.
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Texas Instruments, Attleboro, Mass.
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Encom Prods. Co., Inc., Oxford, Pa.
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Fairchild Sound Equip., Commack, N.Y.
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Douglas Electronics, Inc., San Leandro, Cal.
Elco, Willow Grove, Pa.
Electronic Enclosures, Los Angeles, Cal.
Elctrn. Molding Corp., Woonsocket, R.I.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
IFE Div., E. Providence, R. I.
Int'l. Elctrn. Resch., Burbank, Cal.
Matrix Engineering Corp., Gardena, Calif.
Metropolitan Wire Goods, Wilkes-Barre, Pa.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Mobil Elctrns., Inc., Anderson, Ind.
Modpak, Waltham, Mass.
National Metal Crafters Inc., Phila., Pa.
Panel Controls Corp., Detroit, Mich.
Premier Metal Prods. Co., Bronx, N.Y.
Reed Devices, Inc., Glen Ellyn, Ill.
Robinson-Nugent, New Albany, Ind.
Spec Plastics Inc., No. Hollywood, Cal.
Stanford Applied Engrg., Inc., Santa Ana, Cal.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Thermalloy Co., Inc., Dallas, Tex.
Titchener, E.H. & Co., Binghamton, N.Y.
Useco Div., Van Nuys, Cal.
Waldom Elctrns., Inc., Chicago, Ill.
Zero Mfg. Co., Burbank, Cal.

Racks, Module

Cabtron Sys., Inc., Northbrook, Ill. Vol 3•314
Scanbe Mfg. Corp., El Monte, Cal. Vol 3•773
Vero Electronics, Inc., Hauppauge, N.Y. Vol 3•340
Amco Engrg. Co., Chicago, Ill.
Bivar, Inc., Santa Ana, Cal.
Bud Radio, Willoughby, Ohio
Digital Equip. Corp., Maynard, Mass.
Elco, Willow Grove, Pa.
Falstrom Co., Passaic, N.J.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Honeywell Inc., Wabash, Ind.
Honeywell, Inc., Wabash, Ind.
Int'l. Elctrn. Resch., Burbank, Cal.
Kepco, Inc., Flushing, N.Y.
Metal Works, Inc., Herman, Mo.
Mobil Elctrns., Inc., Anderson, Ind.
Mupac Corp., Brockton, Mass.
Optima Enclosures, Tucker, Ga.
Par-Metal Prods. Div., Brooklyn, N.Y.
PECO Corp., Milpitas, Cal.
Premier Metal Prods. Co., Bronx, N.Y.
Stanford Applied Engrg., Santa Clara, Cal.
Technipower Inc., Ridgefield, Conn.
Titchener, E.H. & Co., Binghamton, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Zero Mfg. Co., Burbank, Cal.
Zonic Tech. Labs., Cincinnati, Ohio

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Amco Engrg. Co., Chicago, Ill.
Bud Radio, Willoughby, Ohio
Craig Sys. Corp., Lawrence, Mass.
Deltron, Inc., N. Wales, Pa.
Electronic Enclosures, Los Angeles, Cal.
Falstrom Co., Passaic, N.J.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Honeywell, Ft. Washington, Pa.
Honeywell, Inc., Wabash, Ind.
Ingersoll Prods., Chicago, Ill.
Kepco, Inc., Flushing, N.Y.
Lambda Elctrns., Melville, N.Y.
Liberty Controls, Inc., Shorewood, Ill.
Metal Works, Inc., Herman, Mo.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Mobil Elctrns., Inc., Anderson, Ind.
N.J.E. Corp., Dayton, N.J.
Par-Metal Prods. Div., Brooklyn, N.Y.
POWERTEC INC., Chatsworth, Cal.
Premier Metal Prods. Co., Bronx, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Vero Electronics, Inc., Hauppauge, N.Y.
Zero Mfg. Co., Burbank, Cal.

Radar Equipment—See Analyzers; Testers; Simulators; etc.

Radar Systems

Vega Precision Labs., Vienna, Va. Vol 1•568
Andersen Labs. Inc., Bloomfield, Conn.
Bendix Corp., Ft. Lauderdale, Fla.
Bendix Corp, Towson, Md.
Bendix Corp., N. Hollywood, Calif.
Cardion Elctrns., Woodbury, N.Y.
Cober Elctrns., Inc., Stamford, Conn.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Datron Systems, Chatsworth, Cal.
Frequency Engrg. Labs., Farmingdale, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
Gould Data Systems, Newton Upper Falls, Mass.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Minneapolis, Minn.
Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Inter-Computer Elctrns., sub. American Electrn. Lab., Lansdale, Pa.
ITT Gilfillan Div. of ITT, Van Nuys, Calif.
ITT Mackay Marine, Elizabeth, N.J.
Lockheed Elctrns. Co., Watchung, N.J.
Marconi Elctrns. Inc., Elmsford, N.Y.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Norden Div., Norwalk, Conn.
RCA Service Co., Camden, N.J.
Singer Co., Little Falls, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
Tasker Systems, Chatsworth, Cal.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Inc., New York, N.Y.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.
Whittaker Corp., Los Angeles, Cal.

Radar Testers—See Testers, Radar

Radioactive Light Sources—See Sources, Light, Radioactive

Radio Comm. Systems—See Comm. Systems (As Modified)

Radiographic Equipment—See X-Ray Inspection Equipment

Radiometers

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Barnes Engrg. Co., Stamford, Conn.
Beckman Instrs., (AISSD), Fullerton, Cal.
Edmund Scientific Co., Barrington, N.J.
EG & G, Inc., Salem, Mass.
Electro-Optical Inds., Inc., Santa Barbara, Cal.
Gamma Sci., San Diego, Cal.
Honeywell, Minneapolis, Minn.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Kahl Scientific Instr. Corp., El Cajon, Calif.
LNR Communications, Inc., Farmingdale, N.Y.
Mikron Instr. Co., Ridgewood, N.J.
Molectron Corp., Sunnyvale, Cal.
Oriel Corp. of America, Stamford, Conn.
Raytek, Inc., Mountain View, Cal.
Santa Barbara Resch. Ctr., Goleta, Calif.
Scientific Communications, Garland, Tex.
Teledyne Geotech, Dallas, Tex.
TRG Prods., E. Boston, Mass.
United Detector Technology Inc., Santa Monica, Cal.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Radomes

Amersil, Inc., Hillside, N.J.
Andrew Corp., Orland Pk., Ill.
Basic Ceramics Inc., Hawthorne, N.J.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Emerson & Cuming, Inc., Canton, Mass.
Gabriel Elctrns. Inc., Scarborough, Me.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
Jerrold Electronics Corp., Philadelphia, Pa.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
National Beryllia Corp., Haskell, N.J.
Nurad, Inc., Baltimore, Md.
Parabam, Inc., Compton, Cal.
RCA Missile & Surface Radar Div., Moorestown, N.J.

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Reactors, Charging

Amersil, Inc., Hillside, N.J.
Basler Elec. Co., Highland, Ill.
Del Electronics Corp., Mt. Vernon, N.Y.
Energy Systems, Palo Alto, Cal.
Ferrodyne Corp., Venice, Calif.
NWL Transformers, Trenton, N.J.
Peschel Instrs., Cape Coral, Fla.
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Engrg., Inc., San Diego, Cal.

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Freed Transformer Co., Bklyn., N.Y. Vol 3•1254
NWL Transformers, Trenton, N.J. Vol 3•1267
Acme Elec. Corp., Cuba, N.Y.
ADC Prods., Minneapolis, Minn.
American Magnetics Corp., Carterville, Ill.
American Trans-Coil Corp., Richmond Hill, N.Y.
Arnold Magnetics, Culver City, Cal.
Basler Elec. Co., Highland, Ill.
Bicron Elctrns. Co., Canaan, Conn.
Biometrics Instrument Corp., Garland, Tex.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Douglas Randall Div., Pawcatuck, Conn.
Energy Systems, Palo Alto, Cal.
Ferrodyne Corp., Venice, Calif.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Grand Transformers, Grand Haven, Mich.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Hisonic, Inc., Olathe, Kans.
Mag-Con, Inc., New Brighton, Minn.
Microtran Co. Inc., Valley Stream, N.Y.
North Electric Co., Galion, Ohio
Peschel Instrs., Cape Coral, Fla.
Pico Elctrns Inc., Mount Vernon, N.Y.
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Engrg., Inc., San Diego, Cal.
Raytheon Co., Waltham, Mass.
Stancor, Chicago, Ill.
Sterling Transformer Corp., Brooklyn, N.Y.
Torotel, Inc., Grandview, Mo.
Triad-Utrad Div., Huntington, Ind.
Vari-L Co., Inc., Denver, Colo.
Zaring Inds., Inc., Westfield, Ind.

Reactors, Loading

ADC Prods., Minneapolis, Minn.
Coil Co. of Amer., Northvale, N.J.
Del Electronics Corp., Mt. Vernon, N.Y.
Ferrodyne Corp., Venice, Calif.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
NWL Transformers, Trenton, N.J.
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Engrg., Inc., San Diego, Cal.
Queensboro Transformer & Mach., College Pt., N.Y.
Zaring Inds., Inc., Westfield, Ind.

Reactors, Saturable

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ADC Prods., Minneapolis, Minn.
Allis-Chalmers, Milwaukee, Wisc.
American Magnetics Corp., Carterville, Ill.
Artronic Instr. Co., Silver Spring, Md.
Basler Elec. Co., Highland, Ill.
Bicron Elctrns. Co., Canaan, Conn.
Biometrics Instrument Corp., Garland, Tex.
Carson Mfg. Co., Indianapolis, Ind.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Constant Voltage Co., Chicago, Ill.
Cross Electronics Inc., Warrendale, Pa.
Del Electronics Corp., Mt. Vernon, N.Y.
Dietz Design, Inc., Belton, Mo.
Electro-Pacific, Inc., Goleta, Calif.
Elgin Elctrns. Inc., Waterford, Pa.
Ferrodyne Corp., Venice, Calif.
Freed Transformer Co., Bklyn., N.Y.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Microtran Co. Inc., Valley Stream, N.Y.
North Electric Co., Galion, Ohio
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Engrg., Inc., San Diego, Cal.
Queensboro Transformer & Mach., College Pt., N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Sterling Transformer Corp., Brooklyn, N.Y.
Torotel, Inc., Grandview, Mo.
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Amp Inc., Harrisburg, Pa.
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Dolan-Jenner Inds., Inc., Melrose, Mass.
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Fiber Photics, Inc., Santa Cruz, Cal.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
W.V. Industries Inc., Franklin Lakes, N.J.

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Dietzgen Corp., Chicago, Ill.
GAF Corp., New York, N.Y.
Heitz, Karl, Inc., New York, N.Y.
Johnson Research Corp., Farmingdale, N.Y.
3M Co., St. Paul, Minn.
Varian Assocs., Palo Alto, Cal.
Visidyne Inc., Burlington, Ma.
Western Reserve Elctrns., Twinsburg, Ohio

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Burroughs Corp., Pasadena, Cal.
Chalco Engrg. Corp., Gardena, Cal.
Data General Corp. (E), Southboro, Ma.
Data Specialties Inc., Highland Park, Ill.
Datascan, Inc., Clifton, N.J.
Digital Equip. Corp., Maynard, Mass.
Digitronics Corp., Albertson, N.Y.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Facit-Addo, Inc., Secaucus, N.J.
Interswitch, Burlingame, Cal.
NES, Inc., Itasca, Ill.
Remex, Santa Ana, Cal.
Scientific-Atlanta, Inc., Atlanta, Ga.
Spectronics, Inc., Richardson, Tex.
Superior Elec., Bristol, Conn.
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Wang Labs., Inc., Tewksbury, Mass.

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Gap Instr. Corp., Hauppauge, N.Y.
Hecon Corp., New Shrewsbury, N.J.
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Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
LVC Inds. Inc., Flushing, N.Y.
Major Data Corp., Costa Mesa, Cal.
Norden Div., Norwalk, Conn.
Penn Keystone Corp., Ansonia, Conn.
Shigoto Inds., Ltd., New York, N.Y.
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Statham Instrs., Inc., Oxnard, Cal.
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Superior Elec., Bristol, Conn.
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Vernitech, Deer Pk., N.Y.
W.V. Industries Inc., Franklin Lakes, N.J.
WABCO Aerospace Dept., Pittsburgh, Pa.

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Electronic Research Co., Shawnee Mission, Kan.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
Litronix, Cupertino, Cal.
NES, Inc., Itasca, Ill.
OPCOA, Inc., Edison, N.J.
Precision Dynamics Corp., Burbank, Cal.
Scientific Measurements, Wilmette, Ill.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
Sensor Technology, Chatsworth, Cal.
Singer Co., Little Falls, N.J.
Sperry Information Displays Div., Scottsdale, Ariz.
W.V. Industries Inc., Franklin Lakes, N.J.

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Bomac Elctrns., Inc., Northridge, Cal.
Burroughs Corp., Plainfield, N.J.
Chicago Miniature Lamp Works, Chicago, Ill.
Computer Prods., Ft. Lauderdale, Fla.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Electrons Co., Fairfield, N.J.
Fiber Photics, Inc., Santa Cruz, Cal.
General Electric Co., Miniature Lamp Dept. Prods., Cleveland, Ohio
Inter-Market, Inc., Glenview, Ill.
LFE Corp., Waltham,, Mass.
Litronix, Cupertino, Cal.
LVC Inds. Inc., Flushing, N.Y.
Master Specialties, Costa Mesa, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Mura Corp., Jericho, N.Y.
National Elctrns., Geneva, Ill.
Nippon Electric/NEC America, N.Y., N.Y.
OPCOA, Inc., Edison, N.J.
Penn Keystone Corp., Ansonia, Conn.
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Rank Precision Inds., Des Plaines, Ill.
RCA Elctrns. Comps., Harrison, N.J.
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Singer Co., Little Falls, N.J.
W.V. Industries Inc., Franklin Lakes, N.J.

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Sperry Information Displays Div., Scottsdale, Ariz.

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Major Data Corp., Costa Mesa, Cal.
W.V. Industries Inc., Franklin Lakes, N.J.

Receivers, A-M/F-M (Precision Test)

Environmental Communications Inc., Santa Ana, Cal.
Intricate Circuit Corp., Port Chester, N.Y.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Trutone Elctrns., Inc., No. Hollywood, Cal.

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American Elctrn. Labs., Inc., Lansdale, Pa.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Intricate Circuit Corp., Port Chester, N.Y.
Loral Elctrn. Sys., Bronx, N.Y.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.

Receivers, Carrier Telegraph

Electrocom Inds., So. Bend, Indiana
GTE Lenkurt Inc., San Carlos, Calif.
Marconi Elctrns. Inc., Elmsford, N.Y.
RFL Inds., Comms. Div., Boonton, N.J.
Thomson-CSF Inc., New York, N.Y.

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Arvin Sys., Inc., Dayton, Ohio
Astro Comm. Lab., Gaithersburg, Md.
Bendix Corp., Ft. Lauderdale, Fla.
Bendix Corp, Towson, Md.
Brelonix, Inc., Seattle, Wash
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Drake, R.L., Co., Miamisburg, Ohio
Electro/Data, Inc., Garland, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Electronic Resch. Assocs., Moonachie, N.J.
Environmental Communications Inc., Santa Ana, Cal.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Automatic Elec., Northlake, Ill.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Heath Co., Benton Harbor, Mich.
Honeywell, Denver, Colo.
IEC Electronics Corp., E. Rochester, N.Y.
Intricate Circuit Corp., Port Chester, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Linear Sys., Inc., Watsonville, Calif.
LNR Communications, Inc., Farmingdale, N.Y.
Marconi Elctrns. Inc., Elmsford, N.Y.
Melpar, Falls Church, Va.
Microwave Assocs., Inc., Burlington, Mass.
Mobil Elctrns., Inc., Anderson, Ind.
Pacific Communications, Santa Ana, Cal.
Pearce-Simpson, Miami, Fla.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
Regency Elctrns., Inc., Indianapolis, Ind.
Rodelco, Deer Park, N.Y.
Scientific Communications, Garland, Tex.
Technical Mat'l., Mamaroneck, N.Y.
Thomson-CSF Inc., New York, N.Y.
Varian Assocs., Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.

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Arvin Sys., Inc., Dayton, Ohio
Astro Comm. Lab., Gaithersburg, Md.
Autocon Inds., Inc., Minneapolis, Minn.
Beukers Labs., Inc., Hauppauge, N.Y.
BF Elctrns., Solana Beach, Calif.
Brelonix, Inc., Seattle, Wash
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Drake, R.L., Co., Miamisburg, Ohio
Dynalab Corp., Van Nuys, Cal.
Edo Western Corp., Salt Lake City, Utah
Electro/Data, Inc., Garland, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Environmental Communications Inc., Santa Ana, Cal.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Denver, Colo.
IEC Electronics Corp., E. Rochester, N.Y.
ISC/Telephonics Div, Huntington, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Linear Sys., Inc., Watsonville, Calif.
Lorch Elctrns. Corp., Englewood, N.J.
Marconi Elctrns. Inc., Elmsford, N.Y.
Micro-Tel Corp., Baltimore, Md.
Mu-Del Elctrns., Silver Spring, Md.
OPtimax Inc., Colmar, Pa.
Pace Div., Harbor City, Calif.
Pacific Communications, Santa Ana, Cal.
Regency Elctrns., Inc., Indianapolis, Ind.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Sierra Sys., Mountain View, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Specific Products, Monrovia, Cal.
Technical Mat'l., Mamaroneck, N.Y.
Thomson-CSF Inc., New York, N.Y.
Watkins Johnson Co., Palo Alto, Cal.

Receivers, Frequency Shift

Autocon Inds., Inc., Minneapolis, Minn.
Bramco Controls, Piqua, Ohio
Collins Radio Co., Dallas, Tex.
Electrocom Inds., So. Bend, Indiana
Frederick Electronics Corp., Frederick, Md.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Lenkurt Inc., San Carlos, Calif.
Honeywell, Denver, Colo.
Integrated Systems, Inc., Norcross, Ga.
Marconi Elctrns. Inc., Elmsford, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Technical Mat'l., Mamaroneck, N.Y.
Thomson-CSF Inc., New York, N.Y.

Receivers, Headphone—See Handsets, Etc.

Receivers, Loran & Omega

Austron, Inc., Austin, Tex. ..... Vol 1•391
Beukers Labs., Inc., Hauppauge, N.Y.
Epsco, Inc., Westwood, Mass.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Micro Instr. Co., Hawthorne, Cal.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Tracor, Inc., Austin, Tex.

Receivers, Microwave

Scientific Communications, Garland, Tex. ..... Vol 1•567
Varian, Solid State West Division, Palo Alto, Cal. ..... Vol 4•440*
Vega Precision Labs., Vienna, Va. Vol 1• 568

Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Applied Research Inc., Port Washington, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
Astro Comm. Lab., Gaithersburg, Md.
Avantek, Inc., Santa Clara, Cal.
Bendix Corp., N. Hollywood, Calif.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
Cubic Corp., San Diego, Cal.
Dynalab Corp., Van Nuys, Cal.
Electrac, Inc., Anaheim, Calif.
Electro/Data, Inc., Garland, Tex.
Environmental Communications Inc., Santa Ana, Cal.
Farinon Electric, San Carlos, Calif.
Foxboro Co., Foxboro, Mass.
Frequency Engrg. Labs., Farmingdale, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
HRB-Singer, Inc., State College, Pa.
ITT Gilfillan Div. of ITT, Van Nuys, Calif.
LNR Communications, Inc., Farmingdale, N.Y.
Loral Elctrn. Sys., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Melpar, Falls Church, Va.
Micro-Now Instr., Chicago, Ill.
Micro-Tel Corp., Baltimore, Md.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Narda Microwave Corp., Plainview, N.Y.
OPtimax Inc., Colmar, Pa.
Polarad Elctrn. Instrs., Lake Success, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Raytheon Data Systems Co., Norwood, Mass.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Service Co., Camden, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Ryka Scientific, Inc., Sunnyvale, Cal.
Scientific-Atlanta, Inc., Atlanta, Ga.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Microwave Div., Van Nuys, Cal.
Technical Research & Mfg. Co., Manchester, N.H.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Inc., New York, N.Y.
Trak Microwave, Tampa, Fla.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assoc., Solid State East Div., Micro-Link Prods., Beverly, Mass
Varian, Beverly, Mass.
Watkins Johnson Co., Palo Alto, Cal.
Weinschel Engrg. Co., Gaithersburg, Md.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Receivers, Monitoring, Communications

Lorch Elctrns. Corp., Englewood, N.J. Vol 2•615
Allied Elctrns., Chicago, Ill.
Applied Research Inc., Port Washington, N.Y.
Arvin Sys., Inc., Dayton, Ohio
Brelonix, Inc., Seattle, Wash
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Conrac Div., Covina, Calif.
Drake, R.L., Co., Miamisburg, Ohio
E-Systems Inc., Dallas, Tex.
Electrac, Inc., Anaheim, Calif.
Electro/Data, Inc., Garland, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Denver, Colo.
HRB-Singer, Inc., State College, Pa.
Intricate Circuit Corp., Port Chester, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Lear Siegler, Grand Rapids, Mich.
Linear Sys., Inc., Watsonville, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Marconi Elctrns. Inc., Elmsford, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Melpar, Falls Church, Va.
Micro-Tel Corp., Baltimore, Md.
Mobil Elctrns., Inc., Anderson, Ind.
Pace Div., Harbor City, Calif.
Pearce-Simpson, Miami, Fla.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Resdel Engrg. Corp., Arcadia, Cal.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Communications, Garland, Tex.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.

Receivers, Multiplex

Bogen Div., Paramus, N.J.
Bramco Controls, Piqua, Ohio
Bristol Div, Waterbury, Conn
Collins Radio Co., Dallas, Tex.
Dataprobe, Inc., So. Hackensack, N.J.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hathaway Instruments, Inc., Denver, Colo.
Lear Siegler, Inc., Santa Monica, Calif.
RFL Inds., Comms. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.

Receivers, NBS

Datum, Inc., Anaheim, Calif.
Tracor, Inc., Austin, Tex.

Receivers, Panoramic

Test & Measuring Instrs. Inc., Hicksville, N.Y. ..... Vol 4•423*
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
AUL Instrs., Inc., Flushng, N.Y.
Collins Radio Co., Dallas, Tex.
Electro/Data, Inc., Garland, Tex.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Denver, Colo.
Loral Elctrn. Sys., Bronx, N.Y.
Marconi Instrs., Englewood, N.J.
Micro-Tel Corp., Baltimore, Md.
Nelson Ross Elctrns., Lake Success, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Communications, Garland, Tex.

Receivers, Phase Lock

Beukers Labs., Inc., Hauppauge, N.Y.
Datum, Inc., Anaheim, Calif.
Drake, R.L., Co., Miamisburg, Ohio
Electrac, Inc., Anaheim, Calif.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
HRB-Singer, Inc., State College, Pa.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Lorch Elctrns. Corp., Englewood, N.J.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Resdel Engrg. Corp., Arcadia, Cal.
Scientific-Atlanta, Inc., Atlanta, Ga.
Specific Products, Monrovia, Cal.
Tasker Systems, Chatsworth, Cal.
Trak Microwave, Tampa, Fla.
Varian, Beverly, Mass.

Receivers, Radar

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Bendix Corp., Ft. Lauderdale, Fla.
Bendix Corp., N. Hollywood, Calif.
Cardion Elctrns., Woodbury, N.Y.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Epsco, Inc., Westwood, Mass.
Frequency Engrg. Labs., Farmingdale, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
LNR Communications, Inc., Farmingdale, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Marconi Elctrns. Inc., Elmsford, N.Y.
Melpar, Falls Church, Va.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Nikon, Inc., Instr. Div., Ehrenreich Photo-Optical Ind., Garden City, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RHG Elctrns. Lab., Deer Park, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Tasker Systems, Chatsworth, Cal.
Thomson-CSF Inc., New York, N.Y.
Varian, Beverly, Mass.
Vega Precision Labs., Vienna, Va.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Receivers, Radiometric—See Radiometers

Receivers, Single-Sideband

Arvin Sys., Inc., Dayton, Ohio
Barker & Williamson, Inc., Bristol, Pa.
Bendix Corp, Towson, Md.
Brelonix, Inc., Seattle, Wash
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Cubic Corp., San Diego, Cal.
Drake, R.L., Co., Miamisburg, Ohio
Electrac, Inc., Anaheim, Calif.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Heath Co., Benton Harbor, Mich.
ITT Mackay Marine, Elizabeth, N.J.
Linear Sys., Inc., Watsonville, Calif.
Lorch Elctrns. Corp., Englewood, N.J.
Marconi Elctrns. Inc., Elmsford, N.Y.
Marconi Instrs., Englewood, N.J.
Micro-Tel Corp., Baltimore, Md.
Pace Div., Harbor City, Calif.
Railway Comm., Raytown, Mo.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Technical Mat'l., Mamaroneck, N.Y.
Thomson-CSF Inc., New York, N.Y.

Receivers, Time Code

A.R.F. Products, Inc., Boulder, Colo.
Chrono-log Corp., Broomall, Pa.
Datatron, Inc., Santa Ana, Cal
Datum, Inc., Anaheim, Calif.
Drake, R.L., Co., Miamisburg, Ohio
Metric Sys., Ft. Walton Beach, Fla.
NES, Inc., Itasca, Ill.
Resdel Engrg. Corp., Arcadia, Cal.
Specific Products, Monrovia, Cal.
Thiem Industries, Inc., Torrance, Cal.

Receivers, Tone

Bramco Controls, Piqua, Ohio Vol 2•419
Re-el Circuits, Inc., Saddle Brook, N.J. Vol 1•320
Arvin Sys., Inc., Dayton, Ohio
Autocon Inds., Inc., Minneapolis, Minn.
BF Elctrns., Solana Beach, Calif.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Douglas Randall Div., Pawcatuck, Conn.
GTE Automatic Elec., Northlake, Ill.
Hathaway Instruments, Inc., Denver, Colo.
HB Engineering Corp., Beltsville, Md.
Honeywell, Denver, Colo.
Integrated Systems, Inc., Norcross, Ga.
Ledex, Inc., Dayton, Ohio
Mobil Elctrns., Inc., Anderson, Ind.
NES, Inc., Itasca, Ill.
OPtimax Inc., Colmar, Pa.
Regency Elctrns., Inc., Indianapolis, Ind.
Resdel Engrg. Corp., Arcadia, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y.
Singer - Tele-Signal, Woodbury, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
T-F Electronics, Inc., Austin, Tex.

Receivers, TV—See Monitors, Video

Receivers, VLF

Geo Space Sys., Tampa, Fla. .. Vol 1•343
American Elctrn. Labs., Inc., Lansdale, Pa.
A.R.F. Products, Inc., Boulder, Colo.
Beukers Labs., Inc., Hauppauge, N.Y.
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Datum, Inc., Anaheim, Calif.
Drake, R.L., Co., Miamisburg, Ohio
Dynalab Corp., Van Nuys, Cal.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Frequency Elctrns., New Hyde Pk., N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Denver, Colo.
ITT Mackay Marine, Elizabeth, N.J.
Lear Siegler, Grand Rapids, Mich.
Marconi Instrs., Englewood, N.J.
Melpar, Falls Church, Va.
Micro-Tel Corp., Baltimore, Md.
Railway Comm., Raytown, Mo.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Rohde & Schwarz Sls., Passaic, N.J.
Thomson-CSF Inc., New York, N.Y.
Tracor, Inc., Austin, Tex.
Watkins Johnson Co., Palo Alto, Cal.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Receptacles—See Connectors; Jacks; Sockets

Receptacles, Antenna Tapping

Siemens Corp., Iselin, N.J.

Recorders, Computer Data—See Data Recorders, Computer

Recorders, Electrostatic

Gould, Inc., Cleveland, Ohio Vol 1•536,537; Vol 4•430,431*
Adtrol Div., Blackburg, Va.
Edo Western Corp., Salt Lake City, Utah
EG&G, Inc., Bedford, Mass.
Geo Space, Houston, Tex.
Information Displays, Inc., Mt. Kisco, N.Y.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Soltec Corp., No. Hollywood, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Data Machines, Palo Alto, Cal.

Recorders, Event

Esterline Angus Div., Indianapolis, Ind. Vol 1•538,539
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 1•449
Gould, Inc., Cleveland, Ohio Vol 1•536,537; Vol 4•430,431*
Larson Instr. Co., Inc., Orangeburg, N.Y. Vol 1•477
Recorder Sys. Div. ..... Vol 1•541
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Alden Sys. Co., Inc., Westboro, Mass.
Almond Instrs. Co., Covina, Cal
Amprobe Instr., Lynbrook, N.Y.
Artisan Elctrns. Corp., Parsippany, N.J.
Bailey Meter Co., Wickliffe, Ohio
Bell & Howell Co., Pasadena, Calif.
Clary Corp., San Gabriel, Calif.
Dohrmann Div., Mountain View, Cal.
Edison, Instr. Div., W. Orange, N.J.
Engdahl Enterprises, Costa Mesa, Cal.

General Scanning, Watertown, Mass.
Hathaway Instruments, Inc., Denver, Colo.
Instrumentation Prods., Camarillo, Cal.
Kenton Engrg. Corp., Skokie, Ill.
Linear Instrs. Corp., Costa Mesa, Cal.
Memodyne Corp., Newton Upper Falls, Ma.
MFE Corporation, Salem, N.H.
NES, Inc., Itasca, Ill.
Photron Instr. Co., Cleveland, Ohio
PPM, Inc., Bedford, Ohio
Resdel Engrg. Corp., Arcadia, Cal.
Recorder Systems Div., E. Greenwich, R.I.
Simpson Elec. Co., Chicago, Ill.
Soltec Corp., No. Hollywood, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Tech Serv., Inc., Fogelsville, Pa.
Telectro Sys. Corp., Corona, N.Y.
Telmar, Inc., Columbus, Ohio
Texas Instruments, Inc., Houston, Tex.
Varian Assocs., Palo Alto, Cal.
Varian Data Machines, Palo Alto, Cal.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio
Zonic Tech. Labs., Cincinnati, Ohio

Recorders, F-M—See Recorders, Magnetic Tape

Recorders, Facsimile

Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Alden Sys. Co., Inc., Westboro, Mass.
Datalog Div., Litton Sys., Melville, N. Y.
Edo Western Corp., Salt Lake City, Utah
EG&G, Inc., Bedford, Mass.
Honeywell, Denver, Colo.
Instrumentation Prods., Camarillo, Cal.
Oeco Corp., Portland, Ore.
Princeton Elctrn. Prods., New Brunswick, N.J.
Telmar, Inc., Columbus, Ohio
3M Co., St. Paul, Minn.

Recorders, Film

Adtrol Div., Blackburg, Va.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
Gould Data Systems, Newton Upper Falls, Mass.
Heitz, Karl, Inc., New York, N.Y.
Instrumentation Prods., Camarillo, Cal.
RCA Corp., Camden, N.J.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Teledyne Geotech, Dallas, Tex.
Video Research Corp., Gaithersburg, Md.

Recorders, Film Strip, Magnetic

Int'l. Electro-Magnetics, Palatine, Ill. Vol 1•313
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Siemens Corp., Iselin, N.J.

Recorders, Graphic—See Recorders (Specific Types)

Recorders, Long-Term Tape —See Recorders, Magnetic Tape

Recorders, Magnetic Tape, Reel & Cartridge

Crown Int'l., Elkhart, Ind. ..... Vol 1•309
Int'l. Electro-Magnetics, Palatine, Ill. Vol 1•313
Sangamo Elec. Co., Springfield, Ill. Vol 1•371
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Telex Comm. Div., Minneapolis, Minn. Vol 1•376
Test & Measuring Instrs. Inc., Hicksville, N.Y. ..... Vol 4•425*
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Allied Elctrns., Chicago, Ill.
Almond Instrs. Co., Covina, Cal
Ampex Corp., Redwood City, Calif.
Audiotronics, N. Hollywood, Cal.
Automedia, Inc., Sunnyvale, Cal.
Bell & Howell Co., Pasadena, Calif.
Burroughs Corp., Pasadena, Cal.
Carolina Medical Elctrns., Inc., King, N.C.
Chalco Engrg. Corp., Gardena, Cal.
Computer Instrs., Hempstead, N.Y.
Data, Inc., Ft. Collins, Col.
Data Recording Sys., Sunnyvale, Cal.
Datum, Inc., Anaheim, Calif.
Design Elements, Columbus, Ohio
Dytro Corp., Hicksville, N.Y.
General Radio Co., Concord, Mass.
Genisco Tech. Corp., Compton, Cal.
Gotham Audio Corp., New York, N.Y.
Hathaway Instruments, Inc., Denver, Colo.
Heitz, Karl, Inc., New York, N.Y.
Honeywell, Denver, Colo.
Instrumentation Prods., Camarillo, Cal.
Interdata, Oceanport, N.J.
Interdyne, Van Nuys, Cal.
Lockheed Elctrns. Co., Watchung, N.J.
Memodyne Corp., Newton Upper Falls, Ma.
NES, Inc., Itasca, Ill.
Nuclear Data, Palatine, Ill.
Oxford Instr. Corp., Annapolis, Md.
Plessey Enviromental Sys., San Diego, Cal.
RCA Corp., Camden, N.J.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Remex, Santa Ana, Cal.
RIL Elctrns., Inc., Southampton, Pa.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
Telectro Sys. Corp., Corona, N.Y.
3M Co., St. Paul, Minn.
Transducer Controls Corp., Covina, Calif.
Video Research Corp., Gaithersburg, Md.

Recorders, Polar

B & K Instrs., Inc., Cleveland, Ohio
Leeds & Northrup Corp., No. Wales, Pa.
Recorder Systems Div., E. Greenwich, R.I.
Scientific-Atlanta, Inc., Atlanta, Ga.

Recorders, Pyrometer—See Pyrometers, Recording

Recorders, Sound Level

B & K Instrs., Inc., Cleveland, Ohio
Columbia Resch. Labs., Woodlyn, Pa.
General Radio Co., Concord, Mass.
Genisco Tech. Corp., Compton, Cal.
NES, Inc., Itasca, Ill.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Telmar, Inc., Columbus, Ohio

Recorders, Strip-Chart

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Gould, Inc., Cleveland, Ohio Vol 1•536,537; Vol 4•430,431*
Harrel, Inc., E. Norwalk, Conn. Vol 2•1163
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Hathaway Instruments, Inc., Denver, Colo. ..... Vol 1•451
Houston Instr., Bellaire, Tex. .. Vol 1•540
Larson Instr. Co., Inc., Orangeburg, N.Y. Vol 1•477
MFE Corporation, Salem, N.H. Vol 1•543
Precision Standards Corp., Santa Ana, Cal. ..... Vol 1•495
Recorder Sys. Div. ..... Vol 1•541
Simpson Elec. Co., Chicago, Ill. Vol 1•503
Tektronix, Inc., Beaverton, Ore. Vol 1•513
Allied Elctrns., Chicago, Ill.
Amprobe Instr., Lynbrook, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
B & K Instrs., Inc., Cleveland, Ohio
Bacharach Instr. Co., Pittsburgh, Pa.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., (AISSD), Fullerton, Cal.
Bell & Howell, Bridgeport, Conn.
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Brinkmann Instrs., Inc., Westbury, N.Y.
Bristol Div, Waterbury, Conn
Cole-Parmer Instr. Co., Chicago, Ill.
Coleman Instr. Div., Oak Brook, Ill.
Conklin Instr. Corp., Pleasant Valley, N.Y.
Corning Glass Works, Medfield, Mass.
Digiac Corp., Plainview, N.Y.
Dohrmann Div., Mountain View, Cal.
Edo Western Corp., Salt Lake City, Utah
Electric Tachometer Corp., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
General Elec., W. Lynn, Mass.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
General Scanning, Watertown, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Honeywell, Ft. Washington, Pa.
Honeywell, Denver, Colo.
Impact-O-Graph Corp., Bedford, Ohio
IMPACT-O-GRAPH Div., Bedford, Ohio
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Laboratory Data Control, Riviera Beach, Fla.
Leeds & Northrup Corp., No. Wales, Pa.
LFE Corp., Waltham,, Mass.
Linear Instrs. Corp., Costa Mesa, Cal.
London Co., Cleveland, Ohio
Matheson Gas Products, East Rutherford, N.J.
McKee-Pedersen Instrs., Danville, Calif.
NES, Inc., Itasca, Ill.
Photron Instr. Co., Cleveland, Ohio
Robertshaw Controls Co., Richmond, Va.
Rohde & Schwarz Sls., Passaic, N.J.
Recorder Systems Div., E. Greenwich, R.I.
Sensotec, Inc., Columbus, Ohio
Siemens Corp., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Sloan Technology Corp., Santa Barbara, Calif.
Soltec Corp., No. Hollywood, Cal.
Standard Controls, Seattle, Wash.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Telmar, Inc., Columbus, Ohio
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Texas Instruments, Inc., Houston, Tex.
Tracor, Inc., Austin, Tex.
Tucker Electronics Co., Garland, Tex.
Varian Assocs., Palo Alto, Cal.
VirTis Co., Gardiner, N.Y.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Westinghouse Elec. Corp., Newark, N.J.
Westronics, Inc., Ft. Worth, Tex.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Recorders, Transient

Gould, Inc., Cleveland, Ohio Vol 1•536,537; Vol 4•430,431*
Ballantine Laboratories, Inc., Boonton,, N. J.
Bell & Howell Co., Pasadena, Calif.
Biomation Corp., Cupertino, Calif.
Data Disc, Inc., Sunnyvale, Cal.
E-H Resch. Labs., Inc., Oakland, Cal.
Endevco, Pasadena, Calif.
Engdahl Enterprises, Costa Mesa, Cal.
Hathaway Instruments, Inc., Denver, Colo.
Kenton Engrg. Corp., Skokie, Ill.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
Micro Instr. Co., Hawthorne, Cal.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Westronics, Inc., Ft. Worth, Tex.
Zonic Tech. Labs., Cincinnati, Ohio

Recorders, Vibration

General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y..... Vol 1•449
B & K Instrs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Endevco, Pasadena, Calif.
Epic, Inc., New York, N.Y.
General Radio Co., Concord, Mass.
Honeywell, Denver, Colo.
Robertshaw Controls Co., Richmond, Va.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Teledyne Geotech, Dallas, Tex.
Telmar, Inc., Columbus, Ohio
Zonic Tech. Labs., Cincinnati, Ohio

Recorders, Video Tape (Reel & Cartridge)

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Audiotronics, N. Hollywood, Cal.
Circon Corp., Santa Barbara, Ca.
Concord Communications Sys., Farmingdale, N.Y.
Data Recording Sys., Sunnyvale, Cal.
Edo Western Corp., Salt Lake City, Utah
Javelin Div., Apollo Lasers, Inc., Los Angeles, Ca.
McDonnell Douglas Electronics Co., St. Charles, Mo.
RCA Corp., Camden, N.J.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
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3M Co., St. Paul, Minn.
Video Research Corp., Gaithersburg, Md.

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Bailey Meter Co., Wickliffe, Ohio
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Bristol Div, Waterbury, Conn
California Computer Prods., Anaheim, Cal
Data General Corp. (E), Southboro, Ma.
Dohrmann Div., Mountain View, Cal.
Fisher Sci. Co., Pittsburgh, Pa.
Gamma Sci., San Diego, Cal.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Laboratory Data Control, Riviera Beach, Fla.
Larson Aero Dev., Concord, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Linear Instrs. Corp., Costa Mesa, Cal.
McKee-Pedersen Instrs., Danville, Calif.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific-Atlanta, Inc., Atlanta, Ga.
Siemens Corp., Iselin, N.J.
Simpson Elec. Co., Chicago, Ill.
Soltec Corp., No. Hollywood, Cal.
Tech Serv., Inc., Fogelsville, Pa.
Texas Instruments, Inc., Houston, Tex.
Tucker Electronics Co., Garland, Tex.
Varian Assocs., Palo Alto, Cal.
Wang Labs., Inc., Tewksbury, Mass.
Xynetics, Inc., Canoga Pk., Cal.

Recording Paper (For Strip-Chart Recorders, Oscillographs, X-Y)—See Paper, Graphic Recording

Recording Tape, Magnetic—See Tapes, Recording, Magnetic

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CBS Laboratories, Stamford, Conn.
Components Corp., Denville, N.J.
GC Electronics, Rockford, Ill.
Pacific Transducer Corp., Los Angeles, Calif.

Rectifiers, Bridges & Assemblies

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M & H Electronics, Long Branch, N.J. Vol 2•908-915
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Elctrn. Devices, Yonkers, N.Y.
AFI Industries Inc., Long Branch, N. J.
FMC Corp., Homer City, Pa.
Ledex, Inc., Dayton, Ohio
Motorola Semiconductor Prods., Phoenix, Ariz.
Opad Elec. Co., Inc., New York, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

Rectifiers, Copper Oxide

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Calvert Elctrns., Inc., New York, N.Y.
Carter Semiconductor, Syossett, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
Christie Elec., Los Angeles, Cal.
Computer Diode, Fair Lawn, N.J.
Cordover, Carl & Co., Mineola, N.Y.
Cross Electronics Inc., Warrendale, Pa.
CSR Industries Inc., E. Farmingdale, N.Y.
Dickson Elctrns. Corp., Scottsdale, Ariz
Edal Inds., Inc., E. Haven, Conn.
Elctrn. Devices, Yonkers, N.Y.
Electronic Transistors, Flushing, N.Y.
AFI Industries Inc., Long Branch, N. J.
FMC Corp., Homer City, Pa.
Gates Elctrn. Co., Bronx, N.Y.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
General Elec. Company, Providence, R.I.
Int'l. Elctrns., Melville, N.Y.
Ledex, Inc., Dayton, Ohio
Microsemiconductor Corp., Culver City, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Nucleonic Prods., Canoga Pk, Cal.
Opad Elec. Co., Inc., New York, N.Y.
Power Components, Inc., Woodland Hills, Cal.
Power Physics Corp., Eatontown, N.J.
Price & Rutzebeck, Hayward, Calif.
RCA Elctrns. Comps., Harrison, N.J.
Sarkes Tarzian, Inc., Bloomington, Ind.
Sel-Rex Co. Div. Oxy Metal Finishing Corp., Nutley, N.J.
Semicon Inc., Burlington, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
TRW Capacitors, Ogallala, Neb.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

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Instru-Lec Corp., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Meltronics Inc., Leeds, Ala.
North American Philips Controls Corp., Cheshire, Conn.
Orbit Instr. Corp., Syosset, N.Y.
PIC Design Division, Ridgefield,, Conn.
Planet Instr., Gardena, Cal.
Reliance Elec. Co., Cleveland, Ohio
Singer Co., Little Falls, N.J.
Sterling Instr., New Hyde Pk., NY
Triac Elctrn. Sys., Forest Hills, N. Y.
Waldom Elctrns., Inc., Chicago, Ill.

Reels, Cord & Cable

Henry Prods. Co., Inc., Inwood, N.Y.
Hunter Spring, Hatfield, Pa.
Hykon Mfg. Co., Alliance, Ohio
Thomas & Betts Co., Elizabeth, N.J.

Reels, Tape—See Tape Recording Accessories

Reference Books—See Technical Books

References, D-C Voltage

Julie Research Lab., New York, N.Y. Vol 1•468
Advanced Energy Conversion, Belmont, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
CEA, San Luis Obispo, Cal.
Components, Inc., Biddeford, Me.
Computer Diode, Fair Lawn, N.J.
Constant Voltage Co., Chicago, Ill.
Digital Equip. Corp., Maynard, Mass.
Dynage, Bloomfield, Conn.
Elcor Prods. Welex Elctrns., Silver Spring, Md.
Electronic Dev. Corp., Boston, Mass.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Resistance, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hybrid Sys. Corp., Burlington, Mass.
Intech, Santa Clara, Cal.
International Rectifier, El Segundo, Cal.
Keithley Instrs., Inc., Cleveland, Ohio
Kepco, Inc., Flushing, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Power Components, Inc., Woodland Hills, Cal.
Signalite, Neptune, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Velonex, Santa Clara, Calif.
Victoreen Instr., Cleveland, Ohio
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Weston Instruments, Inc., Newark, N.J.
Zi-Tech Div., Palo Alto, Cal.

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Refrigerants, Spray

LMB Heeger, Inc., Los Angeles, Calif.
Union Carbide, Chemicals & Plastics, New York, N.Y.

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Regulators, Current

Advanced Energy Conversion, Belmont, Cal.
American Aerospace Controls Inc., Farmingdale, N.Y.
Applied Control Co., Fairfield, N.J.
Arnold Magnetics, Culver City, Cal.
AUL Instrs., Inc., Flushng, N.Y.
Avionic Instrs. Inc., Rahway, N.J.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bendix, Eatontown, N.J.
CGS Units, Inc., Rochester, N.Y.
Constant Voltage Co., Chicago, Ill.
Cross Electronics Inc., Warrendale, Pa.
Davidson Elctrn. Dev. Co., Erie, Pa.
Elasco-Div. Buchbinder Corp., Bloomfield, Conn.
Electro-Module, Inc., Pomona, Cal.
Electronic Modules, Inc., Pasadena, Cal.
Electronic Resch. Assocs., Moonachie, N.J.
GTE Sylvania Inc., Danvers, Mass.
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Halmar Elctrns., Inc., Columbus, Ohio
Honeywell, Ft. Washington, Pa.
Ind'l. Test-Equip., Clifton, NJ
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Lambda Elctrns., Melville, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Mag-Con, Inc., New Brighton, Minn.
Magnetics, Div. of Spang Industries, Inc., Sandy Lake, Pa.
Mid-Eastern Inds., Scotch Plains, N.J.
National Semiconductor, Santa Clara, Cal.
North Electric Co., Galion, Ohio
North Hills Elctrns., Inc., Glen Cove, N.Y.
Opad Elec. Co., Inc., New York, N.Y.
Polyphase Instr. Co., Bridgeport, Pa.
Power Designs, Westbury, N.Y.
Power-Matic, Inc., San Diego, Cal.
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Robicon Corp., Pittsburgh, Pa.
Tele-Dynamics/Wanlass, Fort Washington, Pa.
Todd Products Corp., Farmingdale, N.Y.

Topaz Electronics, San Diego, Cal.
Triac Elctrn. Sys., Forest Hills, N. Y.
Trio Labs, Inc., Plainview, N.Y.
Victoreen Instr., Cleveland, Ohio
W-F Products, Inc., Denver, Co.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Regulators, Frequency

Allis-Chalmers, Milwaukee, Wisc.
American Elctrns., Inc., Fullerton, Cal.
American Time Products, Woodside, N.Y.
Basler Elec. Co., Highland, Ill.
Bendix, Eatontown, N.J.
Collins Radio Co., Dallas, Tex.
Fork Standards, W. Chicago, Ill.
Georator Corporation, Manassas, Va.
National Semiconductor, Santa Clara, Cal.
Nova Electric Mfg. Co., Nutley, N.J.
Paraplegics Mfg., Bensenville, Ill.
Terado Corp., St. Paul, Minn.
Topaz Electronics, San Diego, Cal.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

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Beckman Instrs., Cedar Grove, N.J.
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Computer Diode, Fair Lawn, N.J.
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Dickson Elctrns. Corp., Scottsdale, Ariz
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E-Tronics, Sepulveda, Cal.
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Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Cal.
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Sarkes Tarzian, Inc., Bloomington, Ind.
Semicon Inc., Burlington, Mass.
Solid State Devices, Inc., La Mirada, Cal.
Texas Instruments, Dallas, Tex.
Trio Labs, Inc., Plainview, N.Y.

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Avionic Instrs. Inc., Rahway, N.J.
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Barnes & Reinecke, Inc., Chicago, Ill.
Basler Elec. Co., Highland, Ill.
Beckman Instrs., Cedar Grove, N.J.
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Burr-Brown Resch. Corp., Tucson, Ariz.
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CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
California Instrs. Co., San Diego, Cal.
CGS Units, Inc., Rochester, N.Y.
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Dickson Elctrns. Corp., Scottsdale, Ariz
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E-Tronics, Sepulveda, Cal.
ECC Corp., Euless, Tex.
Elcor Prods. Welex Elctrns., Silver Spring, Md.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electro-Module, Inc., Pomona, Cal.
Electronic Resch. Assocs., Moonachie, N.J.
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Elin Div., San Diego, Cal.
GAR Enterprises, Pasadena, Cal.
General Instr. Corp., Semiconductor Comps. Div., Hicksville, N.Y.
General Radio Co., Concord, Mass.
Geo Space, Houston, Tex.
Georator Corporation, Manassas, Va.
Glentronics, Div. Sawyer Inds., Glendora, Cal.
Kelk, George Ltd., Don Mills, Ont., Canada
Kepco, Inc., Flushing, N.Y.
Ledex, Inc., Dayton, Ohio
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Mag-Con, Inc., New Brighton, Minn.
Megavolt, Inc., New York, N.Y.
Metric Engrg., Mechanicsburg, Pa.
Microtran Co. Inc., Valley Stream, N.Y.
Mid-Eastern Inds., Scotch Plains, N.J.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Power Prods. Inc., Haverhill, Mass.
National Semiconductor, Santa Clara, Cal.
NH Research, Inc., Santa Ana, Calif.
North Electric Co., Galion, Ohio
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Oven Industries, Inc., Mechanicsburg, Pa.
Phoenix Transformer Co., Phoenix, Ariz.
Power Designs, Westbury, N.Y.
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Powercube Corp, Waltham, Mass.
POWERTEC INC., Chatsworth, Cal.
Ratelco, Inc., Seattle, Wash.
RCA Solid State Div., Somerville, N. J.
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Universal Relay Corp., New York, N.Y.
WABCO Aerospace Dept., Pittsburgh, Pa.

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Bell Industries, Compton, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Electro-Module, Inc., Pomona, Cal.
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Flight Sys., Inc., Mechanicsburg, Pa.
General Automatic Corp., Bayonne, N.J.
Hartman Electrical Mfg., Mansfield, Ohio
Heinemann Elec. Co., Trenton, N.J.
Hoagland Instr., Dayton, N.J.
Ingraham Inds., Controls Div., Elizabethtown, Ky.
ITT Jennings, San Jose, Cal
ITT Jennings, Vacuum Elctrn. Prods., San Jose, Cal.
Kratos Precision Prods., Los Angeles, Cal.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Liberty Controls, Inc., Shorewood, Ill.
Logitek, Inc., Farmingdale, N.Y.
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Relay Service Co., Chicago, Ill.
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Sensor Corp., Scottsdale, Pa.
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Square D Co., Park Ridge, Ill.
Teledyne Relays, Hawthorne, Cal.
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
Universal Relay Corp., New York, N.Y.
Wilmar Elctrns. Inc., Torrance, Cal.

Relays, Differential

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Basler Elec. Co., Highland, Ill.
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Fifth Dimension, Princeton, N.J.
General Automatic Corp., Bayonne, N.J.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
ILC Data Device Corp., Hicksville, N.Y.
Kratos Precision Prods., Los Angeles, Cal.
La Marche Mfg. Co., Des Plaines, Ill.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Magnecraft Elec., Chicago, Ill.
MKC Elctrns. Corp., Kansas City, Kans.
Potter & Brumfield, Princeton, Ind.
Printact Relay Div., Long Island City, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Square D Co., Park Ridge, Ill.
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Texas Instruments, Attleboro, Mass.
Universal Relay Corp., New York, N.Y.

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Bell Industries, Compton, Cal.
Biddle, James G., Plymouth Meeting, Pa.
Bramco Controls, Piqua, Ohio
Douglas Randall Div., Pawcatuck, Conn.
Electro-Module, Inc., Pomona, Cal.
Electronic Specialty Div., Portland, Ore
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Hi-G, Windsor Locks, Conn.
J-B-T Instrs., Inc., New Haven, Conn.
Lear Siegler, Inc., Santa Monica, Calif.
Logitek, Inc., Farmingdale, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Stevens-Arnold, Inc., So. Boston, Mass.
Tempo Instrument, Inc., Plainview, N.Y.
Wilmar Elctrns. Inc., Torrance, Cal.

Relays, General Purpose

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Magnecraft Elec., Chicago, Ill. Vol 2•820-825,829; Vol 4•482*
Midtex/Aemco, Mankato, Minn. Vol 2•837
North American Philips Controls Corp., Cheshire, Conn. Vol 2•357
North American Philips Controls, Frederick, Md. Vol 2•841
Ohmite Mfg. Co., Skokie, Ill. Vol 2•842
Omega Electric, Chicago, Ill. Vol 4•484-487,489*
Potter & Brumfield, Princeton, Ind. Vol 2•845-853,856
Printact Relay Div., Long Island City, N.Y. Vol 2•870
Schrack Elec. Sls., New York, N.Y. Vol 2•872
Solid State Elctrns. Corp., Sepulveda, Cal. Vol 1•937
Square D Co., Park Ridge, Ill. Vol 2•875
Struthers-Dunn, Inc., Pitman, N.J. Vol 2•876-880,887
T-Bar Inc., Wilton, Conn. Vol 2•889
Teledyne Relays, Hawthorne, Cal. Vol 2•894
Adams & Westlake, Elkhart, Ind.
Allen-Bradley Co., Milwaukee, Wisc.
Allied Control Co., Plantsville, Conn.
AMF Electical Prods., Alexandria, Va.
Amp Inc., Harrisburg, Pa.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Associated Engrg. & Mfg. Corp., Upper Montclair, N. J.
Bell Industries, Compton, Cal.
Branson Corp., Denville, N.J.
Chicago Dynamic Inds., Chicago, Ill.
Computer Prods., Ft. Lauderdale, Fla.
Controls Div., Elizabeth, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Davis Elec. Co., Cape Girardeau, Mo.
Deltrol Controls, Milwaukee, Wisc.
Douglas Randall Div., Pawcatuck, Conn.
Eagle Signal, Davenport, Iowa
Electronic Specialty Div., Portland, Ore
Essex International, Inc., Logansport, Ind.
Furnas Elec. Co., Batavia, Ill.
General Automatic Corp., Bayonne, N.J.
General Elec. Company, Providence, R.I.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
GTE Automatic Elec., Northlake, Ill.
Guardian California, Culver City, Cal.
H-B Instr. Co., Phila., Pa.
Honeywell, Ft. Washington, Pa.
Honeywell, Mpls., Minn.
Ingraham Inds., Controls Div., Elizabethtown, Ky.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kratos Precision Prods., Los Angeles, Cal.
Landis & Gyr, Inc., Elmsford, N.Y.
Line Electric Co. Unit Esterline Corp., Parsippany, N.J.
Littelfuse, Inc., Des Plaines, Ill.
Mack Elec. Devices, Wyncote, Pa.
Master Elctrn. Controls, Santa Monica, Cal.
Micro Switch, Freeport, Ill.
Oak Inds. Inc., Crystal Lake, Ill.
Relay Service Co., Chicago, Ill.
Relay Specialties Inc., Fair Lawn, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Stevens-Arnold, Inc., So. Boston, Mass.
Syracuse Elctrns. Corp., Syracuse, N.Y.
Triac Elctrn. Sys., Forest Hills, N. Y.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
WABCO Aerospace Dept., Pittsburgh, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
Welch Relay Division, Los Angeles, Calif.
Weston Instruments, Inc., Newark, N.J.
Wheelock Signals, Long Branch, N.J.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

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Elctrn. Instr. & Specialty, Stoneham, Mass. Vol 2•743
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American Zettler, Irvine, Ca.
AMF Electical Prods., Alexandria, Va.
Arrow-Hart, Inc., Hartford, Conn.
Babcock Control Prods., Costa Mesa, Calif.
Beckman Instrs., Cedar Grove, N.J.
Cober Elctrns., Inc., Stamford, Conn.
Computer Comps., Jamaica, N.Y.
Coto-Coil Co., Inc., Providence, R.I.
Cutler-Hammer, Milwaukee, Wisc.
Del Electronics Corp., Mt. Vernon, N.Y.
Elec-Trol, Inc., Saugus, Cal.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Guardian Elec. Mfg. Co., Chicago, Ill.
H-B Instr. Co., Phila., Pa.
Hartman Electrical Mfg., Mansfield, Ohio
Hi-G, Windsor Locks, Conn.
Hipotronics, Inc., Brewster, N.Y.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
James Elctrns., Inc., Chicago, Ill.
Kilovolt Corp., Hackensack, N.J.
Mack Elec. Devices, Wyncote, Pa.
Megavolt, Inc., New York, N.Y.
Micro Switch, Freeport, Ill.
Midtex/Aemco, Mankato, Minn.
MKC Elctrns. Corp., Kansas City, Kans.
North American Philips Controls Corp., Cheshire, Conn.
North American Philips Controls, Frederick, Md.
Peschel Instrs., Cape Coral, Fla.
Potter & Brumfield, Princeton, Ind.
Relay Specialties Inc., Fair Lawn, N.J.
Schrack Elec. Sls., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Solid State Elctrns. Corp., Sepulveda, Cal.
Struthers-Dunn, Inc., Pitman, N.J.
Texas Instruments, Attleboro, Mass.
Torr Labs., Los Angeles, Cal.
Triridge Corp., Pittsburgh, Pa.
Universal Relay Corp., New York, N.Y.

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Ohmite Mfg. Co., Skokie, Ill. Vol 2•843
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Hartman Electrical Mfg., Mansfield, Ohio
ITT Jennings, Vacuum Elctrn. Prods., San Jose, Cal.
Ledex, Inc., Dayton, Ohio
Sigma Instrs., Inc., Braintree, Mass.
Texas Instruments, Dallas, Tex.
Vanguard Relay Corp., Lindenhurst, N.Y.

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Relays, Latching

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Grigsby-Barton, Inc., Rolling Meadows, Ill. Vol 2•767
Guardian Elec. Mfg. Co., Chicago, Ill. Vol 2•775
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Information Transfer, Inc., Holcomb, N.Y. Vol 2•803
ITT Jennings, Vacuum Elctrn. Prods., San Jose, Cal. Vol 2•799
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Ohmite Mfg. Co., Skokie, Ill. Vol 2•842
Omega Electric, Chicago, Ill. Vol 4•485*
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Printact Relay Div., Long Island City, N.Y. Vol 2•870
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T-Bar Inc., Wilton, Conn. Vol 2•889
A. D. Data Sys., Inc., Rochester, N.Y.
Adams & Westlake, Elkhart, Ind.
Allied Control Co., Plantsville, Conn.
AMF Electical Prods., Alexandria, Va.
Babcock Control Prods., Costa Mesa, Calif.
Bell Industries, Compton, Cal.
Branson Corp., Denville, N.J.
Controls Div., Elizabeth, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Deltrol Controls, Milwaukee, Wisc.
Eagle Signal, Davenport, Iowa
Elec-Trol, Inc., Saugus, Cal.
Elctrn. Applications, S. El Monte, Cal.
Elctrn. Instr. & Specialty, Stoneham, Mass.
Fifth Dimension, Princeton, N.J.
GTE Automatic Elec., Northlake, Ill.
Hamlin, Inc., Lake Mills, Wisc.
Hartman Electrical Mfg., Mansfield, Ohio
Ingraham Inds., Controls Div., Elizabethtown, Ky.
ITT Jennings, San Jose, Cal
Liberty Controls, Inc., Shorewood, Ill.
Line Electric Co. Unit Esterline Corp., Parsippany, N.J.
The Maxi-Switch Co., Minneapolis, Minn.
Micro Switch, Freeport, Ill.
Midtex/Aemco, Mankato, Minn.
New Prod. Engrg., Wabash, Ind.
North American Philips Controls Corp., Cheshire, Conn.
Relay Service Co., Chicago, Ill.
Relay Specialties Inc., Fair Lawn, N.J.
Schrack Elec. Sls., New York, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Teledyne Relays, Hawthorne, Cal.
Texas Instruments, Attleboro, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
Triridge Corp., Pittsburgh, Pa.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.

Relays, Mercury Displacement

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Adams & Westlake, Elkhart, Ind.
H-B Instr. Co., Phila., Pa.
James Elctrns., Inc., Chicago, Ill.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Milli-Switch Corp., Gladwyne, Pa.
Struthers-Dunn, Inc., Pitman, N.J.
Universal Relay Corp., New York, N.Y.

Relays, Mercury-Wetted Contacts

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Coto-Coil Co., Inc., Providence, R.I. Vol 2•720,721
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Grigsby-Barton, Inc., Rolling Meadows, Ill. Vol 2•767
Magnecraft Elec., Chicago, Ill. Vol 2•831,832,834; Vol 4•482*
Midtex/Aemco, Mankato, Minn. Vol 2•837
New Prod. Engrg., Wabash, Ind. Vol 2•840
Potter & Brumfield, Princeton, Ind. Vol 2•865,866
Adams & Westlake, Elkhart, Ind.
AMF Electical Prods., Alexandria, Va.
Computer Prods., Ft. Lauderdale, Fla.
Cosar Corp., Garland, Texas
Elctrn. Applications, S. El Monte, Cal.
Electronic Specialty Div., Portland, Ore
Fifth Dimension, Princeton, N.J.
Gordos Corp., Bloomfield, N.J.
GTE Automatic Elec., Northlake, Ill.
H-B Instr. Co., Phila., Pa.
James Elctrns., Inc., Chicago, Ill.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kratos Precision Prods., Los Angeles, Cal.
Matrix Systems Corp., Chatsworth, Calif.
MKC Elctrns. Corp., Kansas City, Kans.
North American Philips Controls Corp., Cheshire, Conn.
North American Philips Controls, Frederick, Md.
Relay Specialties Inc., Fair Lawn, N.J.
Struthers-Dunn, Inc., Pitman, N.J.
Triridge Corp., Pittsburgh, Pa.
Trompeter Elctrns., Chatsworth, Cal.
Universal Relay Corp., New York, N.Y.

Relays, Meter

Beede Electrical Instr. Co., Inc., Penacook, N.H. Vol 1•395
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Larson Instr. Co., Inc., Orangeburg, N.Y. Vol 1•477
Simpson Elec. Co., Chicago, Ill. Vol 1•502
Solid State Elctrns. Corp., Sepulveda, Cal. Vol 1•937
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AMF Electical Prods., Alexandria, Va.
Cutler-Hammer, Milwaukee, Wisc.
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General Elec., W. Lynn, Mass.
Int'l. Instrs., Orange, Conn.
Jewell Electrical Instrs., Manchester, N.H.
LFE Corp., Waltham,, Mass.
Modutec, Inc., Norwalk, Conn.
Q.V.S., Inc., East Orange, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Universal Relay Corp., New York, N.Y.
Weston Instruments, Inc., Newark, N.J.

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Elmwood Sensors, Inc., Cranston, R.I.
Essex International, Inc., Logansport, Ind.
Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Pitman, N.J.
Triac Elctrn. Sys., Forest Hills, N. Y.

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Allen-Bradley Co., Milwaukee, Wisc.
AMF Electical Prods., Alexandria, Va.
Arrow-Hart, Inc., Hartford, Conn.
Autronics Corp., Pasadena, Calif.
Basler Elec. Co., Highland, Ill.
Bell Industries, Compton, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Electro-Module, Inc., Pomona, Cal.
Elctrn. Applications, S. El Monte, Cal.
Electronic Resch. Assocs., Moonachie, N.J.
Electronic Specialty Div., Portland, Ore
Flight Sys., Inc., Mechanicsburg, Pa.
Furnas Elec. Co., Batavia, Ill.
General Automatic Corp., Bayonne, N.J.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Hartman Electrical Mfg., Mansfield, Ohio
Hoagland Instr., Dayton, N.J.
Jewell Electrical Instrs., Manchester, N.H.
Landis & Gyr, Inc., Elmsford, N.Y.
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Potter & Brumfield, Princeton, Ind.
Relay Specialties Inc., Fair Lawn, N.J.
Ross Engrg. Corp., Campbell, Cal.
Sensor Corp., Scottsdale, Pa.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Pitman, N.J.
Teledyne Kinetics, Solana Beach, Cal.
Teledyne Relays, Hawthorne, Cal.
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
Universal Relay Corp., New York, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
Warren G-V Communications, Livingston, N.J.
Westinghouse Elec., Buffalo, N. Y.
Weston Instruments, Inc., Newark, N.J.
Wilmar Elctrns. Inc., Torrance, Cal.

Relays, Phase-Sensing

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Diversified Elctrns., Evansville, Ind Vol 2•731; Vol 4•479*
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Grigsby-Barton, Inc., Rolling Meadows, Ill. Vol 2•766
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Allen-Bradley Co., Milwaukee, Wisc.
Autronics Corp., Pasadena, Calif.
Avtron Mfg., Inc., Cleveland, Ohio
Babcock Control Prods., Costa Mesa, Calif.
Bell Industries, Compton, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Electro-Module, Inc., Pomona, Cal.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Hi-G, Windsor Locks, Conn.
Jewell Electrical Instrs., Manchester, N.H.
Lear Siegler, Inc., Santa Monica, Calif.
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Potter & Brumfield, Princeton, Ind.
Relay Specialties Inc., Fair Lawn, N.J.
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
Wilmar Elctrns. Inc., Torrance, Cal.

Relays, Plate Circuit

Guardian Elec. Mfg. Co., Chicago, Ill. Vol 2•776
Magnecraft Elec., Chicago, Ill. Vol 2•822
American Zettler, Irvine, Ca.
Artisan Elctrns. Corp., Parsippany, N.J.
Computer Comps., Jamaica, N.Y.
Couch S.H. Div., Boston, Mass.
Dale Elctrns., Inc., Yankton, S.D.
Davis Elec. Co., Cape Girardeau, Mo.
Deltrol Controls, Milwaukee, Wisc.
Elctrn. Applications, S. El Monte, Cal.
Essex International, Inc., Logansport, Ind.
Essex Int'l., Logansport, Ind.
General Automatic Corp., Bayonne, N.J.
Guardian California, Culver City, Cal.
Hi-G, Windsor Locks, Conn.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Liberty Controls, Inc., Shorewood, Ill.
Line Electric Co. Unit Esterline Corp., Parsippany, N.J.
Midtex/Aemco, Mankato, Minn.
North American Philips Controls, Frederick, Md.
Ohmite Mfg. Co., Skokie, Ill.
Omega Electric, Chicago, Ill.
Potter & Brumfield, Princeton, Ind.
Relay Service Co., Chicago, Ill.
Relay Specialties Inc., Fair Lawn, N.J.
Schrack Elec. Sls., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Struthers-Dunn, Inc., Pitman, N.J.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.

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Adams & Westlake, Elkhart, Ind.
Babcock Control Prods., Costa Mesa, Calif.
Barber-Colman Co., Motor Div., Rockford, Ill.
Branson Corp., Denville, N.J.
Clare, C.P. & Co., Chicago, Ill.
Computer Comps., Jamaica, N.Y.
Cook Elec. Co., Morton Grove, Ill.
Coto-Coil Co., Inc., Providence, R.I.
Deltrol Controls, Milwaukee, Wisc.
Douglas Randall Div., Pawcatuck, Conn.
Elctrn. Applications, S. El Monte, Cal.
Elctrn. Instr. & Specialty, Stoneham, Mass.
Fifth Dimension, Princeton, N.J.
Flight Sys., Inc., Mechanicsburg, Pa.
General Automatic Corp., Bayonne, N.J.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
GTE Automatic Elec., Northlake, Ill.
Hartman Electrical Mfg., Mansfield, Ohio
ITT Jennings, San Jose, Cal
Jewell Electrical Instrs., Manchester, N.H.
Liberty Controls, Inc., Shorewood, Ill.
Magnecraft Elec., Chicago, Ill.
Midtex/Aemco, Mankato, Minn.
MKC Elctrns. Corp., Kansas City, Kans.
North American Philips Controls, Frederick, Md.
Potter & Brumfield, Princeton, Ind.
Printact Relay Div., Long Island City, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Struthers-Dunn, Inc., Pitman, N.J.
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Triac Elctrn. Sys., Forest Hills, N. Y.
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Adams & Westlake, Elkhart, Ind.
Allen-Bradley Co., Milwaukee, Wisc.
American Zettler, Irvine, Ca.
AMF Electical Prods., Alexandria, Va.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
ATR Elctrns., Inc., St. Paul, Minn.
Basler Elec. Co., Highland, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Davis Elec. Co., Cape Girardeau, Mo.
Deltrol Controls, Milwaukee, Wisc.
Dynamic Controls Corp., S. Windsor, Conn.
Elmwood Sensors, Inc., Cranston, R.I.
Essex International, Inc., Logansport, Ind.
Gems Sensors Div., Farmington, Conn.
General Automatic Corp., Bayonne, N.J.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
GTE Automatic Elec., Northlake, Ill.
Guardian California, Culver City, Cal.
H-B Instr. Co., Phila., Pa.
Hartman Electrical Mfg., Mansfield, Ohio
Hi-G, Windsor Locks, Conn.
Honeywell, Ft. Washington, Pa.
Honeywell, Mpls., Minn.
Ingraham Inds., Controls Div., Elizabethtown, Ky.
International Rectifier, El Segundo, Cal.
James Elctrns., Inc., Chicago, Ill.
Jewell Electrical Instrs., Manchester, N.H.
Johnson E. F. Co., Waseca, Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Ledex, Inc., Dayton, Ohio
Liberty Controls, Inc., Shorewood, Ill.
Line Electric Co. Unit Esterline Corp., Parsippany, N.J.
Littelfuse, Inc., Des Plaines, Ill.
Mack Elec. Devices, Wyncote, Pa.
Nanotron Relay Co., Burbank, Cal.
North American Philips Controls, Frederick, Md.
Oak Inds. Inc., Crystal Lake, Ill.
Relay Specialties Inc., Fair Lawn, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Solid State Elctrns. Corp., Sepulveda, Cal.
Square D Co., Park Ridge, Ill.
T-Bar Inc., Wilton, Conn.
Texas Instruments, Attleboro, Mass.
Torr Labs., Los Angeles, Cal.
Triac Elctrn. Sys., Forest Hills, N. Y.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
Weston Instruments, Inc., Newark, N.J.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Zenith Controls Inc., Chicago, Ill.

Relays, Programmable

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Consolidated Resistance Amer., Yonkers, N.Y.
Constanta Co. of Can., Montreal, Can.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
E-Systems, Inc., Memcor Div., Huntington, Ind.
Edison Elctrns. Div., Manchester, N.H.
Electra/Midland Corp., Mineral Wells, Tex.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
Hybrid Technology Corp., Arlington, Tex.
Kelvin, Van Nuys, Cal.
KRL Electronics, Manchester, N.H.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
Marstan Resistor, Orange, N.J.
Mepco, Inc., Morristown, N.J.
Milwaukee Resistor, Milwaukee, Wisc.
Mini-Systems, Inc, North Attleboro, Mass.
New England Instr., Natick, Mass.
Nytronics Inc., Darlington, S.C.
Ohmite Mfg. Co., Skokie, Ill.
Pyrofilm Corp., Whippany, N.J.
RCA Parts & Accessories, Deptford, N.J.
Seacor, Inc., Norwood, N.J.
Tel Labs., Manchester, N.H.
Ultronix, Inc., Grand Junction, Colo.
United Mineral & Chem. Corp., New York, N.Y.
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Constanta Co. of Can., Montreal, Can.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
AFI Industries Inc., Long Branch, N. J.
Int'l. Components Corp., Farmingdale, N. Y.
Kelvin, Van Nuys, Cal.
KRL Electronics, Manchester, N.H.
Mepco, Inc., Morristown, N.J.
Mini-Systems, Inc, North Attleboro, Mass.
RCA Parts & Accessories, Deptford, N.J.
Ross Engrg. Corp., Campbell, Cal.
Seacor, Inc., Norwood, N.J.
Sprague Elec. Co., No. Adams, Mass.
United Mineral & Chem. Corp., New York, N.Y.
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Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
Hybrid Technology Corp., Arlington, Tex.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
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Beckman Instrs., Helipot Div., Fullerton, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Consolidated Resistance Amer., Yonkers, N.Y.
Constanta Co. of Can., Montreal, Can.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Cox & Co., Inc., New York, N.Y.
CW Industries, Warminster, Pa.
E-Systems, Inc., Memcor Div., Huntington, Ind.
Edison Elctrns. Div., Manchester, N.H.
Electra/Midland Corp., Mineral Wells, Tex.
Electro Mats. Corp. Amer., Mamaroneck, N.Y.
Electro Sci. Inds., Portland, Ore.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
AFI Industries Inc., Long Branch, N. J.
General Resistance, Inc., Mt. Vernon, N.Y.
Guildline Instrs., Inc., Larchmont, N.Y.
Int'l. Components Corp., Farmingdale, N. Y.
Julie Research Lab., New York, N.Y.
Kelvin, Van Nuys, Cal.
KRL Electronics, Manchester, N.H.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
Marstan Resistor, Orange, N.J.
Mepco, Inc., Morristown, N.J.
Mini-Systems, Inc, North Attleboro, Mass.
New England Instr., Natick, Mass.
Nytronics Inc., Darlington, S.C.
Ohmite Mfg. Co., Skokie, Ill.
Precision Resistor Co., Hillside, N.J.
Pyrofilm Corp., Whippany, N.J.

Reon Resistor Corp., Frazer, Pa.
Resistors, Inc., Chicago, Ill.
Seacor, Inc., Norwood, N.J.
Shallco, Inc., Smithfield, N.C.
Stettner-Trush Inc., Cazenovia, N.Y.
Texas Instruments, Attleboro, Mass.
TRW/IRC Fixed Resistors, Boone, N.C.
Ultronix, Inc., Grand Junction, Colo.
United Mineral & Chem. Corp., New York, N.Y.
Vishay Resistor Prod. Div., Malvern, Pa.
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Electro Mats. Corp. Amer., Mamaroneck, N.Y.
Electro-Science Labs., Pennsauken, N. J.
Int'l. Components Corp., Farmingdale, N. Y.
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Dale Elctrns., Inc., Columbus, Neb.
EMC Technology Inc, Cherry Hill, N.J.
General Radio Co., Concord, Mass.
Metavac, Inc., Flushing, N.Y.
Mini-Systems, Inc, North Attleboro, Mass.
Norsal Industries, Inc., Brentwood, N.Y.
Pyrofilm Corp., Whippany, N.J.
RCL Elctrns., Inc., Irvington, N.J.
TRW/IRC Fixed Resistors, Burlington, Iowa
United Mineral & Chem. Corp., New York, N.Y.
Weinschel Engrg. Co., Gaithersburg, Md.

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Beckman Instrs., Helipot Div., Fullerton, Cal.
Beman Mfg., Inc., New Cumberland, Pa.
Bendix Corp., Sturbridge, Mass.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Carbone Corp., Boonton, N.J.
Carborundum Co., Niagara Falls, N.Y.
Consolidated Resistance Amer., Yonkers, N.Y.
Constanta Co. of Can., Montreal, Can.
Cox & Co., Inc., New York, N.Y.
Dale Elctrns., Inc., Columbus, Neb.
E-Systems, Inc., Memcor Div., Huntington, Ind.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., Riverside, N.J.
General Resistance, Inc., Mt. Vernon, N.Y.
Kelvin, Van Nuys, Cal.
Keystone Carbon Co., St. Marys, Pa.
Mepco, Inc., Morristown, N.J.
New England Instr., Natick, Mass.
Pyrofilm Corp., Whippany, N.J.
Resistance Prods., Harrisburg, Pa.
Rodan Ind's., Anaheim, Ca.
Tel Labs., Manchester, N.H.
Texas Instruments, Attleboro, Mass.
Thin Film Services, Gile, Wisc.
TRW/IRC Fixed Resistors, Burlington, Iowa
United Mineral & Chem. Corp., New York, N.Y.
Victory Engrg. Corp., Springfield, N.J.

Resistors, Non-Inductive

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Arcidy Assocs., Manchester, N. H.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Beman Mfg., Inc., New Cumberland, Pa.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Carbone Corp., Boonton, N.J.
Consolidated Resistance Amer., Yonkers, N.Y.
Constanta Co. of Can., Montreal, Can.
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
E-Systems, Inc., Memcor Div., Huntington, Ind.
Edison Elctrns. Div., Manchester, N.H.
Electro Sci. Inds., Portland, Ore.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
General Resistance, Inc., Mt. Vernon, N.Y.
Julie Research Lab., New York, N.Y.
Kelvin, Van Nuys, Cal.
KRL Electronics, Manchester, N.H.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
Marstan Resistor, Orange, N.J.
Mepco, Inc., Morristown, N.J.
Milwaukee Resistor, Milwaukee, Wisc.
Mini-Systems, Inc, North Attleboro, Mass.
Nytronics Inc., Darlington, S.C.
Ohmite Mfg. Co., Skokie, Ill.
Precision Resistor Co., Hillside, N.J.
Pyrofilm Corp., Whippany, N.J.
Reon Resistor Corp., Frazer, Pa.
Resistance Prods., Harrisburg, Pa.
Samarius, Inc., Derby, Conn.
Seacor, Inc., Norwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Stackpole Carbon Co., Elctrn. Comp. Div.-Soft Ferrites/Special Resistors, St. Marys, Pa.
Ultronix, Inc., Grand Junction, Colo.
Vishay Resistor Prod. Div., Malvern, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
Ward Leonard Hagerstown Div., Hagerstown, Md.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Resistors, Oil Filled

Consolidated Resistance Amer., Yonkers, N.Y.
Dale Elctrns., Inc., Columbus, Neb.
Edison Elctrns. Div., Manchester, N.H.
General Resistance, Inc., Mt. Vernon, N.Y.
Julie Research Lab., New York, N.Y.
Julie Research Lab., New York, N.Y.
KRL Electronics, Manchester, N.H.
RCL Elctrns., Inc., Irvington, N.J.
Tel Labs., Manchester, N.H.
Ultronix, Inc., Grand Junction, Colo.
Vishay Resistor Prod. Div., Malvern, Pa.

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Ultronix, Inc., Grand Junction, Colo.

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Beckman Instrs., Helipot Div., Fullerton, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Carborundum Co., Niagara Falls, N.Y.
Centralab Elctrns Div., Milwaukee, Wisc
Consolidated Resistance Amer., Yonkers, N.Y.
Constanta Co. of Can., Montreal, Can.
Dale Elctrns., Inc., Columbus, Neb.
E-Systems, Inc., Memcor Div., Huntington, Ind.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., Riverside, N.J.
General Resistance, Inc., Mt. Vernon, N.Y.
Julie Research Lab., New York, N.Y.
Julie Research Lab., New York, N.Y.
Kelvin, Van Nuys, Cal.
KRL Electronics, Manchester, N.H.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
Marstan Resistor, Orange, N.J.
Mepco, Inc., Morristown, N.J.
Milwaukee Resistor, Milwaukee, Wisc.
Ohmite Mfg. Co., Skokie, Ill.
Precision Resistor Co., Hillside, N.J.
Pyrofilm Corp., Whippany, N.J.
Rodan Ind's., Anaheim, Ca.
Sprague Elec. Co., No. Adams, Mass.
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Texas Instruments, Attleboro, Mass.
Thin Film Services, Gile, Wisc.
TRW/IRC Fixed Resistors, Burlington, Iowa
TRW/IRC Fixed Resistors, Philadelphia, Pa.
Ultronix, Inc., Grand Junction, Colo.
Vishay Resistor Prod. Div., Malvern, Pa.
Ward Leonard Hagerstown Div., Hagerstown, Md.

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Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Centralab Elctrns Div., Milwaukee, Wisc
Diplohmatic Div., Seattle, Wash.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
EMC Technology Inc, Cherry Hill, N.J.
Kelvin, Van Nuys, Cal.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
Mallory Controls, Frankfort, Ind.
Mepco, Inc., Morristown, N.J.
Nytronics Inc., Darlington, S.C.
Precision Resistor Co., Hillside, N.J.
Resistance Prods., Harrisburg, Pa.
Samarius, Inc., Derby, Conn.
Seacor, Inc., Norwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Square D Co., Park Ridge, Ill.
Stackpole Carbon Co., Elctrn. Comp. Div.-Soft Ferrites/Special Resistors, St. Marys, Pa.
Ultronix, Inc., Grand Junction, Colo.
United Mineral & Chem. Corp., New York, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.

Resistors, Pressure Sensitive

Bourns, Inc., Instr. Div., Riverside, Calif.

Resistors, Rectilinear

Allen-Bradley Co., Milwaukee, Wisc.
Astro Elctrns., Inc., Fullerton, Calif.

Beckman Instrs., Helipot Div., Fullerton, Cal.
Bourns, Inc., Instr. Div., Riverside, Calif.
Carbone Corp., Boonton, N.J.
Carter Mfg. Corp., Hudson, Mass.
Computer Instrs., Hempstead, N.Y.
Dale Elctrns., Inc., Columbus, Neb.
Diplohmatic Div., Seattle, Wash.
E-Systems, Inc., Memcor Div., Huntington, Ind.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Kelvin, Van Nuys, Cal.
Litton Inds., Mt. Vernon, N.Y.
New England Instr., Natick, Mass.
Reon Resistor Corp., Frazer, Pa.
Samarius, Inc., Derby, Conn.
United Mineral & Chem. Corp., New York, N.Y.

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EMC Technology Inc, Cherry Hill, N.J.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
Litton Inds., Mt. Vernon, N.Y.
Metavac, Inc., Flushing, N.Y.
Milwaukee Resistor, Milwaukee, Wisc.
Pyrofilm Corp., Whippany, N.J.
RCL Elctrns., Inc., Irvington, N.J.
Tel Labs., Manchester, N.H.
United Mineral & Chem. Corp., New York, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.

Resistors, Suppressor

Carborundum Co., Niagara Falls, N.Y.
CW Industries, Warminster, Pa.
Dale Elctrns., Inc., Columbus, Neb.
Estes Engrg. Co., Gardena, Calif.
Ohio Carbon Co., Cleveland, Ohio
TRW/IRC Fixed Resistors, Boone, N.C.
United Mineral & Chem. Corp., New York, N.Y.

Resistors, Surge

Beman Mfg., Inc., New Cumberland, Pa.
Carborundum Co., Niagara Falls, N.Y.
Dale Elctrns., Inc., Columbus, Neb.
Kelvin, Van Nuys, Cal.
Milwaukee Resistor, Milwaukee, Wisc.
Ohmite Mfg. Co., Skokie, Ill.
RCA Parts & Accessories, Deptford, N.J.
Rodan Ind's., Anaheim, Ca.
Stackpole Carbon Co., Elctrn. Comp. Div.-Soft Ferrites/Special Resistors, St. Marys, Pa.
TRW/IRC Fixed Resistors, Boone, N.C.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.

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Burr-Brown Resch. Corp., Tucson, Ariz.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Centralab Elctrns Div., Milwaukee, Wisc
Clarostat Mfg. Co., Inc., Dover, N.H.
Consolidated Resistance Amer., Yonkers, N.Y.
Constanta Co. of Can., Montreal, Can.
CTS Corp, Elkhart, Ind.
E-Systems, Inc., Memcor Div., Huntington, Ind.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
General Resistance, Inc., Mt. Vernon, N.Y.
Kelvin, Van Nuys, Cal.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
Mallory Controls, Frankfort, Ind.
Mepco, Inc., Morristown, N.J.
Milwaukee Resistor, Milwaukee, Wisc.
Ohmite Mfg. Co., Skokie, Ill.
RCL Elctrns., Inc., Irvington, N.J.
Reon Resistor Corp., Frazer, Pa.
Samarius, Inc., Derby, Conn.
Shallcross, Selma, N.C.
Shigoto Inds., Ltd., New York, N.Y.
Tech Labs., Inc., Palisades Pk., N.J.
Tel Labs., Manchester, N.H.
TRW/IRC Fixed Resistors, Boone, N.C.
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Mallory Controls, Frankfort, Ind.

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Centralab Elctrns Div., Milwaukee, Wisc
Edison Elctrns. Div., Manchester, N.H.
Mepco, Inc., Morristown, N.J.
RCA Parts & Accessories, Deptford, N.J.
Schauer Mfg. Corp., Cincinnati, Ohio
Tel Labs., Manchester, N.H.
Victory Engrg. Corp., Springfield, N.J.

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Clarostat Mfg. Co., Inc., Dover, N.H. Vol 3•1218
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Dale Electronics, Inc., Norfolk, Nebr. Vol 3•1127-1136
Dale Elctrns. Canada, Ltd., Scarborough, Ont., Can. Vol 3•1127-1136
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Automation Services Div., Windsor, N. Y.
Cal-R, Inc., Santa Monica, Cal.
Carter Mfg. Corp., Hudson, Mass.
Centralab Elctrns Div., Milwaukee, Wisc
Coil Specialty Co., Boalsburg, Pa.
Consolidated Resistance Amer., Yonkers, N.Y.
Diplohmatic Div., Seattle, Wash.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
General Resistance, Inc., Mt. Vernon, N.Y.
Julie Research Lab., New York, N.Y.
Kelvin, Van Nuys, Cal.
KRL Electronics, Manchester, N.H.
Lectrohm Div. of Capco, Inc., Grand Junction, Col.
Litton Inds., Mt. Vernon, N.Y.
Mallory Controls, Frankfort, Ind.
Marstan Resistor, Orange, N.J.
Nytronics Inc., Darlington, S.C.
Precision Resistor Co., Hillside, N.J.
Reon Resistor Corp., Frazer, Pa.
Samarius, Inc., Derby, Conn.
Seacor, Inc., Norwood, N.J.
Shallco, Inc., Smithfield, N.C.
Shigoto Inds., Ltd., New York, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Square D Co., Park Ridge, Ill.
TRW/IRC Fixed Resistors, Philadelphia, Pa.
Ultronix, Inc., Grand Junction, Colo.
United Mineral & Chem. Corp., New York, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
Westinghouse Elec., Buffalo, N. Y.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Resistors, Wire Woven

Cal-R, Inc., Santa Monica, Cal.
Dale Elctrns., Inc., Columbus, Neb.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Nytronics Inc., Darlington, S.C.
RCA Parts & Accessories, Deptford, N.J.
TRW/IRC Fixed Resistors, Boone, N.C.

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Bendix Aerospace-Elctrns., Teterboro, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
C & A Products, Inc., Woodside, N. Y.
Clifton Precision, Clifton Hgts., Pa.
Electric Indicator Co., Inc., Norwalk, Conn.
Farrand Controls, Inc., Valhalla, N.Y.
General Magnetics, Bloomfield, N.J.
Harowe Servo Controls, W. Chester, Pa.
IMC Magnetics Corp., Westbury, N.Y.
IMC Magnetics Corp., Maywood, Cal.
Singer Co., Little Falls, N.J.
Transicoil, Inc., Worcester, Pa.

Resonators, Microwave

Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Collins Radio Co., Dallas, Tex.
E & M Laboratories, Inc., Westlake Village, Cal.
Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCL, Inc., La Grange, Ill.
Microlab/FXR, Livingston, N.J.
Norsal Industries, Inc., Brentwood, N.Y.
Premier Microwave, Port Chester, N.Y.
Vector Industries, Palo Alto, Cal.

Retainers, Battery

Acme Model Engrg. Co., Ridgefield, N.J.
Augat Inc., Attleboro, Mass.
Keystone Elctrns. Corp., New York, N.Y.
Transcon Mfg. Co., Dallas, Tex.

Retainers, Relay

American Zettler, Irvine, Ca.
Ingraham Inds., Controls Div., Elizabethtown, Ky.
Transcon Mfg. Co., Dallas, Tex.

Retainers, Transistor & Diode

Vector Elctrn. Co., Inc., Sylmar, Cal. Vol 3•956,957
Atlee Corp., Woburn, Mass.
Birnbach Co., Inc., Freeport, N.Y.
Gibson/Egan Co., Arcadia, Calif.
Int'l. Elctrn. Resch., Burbank, Cal.
Jettron Prods., Hanover, N.J.
Keystone Elctrns. Corp., New York, N.Y.
Micro Instr. Co., Hawthorne, Cal.
Transcon Mfg. Co., Dallas, Tex.
Wakefield Engrg., Inc., Components Div., Wakefield, Mass.

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Allen-Bradley Co., Milwaukee, Wisc.
Amphenol Controls Oper. of Connector Div., Broadview, Ill.
Carter Mfg. Corp., Hudson, Mass.
Centralab Elctrns Div., Milwaukee, Wisc
CW Industries, Warminster, Pa.
Duncan Elctrns., Costa Mesa, Cal.
Edison Elctrns. Div., Manchester, N.H.
Electro Sci. Inds., Portland, Ore.
Litton Inds., Mt. Vernon, N.Y.
Mallory Controls, Frankfort, Ind.
Maurey Instrument Corp., Chicago, Ill.
Reon Resistor Corp., Frazer, Pa.
Samarius, Inc., Derby, Conn.
Shigoto Inds., Ltd., New York, N.Y.
Tech Labs., Inc., Palisades Pk., N.J.
Techno-Comps. Corp., Van Nuys, Cal.
Triac Elctrn. Sys., Forest Hills, N. Y.
United Mineral & Chem. Corp., New York, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
Westinghouse Elec., Buffalo, N. Y.
Weston Comps. Div., Archbald, Pa.

Rings, Retaining

Eaton Corp., Engired. Fasteners Div., Cleveland, Ohio
GC Electronics, Rockford, Ill.
PIC Design Division, Ridgefield,, Conn.
Sterling Instr., New Hyde Pk., NY
Superior Carbon Prods., Inc., Cleveland, Ohio
Templeman, D.R. Co., Plainville, Conn.
Tridair Inds., Torrance, Calif.
Vaco Prods. Co., Chicago, Ill.
Waldes Kohinoor, Inc., Long Island City, N.Y.

Rings, Slip-Brush Assemblies—See Slip Ring Assemblies

Rivets

APM-Hexseal, Englewood, N.J.
Cherry Rivet & Boots Nut Divs., Santa Ana, Calif.
Circon Corp., Santa Barbara, Ca.
Deutsch Fastener Corp., Los Angeles, Cal.
Eaton Corp., Engired. Fasteners Div., Cleveland, Ohio
GC Electronics, Rockford, Ill.
Gries Reproducer Co., New Rochelle, N.Y.
Ico/Rally, Palo Alto, Cal.
ITT Harper Inc., Morton Grove, Ill.
Milford Rivet & Mach., Milford, Conn.
Norelcom Inds., Inc., Farmingdale, N.Y.
Pylon Co., Inc., Attleboro, Mass.
Smith, Herman H., Inc., Bklyn., N.Y.
Taylor Industries Inc., Howell, Mich.
USM Corp., Shelton, Conn.
Vaco Prods. Co., Chicago, Ill.

Rooms, Clean, Dust-Free

Agnew-Higgins, Inc., Garden Grove, Calif.
Baker Co., Inc., Sanford, Me.
Clean Room Prods., Farmingdale, N.Y.
Merix Chem. Co., Chicago, Ill.

Standard Environmental Systems, Inc., Totowa, N.J.
Tenney Engrg., Inc., Union, N.J.
Westinghouse Elec., Grand Rapids, Mich.

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Rubber, Conductive

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Chomerics, Inc., Woburn, Mass.
Electro-Science Labs., Pennsauken, N. J.
Hardman Inc., Belleville, N.J.
Metex Corp., Edison, N.J.
SWS Silicones Div., Adrian, Mich.

Rubber Guards (For Equipment)—See Bumpers

Rubber, Silicone

Allaco Prods Div., Watertown, Mass.
APM-Hexseal, Englewood, N.J.
Bacon Inds., Watertown, Mass.
Dow Corning Corp., Midland, Mich.
Emerson & Cuming, Inc., Canton, Mass.
General Elec. Co., Waterford, N.Y.
General Elec. Company, Providence, R.I.
Hardman Inc., Belleville, N.J.
Minnesota Rubber Co., Minneapolis, Minn.
Ram Chems., Gardena, Calif.
SWS Silicones Div., Adrian, Mich.
Tra-Con, Inc., Medford, Mass.
Varflex Corp., Rome, N.Y.

Sapphire Parts

Alberox Corp., New Bedford, Mass.
Basic Ceramics Inc., Hawthorne, N.J.
Bird, Richard H. & Co., Inc., Waltham, Mass.
Ceramic Magnetics, Inc., Fairfield, N.J.
Fansteel Inc., N Chicago, Ill.
Keller, Hugo P., Inc., New York, N.Y.
Optics International, Tenafly, N.J.
Quartzite Processing, Inc., Malden, Mass.
Union Carbide, San Diego, Cal.

Scale Expanders, Meter—See Multipliers, Meter

Scalers, Binary, Decade

Amtron Inc., Midlothian, Ill.
Controlcraft Corp., West Chicago, Ill.
Fork Standards, W. Chicago, Ill.
Harshaw Chem. Co., Cleveland, Ohio
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
Milletron, Inc., Pittsburgh, Pa.
Norden Div., Norwalk, Conn.
Nuclear Data, Palatine, Ill.
Nuclear Meas. Corp., Indianapolis, Ind.
Nuclear Resch. Corp., Southampton, Pa.
Ormond Inc., Santa Fe Springs, Cal.
Packard Instrument Co., Inc., Downers Grove, Ill.
Pinlites, Fairfield, N.J.
Signetics. Corp., Sunnyvale, Calif.
Soltec Corp., No. Hollywood, Cal.
3M Co., St. Paul, Minn.

Scales, Dial

Datak Corp., Passaic, N.J. Vol 2•479
Amtron Inc., Midlothian, Ill.
Apahouser Corp. of N.E., Boston, Mass.
Beckman Instrs., (AISSD), Fullerton, Cal.
Chatillon John & Sons, Kew Gardens, N.Y.
Detecto Scales, Inc., Brooklyn, N.Y.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Howe Richardson Scale Co., Clifton, N.J.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Millen, James Mfg., Malden, Mass.
Panelgraphic Corp., Caldwell, N.J.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Smith, Herman H., Inc., Bklyn., N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tech-Etch, Inc., Hingham, Mass.
Theta Instr. Corp., Fairfield, N.J.
Toledo Scale, Toledo, Ohio
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Waldom Elctrns., Inc., Chicago, Ill.

Scanners, Crossbar

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Amp Inc., Harrisburg, Pa.
Lear Siegler, Anaheim, Cal.
Matrix Systems Corp., Chatsworth, Calif.
Monitor Labs, Inc., San Diego, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan

Scanners, Flying Spot

American Time Products, Woodside, N.Y. Vol 2•680
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Amperex Elctronic Corp., Slatersville, R.I.
General Scanning, Watertown, Mass.
Gould Data Systems, Newton Upper Falls, Mass.
Rank Precision Inds., Des Plaines, Ill.
Raytheon Co., Quincy, Mass.
Syntronic Instrs., Inc., Addison, Ill.

Scanners, Infrared

American Time Products, Woodside, N.Y.
Barnes Engrg. Co., Stamford, Conn.
Bendix Corp., Ann Arbor, Mich.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Dolan-Jenner Inds., Inc., Melrose, Mass.
General Scanning, Watertown, Mass.
Honeywell, Minneapolis, Minn.
HRB-Singer, Inc., State College, Pa.
Innovation Industries Inc., Roswell, N.M.
Rank Precision Inds., Des Plaines, Ill.
Santa Barbara Resch. Ctr., Goleta, Calif.
Scientific Technology, Mountain View, Cal.
Skan-A-Matic Corp., Elbridge, N. Y.

Scanners, Instrument, Input/Output

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Matrix Corp., Beech Grove, Ind. Vol 1•355
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A. D. Data Sys., Inc., Rochester, N.Y.
Aerotronic Assocs., Inc., Contoocook, N.H.
Autocon Inds., Inc., Minneapolis, Minn.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Beckman Instrs., Cedar Grove, N.J.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
Bristol Div, Waterbury, Conn
CGS Units, Inc., Rochester, N.Y.
Computer Prods., Ft. Lauderdale, Fla.
Conklin Instr. Corp., Pleasant Valley, N.Y.
Control Equip. Corp., Lowell, Mass.
Data Graphics, San Antonio, Tex.
Data Specialties Inc., Highland Park, Ill.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dytro Corp., Hicksville, N.Y.
EG&G, Inc., Bedford, Mass.
Electronic Research Co., Shawnee Mission, Kan.
Fifth Dimension, Princeton, N.J.
General Radio Co., Concord, Mass.
Harshaw Chem. Co., Cleveland, Ohio
Hawkeye Instrus., Inc., Marion, Iowa
Heitz, Karl, Inc., New York, N.Y.
Information Transfer, Inc., Holcomb, N.Y.
Julie Research Lab., New York, N.Y.
Kollsman Instr. Co., Syosset, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Leeds & Northrup Corp., No. Wales, Pa.
Metra Instruments, Inc., Mt. View, Cal.
Micro Instr. Co., Hawthorne, Cal.
Midland Standard Inc., Elgin, Ill.
Monarch Marking Sys., Dayton, Ohio
Monitor Labs, Inc., San Diego, Cal.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
NES, Inc., Itasca, Ill.
Princeton Elctrn. Prods., New Brunswick, N.J.
Rosemount Inc., Minneapolis, Minn.
Skan-A-Matic Corp., Elbridge, N. Y.
Teradyne, Inc., Boston, Mass.
Test & Measuring Instrs. Inc., Hicksville, N.Y.
Thiem Industries, Inc., Torrance, Cal.
3M Co., St. Paul, Minn.
United Sys. Corp., Dayton, Ohio
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Wyle Computer Prods., Inc., El Segundo, Calif.

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Autocon Inds., Inc., Minneapolis, Minn.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
CGS Units, Inc., Rochester, N.Y.
Computer Prods., Ft. Lauderdale, Fla.
Control Equip. Corp., Lowell, Mass.
Controlcraft Corp., West Chicago, Ill.
Data Specialties Inc., Highland Park, Ill.
Doric Sci. Corp., San Diego, Calif.
Fifth Dimension, Princeton, N.J.
General Radio Co., Concord, Mass.
HB Engineering Corp., Beltsville, Md.
Innovation Industries Inc., Roswell, N.M.
Instrumentation Prods., Camarillo, Cal.
Julie Research Lab., New York, N.Y.
Kollsman Instr. Co., Syosset, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Metra Instruments, Inc., Mt. View, Cal.
Monitor Labs, Inc., San Diego, Cal.
R.C.A. Electromagnetic & Aviation Sys. Div., Van Nuys, Cal.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Scissors

Clauss Cutlery Co., Fremont, Ohio
Jonard Inds. Corp., Bronx, N.Y.
Klein, Mathias & Sons, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Techni-Tool, Inc., Philadelphia, Pa.
Vigor Co., New York, N.Y.
Wen Prods., Inc., Chicago, Ill.

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Jade Corp., Huntingdon Valley, Pa. Vol 1•384
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Sprague Elec. Co., No. Adams, Mass.

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Desco Mfg. Co., Glendale, Calif.
Erikson Specialized Tool Co., Pico-Rivera, Cal.
FMC Corp., Homer City, Pa.
Gardner-Denver Co., Quincy, Ill.
General Hardware Mfg. Co., New York, N.Y.
Hunter Tools, El Monte, Calif
Kedman Co., Salt Lake City, Utah
Klein, Mathias & Sons, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Moody Tools, Inc., Providence, R.I.
Neuses, P.K., Inc., Arlington Hgts., Ill.
Norelcom Inds., Inc., Farmingdale, N.Y.
Skyo Industries Inc., Deer Park, N.Y.
Standard Pneumatic Motor Co., Reno, Nev.
Techni-Tool, Inc., Philadelphia, Pa.
Vigor Co., New York, N.Y.
X-Acto, Long Island City, N.Y.
Xcelite, Inc., Orchard Park, N.Y.

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General Hardware Mfg. Co., New York, N.Y.
Laser Technology, Inc., N. Hollywood, Calif.
Materials Resch. Corp., Orangeburg, N.Y.
Rank Precision Inds., Des Plaines, Ill.
Union Carbide, San Diego, Cal.
Varian Assocs., Palo Alto, Cal.

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Seals, Ceramic To Metal

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Airpax Elctrns., Inc., Cambridge, Md.
Alberox Corp., New Bedford, Mass.
American Lava Corp., Chattanooga, Tenn.
Basic Ceramics Inc., Hawthorne, N.J.
Centralab Elctrns Div., Milwaukee, Wisc
Ceramaseal, Inc., New Lebanon Center, N.Y.
Composite Microcircuits, Waltham, Mass.
Coors Porcelain Co., Golden, Colo.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Eimac, San Carlos, Calif.
Electro-Science Labs., Pennsauken, N. J.
Fansteel Inc., N Chicago, Ill.
General Elec. Co., Waterford, N.Y.
General Lab. Assocs., Norwich, N.Y.
Glass Beads Co., Latrobe, Pa.
Gulton Inds., Newport Bch., Cal.
Hermetic Seal Corp., Rosemead, Cal.
Lapp Insulator Div., Interpace Corp., LeRoy, N.Y.
Latronics Corp., Latrobe, Pa.
Materials for Elctrns., Inc., Jamaica, N.Y.
National Beryllia Corp., Haskell, N.J.
Plessey Ceramic Div., Frenchtown, N.J.
Statham Instrs., Inc., Oxnard, Cal.
Tekform Prods. Co., Anaheim, Cal.
3M Co., St. Paul, Minn.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.

Seals, Glass To Metal

Bendix, Franklin, Ind. Vol 3•1007
Airpax Elctrns., Inc., Cambridge, Md.
Anchor Alloys, Inc., Brooklyn, N.Y.
Armstrong Cork Co., Lancaster, Pa.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Composite Microcircuits, Waltham, Mass.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Electrical Inds., Murray Hill, N.J.
Electro-Science Labs., Pennsauken, N. J.
Elctrn. Seals, Van Nuys, Cal.
Fredericks Co., Huntingdon Valley, Pa.
General Elec. Co., Waterford, N.Y.
GTI Corp. (E), Pittsburgh, Pa.

Gulton Inds., Newport Bch., Cal.
Hermetic Seal Corp., Rosemead, Cal.
High Voltage Engrg. Corp., Burlington, Mass.
Latronics Corp., Latrobe, Pa.
Malco, A Microdot Co., Inc., Chicago, Ill.
National Beryllia Corp., Haskell, N.J.
Statham Instrs., Inc., Oxnard, Cal.
Tekform Prods. Co., Anaheim, Cal.
Thermal Amer. Fused Quartz, Montville, N.J.
Torr Labs., Los Angeles, Cal.
Vacumetrics Inc., Waltham, Mass.
Wilmad Glass Co., Inc., Buena, N.J.

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Alberox Corp., New Bedford, Mass.
APM-Hexseal, Englewood, N.J.
Basic Ceramics Inc., Hawthorne, N.J.
Centralab Elctrns Div., Milwaukee, Wisc
Ceramaseal, Inc., New Lebanon Center, N.Y.
Composite Microcircuits, Waltham, Mass.
Coors Porcelain Co., Golden, Colo.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Eimac, San Carlos, Calif.
Electrical Inds., Murray Hill, N.J.
Electro-Science Labs., Pennsauken, N. J.
Elctrn. Seals, Van Nuys, Cal.
Fansteel Inc., N Chicago, Ill.
General Lab. Assocs., Norwich, N.Y.
GTI Corp. (E), Pittsburgh, Pa..
Hermetic Seal Corp., Rosemead, Cal.
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y.
Latronics Corp., Latrobe, Pa.
Malco, A Microdot Co., Inc., Chicago, Ill.
Metal Bellows Corp., Sharon, Mass.
National Beryllia Corp., Haskell, N.J.
Parker Seal Co., Culver City, Calif.
Plessey Ceramic Div., Frenchtown, N.J.
Singer Co., Little Falls, N.J.
Solid State Equipment Corp., Fort Washington, Pa.
Tekform Prods. Co., Anaheim, Cal.
Zippertubing Co., Los Angeles, Calif.

Seals, Metal To Metal

Armstrong Cork Co., Lancaster, Pa.
Associate General Labs., Inc., Brookfield, Ill.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Chemetron Corp., Chicago, Ill.
Electro-Science Labs., Pennsauken, N. J.
Fansteel Inc., N Chicago, Ill.
General Elec. Co., Waterford, N.Y.
High Voltage Engrg. Corp., Burlington, Mass.
Latronics Corp., Latrobe, Pa.
Omega Engrg., Inc., Stamford, Conn.
Parker Seal Co., Culver City, Calif.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
Semicon Assoc., Inc., Lexington, Ky.
Servotronics, Inc., Buffalo, N.Y.
Solid State Equipment Corp., Fort Washington, Pa.
Vigor Co., New York, N.Y.

Seals, Microwave—See Gaskets, Shielding, R-F; Seals, Waveguide

Seals, Plastic

Cadilac Plastics & Chems., Detroit, Mich.
Chemplast, Inc., Wayne, N.J.
Cole-Flex Corp., W. Babylon, N.Y.
Dixon Corp., Bristol, R.I.
Lake Chemical Co., Chicago, Ill.
Paul, F.H. & Stein Bros., New York, N.Y.
Penn Fibre & Specialty, Phila., Pa.
Press-On Prods., Addison, Ill.
Rogers Corp., Rogers, Conn.
Zippertubing Co., Los Angeles, Calif.

Seals, Rubber

Adhesive Prods. Corp., Bronx, N.Y.
APM-Hexseal, Englewood, N.J.
Armstrong Cork Co., Lancaster, Pa.
Bacon Inds., Watertown, Mass.
Edwards High Vacuum, Grand Island, N.Y.
General Elec. Co., Waterford, N.Y.
Hardman Inc., Belleville, N.J.
Minnesota Rubber Co., Minneapolis, Minn.
Parker Seal Co., Culver City, Calif.
Paul, F.H. & Stein Bros., New York, N.Y.
Press-On Prods., Addison, Ill.
Rogers Corp., Rogers, Conn.
Uniroyal, Inc., New York, N.Y.

Seals, Rubber To Metal

Adhesive Prods. Corp., Bronx, N.Y.
APM-Hexseal, Englewood, N.J.
General Elec. Co., Waterford, N.Y.
Hardman Inc., Belleville, N.J.
High Voltage Engrg. Corp., Burlington, Mass.
Minnesota Rubber Co., Minneapolis, Minn.
Parker Seal Co., Culver City, Calif.
Rogers Corp., Rogers, Conn.
Vacuum Resch. Mfg., San Ramon, Cal.

Seals, Waveguide

Chomerics, Inc., Woburn, Mass.
Parker Seal Co., Culver City, Calif.
Systron-Donner Microwave Div., Van Nuys, Cal.
Waveline, Inc., W. Caldwell, N.J.

Search Unit, Magnetic Tape—See Tape Search Equipment

Self-Lubricating Materials—See Materials, Self-Lubricating

Selsyns—See Motors, Synchronous

Semiconductor Material—See Crystals, Semiconductor

Semiconductor Wafer Fabrication, Artwork (Precision)

Illumination Inds., Inc., Sunnyvale, Cal. Vol 2•682
Cal-Tex Semiconductor, Santa Clara, Cal.
Texas Instruments, Dallas, Tex.

Semiconductor Wafer Fabrication, Assembling (Packaging)

Cal-Tex Semiconductor, Santa Clara, Cal.
Texas Instruments, Dallas, Tex.
Wentworth Labs, Inc., Broadfield, Conn.

Semiconductor Wafer Fabrication, Designing (Topological)

Cal-Tex Semiconductor, Santa Clara, Cal.
Laser Technology, Inc., N. Hollywood, Calif.
Lithic Systems, Inc., Cupertino, Cal.
Materials Resch. Corp., Orangeburg, N.Y.
National Semiconductor, Santa Clara, Cal.
Precision Monolithics Inc., Santa Clara, Cal.
Texas Instruments, Dallas, Tex.

Semiconductor Wafer Fabrication, Maskmaking (Tooling)

Illumination Inds., Inc., Sunnyvale, Cal. Vol 2•682
Cal-Tex Semiconductor, Santa Clara, Cal.
Suffolk Etched Prods., Inc., Riverhead, N.Y.
Texas Instruments, Dallas, Tex.

Semiconductor Wafer Fabrication, Processing

Cal-Tex Semiconductor, Santa Clara, Cal.
Cincinnati Milacron, Lebanon, Ohio
Materials Resch. Corp., Orangeburg, N.Y.
National Beryllia Corp., Haskell, N.J.
Philadelphia Quartz Co., Phila., Pa.
Precision Monolithics Inc., Santa Clara, Cal.
Research Devices, Berkeley Heights, N.J.
Texas Instruments, Dallas, Tex.
Union Carbide, San Diego, Cal.
Varadyne Capacitors, Santa Monica, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Semiconductor Wafer Fabrication, Testing

Cal-Tex Semiconductor, Santa Clara, Cal.
Comaltest, Danbury, Conn.
Hacker Instrs., Inc., Fairfield, N.J.
Laser Technology, Inc., N. Hollywood, Calif.
Lithic Systems, Inc., Cupertino, Cal.
Materials Resch. Corp., Orangeburg, N.Y.
Precision Monolithics Inc., Santa Clara, Cal.
Research Devices, Berkeley Heights, N.J.
Teradyne, Inc., Boston, Mass.
Texas Instruments, Dallas, Tex.
Transitron Elctrn. Corp., Wakefield, Mass.
Varian Assocs., Vacuum Div., Palo Alto, Cal.
Wentworth Labs, Inc., Broadfield, Conn.

Semiconductors—See Diodes; Rectifiers; Transistors

Sensors—See Tranducer Listings

Sensors, Temperature—See Bolometers; Thermistors; Transducers

Services, Assembly & Fabrication

Amphenol Cadre Div., Endicott, N.Y. Vol 3•1091
Peerless Radio Corp., Lynbrook, N.Y. Vol 3•1089
ABA Industries, Inc., Pinellas Pk., Fla.
Abrams Instr., Lansing, Mich.
Accurate Elctrns. Corp., Elyria, Ohio
American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol Sams Div., Chatsworth, Cal.
Applied Control Co., Fairfield, N.J.
BECO, Inc., Salem, Va.
Bendix Corp, Towson, Md.
Bud Radio, Willoughby, Ohio
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Elctrn. Molding Corp., Woonsocket, R.I.
Elgin Elctrns. Inc., Waterford, Pa.
Estes Engrg. Co., Gardena, Calif.
GRM Corp., Medford, N.J.
Hybrid-Technology Corp., Arlington, Tex.
IEC Electronics Corp., E. Rochester, N.Y.
Inservco, Inc., La Grange, Ohio
Kates Scientific Instrs., Inc., Watertown, Mass.
Kinetron Corp., Asbury Park, N.J.
Mag-Con, Inc., New Brighton, Minn.
Matrix Engineering Corp., Gardena, Calif.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Midland Standard Inc., Elgin, Ill.
Mobil Elctrns., Inc., Anderson, Ind.
National Metal Crafters Inc., Phila., Pa.
New Era Products, Cleveland, Ohio
Norelcom Inds., Inc., Farmingdale, N.Y.
Pioneer/Instrumentation, Cleveland, Ohio
Plastiglide Mfg. Corp., Santa Monica, Cal.
Projects Unlimited, Inc., Dayton, Ohio
Proto Matic Co., Cincinnati,, Ohio
RCA Service Co., Camden, N.J.
3M Co., St. Paul, Minn.
Viking Inds., Inc., Chatsworth, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

Services, Backplane Wiring

Amphenol Cadre Div., Endicott, N.Y. Vol 3•647
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill. ..... Vol 3•647
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
IFE Div., E. Providence, R. I.
Malco, A Microdot Co., Inc., Chicago, Ill.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Vero Electronics, Inc., Hauppauge, N.Y.
Zonic Tech. Labs., Cincinnati, Ohio

Services, Calibration & Instrument Repair

AEL Communications Corp., Sub. of Amer. Elctrn. Labs. Inc., Lansdale, Pa.
American Elctrn. Labs., Inc., Lansdale, Pa.
BECO, Inc., Salem, Va.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Biddle, James G., Plymouth Meeting, Pa.
BLH Elctrns., Inc., Waltham, Mass.
Columbia Resch. Labs., Woodlyn, Pa.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electrical Testing Labs., Inc., New York, N.Y.
Flow Technology, Inc., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
Gen'l. Environments Corp., Morton Grove, Ill.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Honeywell, Minneapolis, Minn.
Honeywell, Denver, Colo.
Lear Siegler, Inc., Santa Monica, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Main Elctrns., Inc., Wichita, Kans.
Marlin Mfg. Corp., Cleveland, Ohio
Maury Microwave Corp., Cucamonga, Calif.
Milletron, Inc., Pittsburgh, Pa.
New Era Products, Cleveland, Ohio
N.Y. Testing Labs., Inc., Westbury, N.Y.
Ormond Inc., Santa Fe Springs, Cal.
Photo Resch. Corp., Burbank, Calif.
Pioneer/Instrumentation, Cleveland, Ohio
Polarad Elctrn. Instrs., Lake Success, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Service Co., Camden, N.J.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tektronix, Inc., Beaverton, Ore.
Thwing-Albert Instr. Co., Philadelphia, Pa.
Transducers, Inc., Whittier, Ca.
Tucker Electronics Co., Garland, Tex.
Victoreen Instr., Cleveland, Ohio
Westinghouse Elec. Corp., Industry Srvcs. Div., Pittsburgh, Pa.
Weston Instruments, Inc., Newark, N.J.
Westronics, Inc., Ft. Worth, Tex.

Services, Coating (All-Types)

Alpha Metals, Inc., Jersey City, N.J.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Atlantic Instrs. Corp., Watertown, Mass.
Chemplast, Inc., Wayne, N.J.
Collins Radio Co., Dallas, Tex.
Hardman Inc., Belleville, N.J.
High Voltage Engrg. Corp., Burlington, Mass.
Hughes Aircraft Co., Ground Systems Grp., Fullerton, Cal.
Materials Resch. Corp., Orangeburg, N.Y.
Metavac, Inc., Flushing, N.Y.
Mid-West Metal Prods., Inc., Kansas City, Kans.
National Beryllia Corp., Haskell, N.J.
Natvar Corp., Rahway, N.J.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Press-On Prods., Addison, Ill.
Sifco Metachemical, Cleveland, Ohio
Spectra-Physics, Inc., Mountain View, Calif.
Tempil Div., So. Plainfield, N.J.
Thin Film Services, Gile, Wisc.
Union Carbide, San Diego, Cal.
Union Carbide, Indpls., Ind.
Valpey Corp., Holliston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Services, Computer-Aided Design (CAD)

Design Automation, Inc., Lexington, Mass.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Scanbe Mfg. Corp., El Monte, Cal.

Services, Crimping

Amphenol Cadre Div., Endicott, N.Y.

Services Custom Molding, Plastics

Accurate Elctrns. Corp., Elyria, Ohio
Barker Prods. Co., Saugus, Mass.
Central Plastics Dists., Chicago, Ill.
Chemplast, Inc., Wayne, N.J.
Communications Technology Corp., Los Angeles, Cal.
Grayhill Moldtronics, Inc., Downers Grove, Ill.
GTE Sylvania Inc., Warren, Pa.

GTI Corp. (E), Pittsburgh, Pa.
Harbison Ind'l. Prods., Inc., Levittown, Pa.
Haysite Div., Erie, Pa.
IFE Div., E. Providence, R. I.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Kurz-Kasch Incorporated, Dayton, Ohio
Molex Inc., Lisle, Ill.
Nat'l. Wire & Cable, Los Angeles, Cal.
NVF Co., Yorklyn, Del.
Panta-Pak Packaging Div., Passaic, N.J.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Precision Paper Tube Co., Wheeling, Ill.
Projects Unlimited, Inc., Dayton, Ohio
Rostone Corp., Lafayette, Ind.
Stevens Prods., Inc., E. Orange, N.J.
Textool Prods., Inc., Irving, Tex.
Vichek Plastics Co., Middlefield, Ohio
Westinghouse Elec., W. Mifflin, Pa.
Whittaker Corp., Los Angeles, Cal.

Services, Decapsulation

Amphenol Cadre Div., Endicott, N.Y. Vol 3•1090
Amphenol Comps. Grp. Mktg., Oak Brook, Ill.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Amphenol Sams Div., Chatsworth, Cal.

Services, Electrical Measurement & Test

Amphenol Cadre Div., Endicott, N.Y. Vol 3•647
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill. ..... Vol 3•647
Cornell-Dubilier Elctrns., Newark, N.J. Vol 2•559
Hopkins Engrg., San Fernando, Cal. Vol 2•569
AEL Communications Corp., Sub. of Amer. Elctrn. Labs. Inc., Lansdale, Pa.
All-Tronics Inc., Westbury, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol Sams Div., Chatsworth, Cal.
Biddle, James G., Plymouth Meeting, Pa.
Comaltest, Danbury, Conn.
Dielectric Instr. Corp., Pittsburgh, Pa.
Dynamic Measurements Corp., Winchester, Ma.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Electrical Testing Labs., Inc., New York, N.Y.
Electro-Mechanics Co., Austin, Tex.
Erie Technological Prods. (EEM), Erie, Pa.
Esterline Angus Div., Indianapolis, Ind.
Gen'l. Environments Corp., Morton Grove, Ill.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Honeywell, Denver, Colo.
HRB-Singer, Inc., State College, Pa.
ITT Jennings, Vacuum Elctrn. Prods., San Jose, Cal.
LFE Corp., Waltham,, Mass.
Lockheed Elctrns. Co., Watchung, N.J.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Melpar, Falls Church, Va.
New Era Products, Cleveland, Ohio
Parks Laboratory Henry Francis, Seattle, Wash.
Proto Matic Co., Cincinnati,, Ohio
RCA Service Co., Camden, N.J.
Ross Engrg. Corp., Campbell, Cal.
Rowe Inds., Div., Toledo, Ohio
Sanders Assocs., Nashua, N.H.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Solar Elctrns. Co., Hollywood, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Tech-Etch, Inc., Hingham, Mass.
Technical Research & Mfg. Co., Manchester, N.H.
Teledyne Micronetics, San Diego, Calif.
Westinghouse Elec. Corp., Industry Srvcs. Div., Pittsburgh, Pa.

Services, Encapsulation

Airflyte Elctrns. Co., Bayonne, N.J.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol Cadre Div., Endicott, N.Y.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Amphenol Sams Div., Chatsworth, Cal.
Anchor Alloys, Inc., Brooklyn, N.Y.
Atlantic Instrs. Corp., Watertown, Mass.
Automation Services Div., Windsor, N. Y.
Bacon Inds., Watertown, Mass.
Beman Mfg., Inc., New Cumberland, Pa.
Bendix Corp., Sturbridge, Mass.
Cable Sys. & Assembly Co., Inc., Everett, Mass.
Conap, Inc., Allegany, N.Y.
Dynamic Measurements Corp., Winchester, Ma.
Eastern Delta Corp., Fair Lawn, N.J.
Electrical Plastics Corp., Long Branch, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
Emerson & Cuming, Inc., Canton, Mass.
Endicott Coil Co., Binghamton, N.Y.
Estes Engrg. Co., Gardena, Calif.
Grayhill Inc., LaGrange, Ill.
Hardman Inc., Belleville, N.J.
Hightemp Resins, Inc., Stamford, Conn.
Hughes Aircraft Co., Ground Systems Grp., Fullerton, Cal.
Kates Scientific Instrs., Inc., Watertown, Mass.
Manger Elec. Co., Inc., Stamford, Conn.
National Beryllia Corp., Haskell, N.J.
Paraplegics Mfg., Bensenville, Ill.
Projects Unlimited, Inc., Dayton, Ohio
Q.V.S., Inc., East Orange, N.J.
Robinson-Nugent, New Albany, Ind.
Rowe Inds., Div., Toledo, Ohio
Semicon Assoc., Inc., Lexington, Ky.
U.S. Elctrns., Long Branch, N.J.

Services, Environmental Testing

Abrams Instr., Lansing, Mich.
American Elctrn. Labs., Inc., Lansdale, Pa.
Atlas Electric Devices, Chicago, Ill.
Baganoff Assocs., Inc., St. Louis, Mo.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
Beukers Labs., Inc., Hauppauge, N.Y.
Burlington Opers. Div., Burlington, Mass.
Dow Chemical Co., Midland, Mich.
Electrical Testing Labs., Inc., New York, N.Y.
Electro-Mechanics Co., Austin, Tex.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Fairchild Space & Defense Sys., Syosset, N.Y.
Fisher Sci. Co., Pittsburgh, Pa.
General Elec., Baltimore, Md.
General Elec., Phila., Pa.
Gen'l. Environments Corp., Morton Grove, Ill.
Grayhill Inc., LaGrange, Ill.
GRM Corp., Medford, N.J.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Ground Sys. Grp., Fullerton, Cal.
Hughes Aircraft Co., Ground Systems Grp., Fullerton, Cal.
Kaman Sciences Corp., Colorado Springs, Colo.
L.A.B. Corp., Skaneateles, N.Y.
Lear Siegler, Inc., Elyria, Ohio
Lockheed Elctrns. Co., Watchung, N.J.
Melcor Elctrns. Corp., Farmingdale, N.Y.
N.Y. Testing Labs., Inc., Westbury, N.Y.
Q.V.S., Inc., East Orange, N.J.
RCA Service Co., Camden, N.J.
Rowe Inds., Div., Toledo, Ohio
Sloan Technology Corp., Santa Barbara, Calif.
Torwico Elctrns., Inc., Lakewood, N.J.
Trio-Tech, Inc. of Calif., Burbank, Calif.
Varian Assocs., Vacuum Div., Palo Alto, Cal.
Vibration Instrs. Co., Anaheim, Cal.
Webber Mfg. Co., Inc., Indianapolis, Ind.
Westinghouse Elec., Elmira, N.Y.
Westinghouse Elec. Corp., Industry Srvcs. Div., Pittsburgh, Pa.
Whittaker Corp., Los Angeles, Cal.

Services, Glass Blowing & Fabrication

Bendix Corp., Sturbridge, Mass.
Fredericks Co., Huntingdon Valley, Pa.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
Kahl Scientific Instr. Corp., El Cajon, Calif.
Latronics Corp., Latrobe, Pa.
Valpey Corp., Holliston, Mass.

Services, Hermetic Sealing

Alberox Corp., New Bedford, Mass.
Associate General Labs., Inc., Brookfield, Ill.
Basic Ceramics Inc., Hawthorne, N.J.
Bendix Corp., Sturbridge, Mass.
Bendix, Franklin, Ind.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Composite Microcircuits, Waltham, Mass.
Electrical Inds., Murray Hill, N.J.
Elctrn. Seals, Van Nuys, Cal.
Fansteel Inc., N Chicago, Ill.
Glass Beads Co., Latrobe, Pa.
GTI Corp. (E), Pittsburgh, Pa.
Gulton Inds., Newport Bch., Cal.
Hermetic Seal Corp., Rosemead, Cal.
Kinetron Corp., Asbury Park, N.J.
Latronics Corp., Latrobe, Pa.
Mann, David W. Co., Burlington, Mass.
Solid State Equipment Corp., Fort Washington, Pa.
Tekform Prods. Co., Anaheim, Cal.
Texas Instruments, Attleboro, Mass.

Services, High Vacuum

Bemco, Inc., Pacoima, Cal.
Eastern Delta Corp., Fair Lawn, N.J.
Evaporated Coatings, Inc., Huntingdon Valley, Pa.
Fredericks Co., Huntingdon Valley, Pa.
Gen'l. Environments Corp., Morton Grove, Ill.
High Voltage Engrg. Corp., Burlington, Mass.
Materials Resch. Corp., Orangeburg, N.Y.
Metavac, Inc., Flushing, N.Y.
N.Y. Testing Labs., Inc., Westbury, N.Y.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
Thin Film Services, Gile, Wisc.
Vacumetrics Inc., Waltham, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Services, Mask Making

Buckbee-Mears Co., St. Paul, Minn.
Conforming Matrix Corp., Toledo, Ohio
Mann, David W. Co., Burlington, Mass.
Photronic Labs., Danbury, Conn.
Press-On Prods., Addison, Ill.
Suffolk Etched Prods., Inc., Riverhead, N.Y.
Tech-Etch, Inc., Hingham, Mass.

Services, Metal Etching, Engraving

Buckbee-Mears Co., St. Paul, Minn.
Hamilton Technology, Inc., Lancaster, Pa.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Suffolk Etched Prods., Inc., Riverhead, N.Y.
Tech-Etch, Inc., Hingham, Mass.
Thin Film Services, Gile, Wisc.

Services, Metal Parts Fabrication

Abrams Instr., Lansing, Mich.
Acme Model Engrg. Co., Ridgefield, N.J.
American Elctrn. Labs., Inc., Lansdale, Pa.
Automation Services Div., Windsor, N. Y.
Bram Metallurgical-Chem. Co., Phila., Pa.
Buckbee-Mears Co., St. Paul, Minn.
Bud Radio, Willoughby, Ohio
Conklin Instr. Corp., Pleasant Valley, N.Y.
Electronic Enclosures, Los Angeles, Cal.
Evans, George Corp., Moline, Ill.
Falstrom Co., Passaic, N.J.
GTE Sylvania Inc., Warren, Pa.
GTI Corp. (E), Pittsburgh, Pa.
Hamilton Technology, Inc., Lancaster, Pa.
Hughes Aircraft Co., Ground Systems Grp., Fullerton, Cal.
Jade Corp., Huntingdon Valley, Pa.
Kates Scientific Instrs., Inc., Watertown, Mass.
Kinetron Corp., Asbury Park, N.J.
Lear Siegler, Inc., Elyria, Ohio
Luminator Div., Plano, Tex.
Matrix Engineering Corp., Gardena, Calif.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Micrite Metal Mfg., Inc., Canoga Park, Cal.
Mid-West Metal Prods., Inc., Kansas City, Kans.
Mobil Elctrns., Inc., Anderson, Ind.
Modpak, Waltham, Mass.
Nanotron Relay Co., Burbank, Cal.
National Metal Crafters Inc., Phila., Pa.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Semicon Assoc., Inc., Lexington, Ky.
Servotronics, Inc., Buffalo, N.Y.
South River Metal Prods. Co., South River, N.J.
South Shore Metal Prods., Inc., Farmingdale, N.Y.
Staver Co., Inc., Bay Shore, N.Y.
Suffolk Etched Prods., Inc., Riverhead, N.Y.
Titchener, E.H. & Co., Binghamton, N.Y.
W.L.S. Stamping Co., Cleveland, Ohio
Zenrad Controls Co., Santa Barbara, Ca.
Zero Mfg. Co., Burbank, Cal.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

Services, Metallizing (Including Electroforming)

Alberox Corp., New Bedford, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Basic Ceramics Inc., Hawthorne, N.J.
Buckbee-Mears Co., St. Paul, Minn.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Craig Sys. Corp., Lawrence, Mass.
Eastern Delta Corp., Fair Lawn, N.J.
Electro-Science Labs., Pennsauken, N. J.
Evaporated Coatings, Inc., Huntingdon Valley, Pa.
Fredericks Co., Huntingdon Valley, Pa.
Hermetic Seal Corp., Rosemead, Cal.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co., Ground Systems Grp., Fullerton, Cal.
Latronics Corp., Latrobe, Pa.
Materials Resch. Corp., Orangeburg, N.Y.
Metalized Ceramics, Providence, R.I.
Metavac, Inc., Flushing, N.Y.
Schweitzer, Peter J. Div., Lee, Mass.
Servometer Corp., Clifton, N.J.
Statek Corp., Orange, Cal.
Thin Film Services, Gile, Wisc.
Union Carbide, San Diego, Cal.
Union Carbide, Indpls., Ind.
Varian Assocs., Palo Alto, Cal.
Zenrad Controls Co., Santa Barbara, Ca.

Services, Molding

Amphenol Cadre Div., Endicott, N.Y. Vol 3•646
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill. ..... Vol 3•646
ITT Thermotech, Hopkins, Minn. Vol 3•1014,1015
Nat'l. Wire & Cable, Los Angeles, Cal. Vol 3•1406
Atlantic Optical Moulding Co., Dudley, Mass.
Automation Services Div., Windsor, N. Y.
Beman Mfg., Inc., New Cumberland, Pa.
Cable Sys. & Assembly Co., Inc., Everett, Mass.
Capsonic Group, Inc., Elgin, Ill.
Central Plastics Dists., Chicago, Ill.
Communications Technology Corp., Los Angeles, Cal.
Elctrn. Molding Corp., Woonsocket, R.I.
Grayhill Moldtronics, Inc., Downers Grove, Ill.
Hardman Inc., Belleville, N.J.
Hughes Aircraft Co., Ground Systems Grp., Fullerton, Cal.
Jewell Electrical Instrs., Manchester, N.H.
Kates Scientific Instrs., Inc., Watertown, Mass.
Minnesota Rubber Co., Minneapolis, Minn.
Molex Inc., Lisle, Ill.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Precision Paper Tube Co., Wheeling, Ill.
Projects Unlimited, Inc., Dayton, Ohio
Robinson-Nugent, New Albany, Ind.
Rostone Corp., Lafayette, Ind.
Skydyne A Brooks & Perkins Co., Port Jervis, N.Y.
Useco Div., Van Nuys, Cal.
Westinghouse Elec., W. Mifflin, Pa.
Westmoreland Plastics Co., Latrobe, Pa.

Services, Packaging
Composite Microcircuits, Waltham, Mass.
GTE Sylvania, Muncy, Pa.
Kates Scientific Instrs., Inc., Watertown, Mass.
Modpak, Waltham, Mass.
Solid State Equipment Corp., Fort Washington, Pa.
Zero Mfg. Co., Burbank, Cal.

Services, Plastics Fabrication
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Ace Plastic Co., Inc., Jamacia, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol Cadre Div., Endicott, N.Y.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Anchor Specialty Mfg., Teterboro, N.J.
Apahouser Corp. of N.E., Boston, Mass.
Aubin, A.E. Co., Glastonbury, Conn.
Bell Co., Inc., Trussville, Ala.
Budd Co., Bridgeport, Pa.
Cadilac Plastics & Chems., Detroit, Mich.
Central Plastics Dists., Chicago, Ill.
Chemplast, Inc., Wayne, N.J.
Comco Plastics, Inc., Richmond Hill, N.Y.
Communications Technology Corp., Los Angeles, Cal.
Conap, Inc., Allegany, N.Y.
Devco Engrg., W. Caldwell, N.J.
Dura Plastics N.Y., Inc., Westport, Conn.
Electronic Hardware Corp., Jamaica, N.Y.
Emerson & Cuming, Inc., Canton, Mass.
Estes Engrg. Co., Gardena, Calif.
Globe Plastics, Pomona, Cal.
Grayhill Inc., LaGrange, Ill.
Grayhill Moldtronics, Inc., Downers Grove, Ill.
GTE Sylvania Inc., Warren, Pa.
Harbison Ind'l. Prods., Inc., Levittown, Pa.
Hermes Plastics, Inc., New York, N.Y.
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Lear Siegler, Inc., Santa Monica, Calif.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Minnesota Rubber Co., Minneapolis, Minn.
Molex Inc., Lisle, Ill.
National Tel-Tronics, Meadville, Pa.
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NVF Co., Yorklyn, Del.
Panelgraphic Corp., Caldwell, N.J.
Parabam, Inc., Compton, Cal.
Photo Chemical Prods. Cal., Santa Monica, Cal.
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Projects Unlimited, Inc., Dayton, Ohio
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Reynolds Inds., Inc., Marina Del Rey, Cal.
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Kawecki Berylco Inds., Inc., New York, N.Y.
Materials Technology, Inc., Somerset, N.J.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Sifco Metachemical, Cleveland, Ohio
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Tucker Electronics Co., Garland, Tex.
Westronics, Inc., Ft. Worth, Tex.
Wiltron Co., Palo Alto, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

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Acme Model Engrg. Co., Ridgefield, N.J.
Allied Systems Corp., Greensboro, N.C.
American Elctrn. Labs., Inc., Lansdale, Pa.
Apahouser Corp. of N.E., Boston, Mass.
BECO, Inc., Salem, Va.
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Decalcraft Corp., Hatfield, Pa.
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Dytronics Co., Columbus, Ohio
Gen'l. Environments Corp., Morton Grove, Ill.
N.Y. Testing Labs., Inc., Westbury, N.Y.
Teledyne Geotech, Dallas, Tex.
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Services, Waveform Analysis
Federal Sci. Corp., New York, N.Y.
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General Microwave Corp., Farmingdale, N.Y.
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Keithley Instrs., Inc., Cleveland, Ohio
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Microwave Development Labs., Inc., Needham Hgts., Mass.
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Wall-Lenk Mfg. Co., Kinston, N.C. Vol 3•1243
Allied Elctrns., Chicago, Ill.
Alpha Metals, Inc., Jersey City, N.J.
Anchor Alloys, Inc., Brooklyn, N.Y.
Bow Solder Products, Newark, N.J.
Chemetron Corp., Chicago, Ill.
Chemical Etching Equip. & Supply, Alexandria, Va.
Chemtronics, Inc., Brooklyn, N.Y.
Circon Corp., Santa Barbara, Ca.
CRM, Div. Consolidated Refining Co., Mamaroneck, N.Y.
Dunton, M.W. Co., Providence, R.I.
Electro Mats. Corp. Amer., Mamaroneck, N.Y.
Electro-Science Labs., Pennsauken, N. J.
Gardiner Solder Co., Chicago, Ill.
Keller, Hugo P., Inc., New York, N.Y.
Kester Solder Co, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Multicore Sales Corp., Westbury, N.Y.
NL Inds., Inc., Metal Div., New York, N.Y.
Norelcom Inds., Inc., Farmingdale, N.Y.

Solder Pots

Hexacon Elec. Co., Roselle Park, N.J. Vol 3•1239
Allied Elctrns., Chicago, Ill.
American Elec. Heater, Detroit, Mich.
Anchor Alloys, Inc., Brooklyn, N.Y.
Caig Labs., Inc., Westbury, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
Edsyn, Inc., Van Nuys, Cal.
Electric Soldering Iron Co., Inc., Deep River, Conn.
Electrovert, Mt. Vernon, N.Y.
Freudenberg, B., Inc., New York, N.Y.
Gardiner Solder Co., Chicago, Ill.
Hollis Engrg., Inc., Nashua, N.H.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Precision Elec. Co., Kezar Falls, Me.
Sta-Warm Elec. Co., Ravenna, Ohio
Techni-Tool, Inc., Philadelphia, Pa.
Zeva Elec. Corp., Hanover, N.J.

Solder Preforms (Including Rings)-Also See Preforms,Precious Metal

CRM, Div. Consolidated Refining Co., Mamaroneck, N.Y. ..... Vol 3•1092
Alpha Metals, Inc., Jersey City, N.J.
Anchor Alloys, Inc., Brooklyn, N.Y.
Bow Solder Products, Newark, N.J.
Circon Corp., Santa Barbara, Ca.
Gardiner Solder Co., Chicago, Ill.
Goldsmith Precious Metals Div., Chicago, Ill.
Kester Solder Co, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Multicore Sales Corp., Westbury, N.Y.
NL Inds., Inc., Metal Div., New York, N.Y.

Soldering Accessories

Caig Labs., Inc., Westbury, N.Y. Vol 4•324,558*
Enterprise Development Corp., Indianapolis, Ind. ..... Vol 3•1236
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 3•1237
Hexacon Elec. Co., Roselle Park, N.J. Vol 3•1238,1239
Wall-Lenk Mfg. Co., Kinston, N.C. Vol 3•1243
Air-O-Tronics Prods., Morrisville, N.Y.
Air-Vac Engrg. Co., Milford, Conn.
Alpha Metals, Inc., Jersey City, N.J.
American Elec. Heater, Detroit, Mich.
Anchor Alloys, Inc., Brooklyn, N.Y.
Chemetron Corp., Chicago, Ill.
Circon Corp., Santa Barbara, Ca.
Edsyn, Inc., Van Nuys, Cal.
Electric Soldering Iron Co., Inc., Deep River, Conn.
Engineering & Elctrn. Devices, Inc., Los Angeles, Calif.
Erikson Specialized Tool Co., Pico-Rivera, Cal.
GC Electronics, Rockford, Ill.
General Electric, Shelbyville, Ind.
Hughes Aircraft Co., Welding Equip./Ind'l. Prods. Div., Oceanside, Calif.
Hunter Tools, El Monte, Calif
Kester Solder Co, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Matrix Engineering Corp., Gardena, Calif.
Miller, L.C. Co., Monterey Park, Calif.
Precision Elec. Co., Kezar Falls, Me.
Superior Flux & Mfg., Cleveland, Ohio
Techni-Tool, Inc., Philadelphia, Pa.
Telvac Instr. Co., Van Nuys, Cal.
Titchener, E.H. & Co., Binghamton, N.Y.
UNGAR, Compton, Calif.
Union Carbide, Linde Div., New York, N. Y.
Zeva Elec. Corp., Hanover, N.J.

Soldering Equip., Induction Heating

General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 3•1237
Cycle-Dyne, Inc., Jamaica, N.Y.
Electrovert, Mt. Vernon, N.Y.
Gardiner Solder Co., Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Miller, L.C. Co., Monterey Park, Calif.
Taylor-Winfield Corp., Warren, Ohio
Techni-Tool, Inc., Philadelphia, Pa.

Soldering Equip., Printed Circuit

Caig Labs., Inc., Westbury, N.Y. Vol 4•558*
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American Elec. Heater, Detroit, Mich.
Anchor Alloys, Inc., Brooklyn, N.Y.
Atlantic Instrs. Corp., Watertown, Mass.
Chemical Etching Equip. & Supply, Alexandria, Va.
Circon Corp., Santa Barbara, Ca.
Electrovert, Mt. Vernon, N.Y.
Gardiner Solder Co., Chicago, Ill.
Hexacon Elec. Co., Roselle Park, N.J.
Hollis Engrg., Inc., Nashua, N.H.
Hughes Aircraft Co., Welding Equip./Ind'l. Prods. Div., Oceanside, Calif.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Matrix Engineering Corp., Gardena, Calif.
OAL Assocs., Inc., Westbury, N.Y.
Precision Elec. Co., Kezar Falls, Me.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Selectrons, Ltd., New York, N.Y.
Superior Flux & Mfg., Cleveland, Ohio
Techni-Tool, Inc., Philadelphia, Pa.
Tech. Devices Co., Culver City, Calif.
UNGAR, Compton, Calif.
Zeva Elec. Corp., Hanover, N.J.

Soldering Equip., Reflow

Atlantic Instrs. Corp., Watertown, Mass.
Casso-Solar Inc., Kew Gardens, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
Circon Corp., Santa Barbara, Ca.
Electrovert, Mt. Vernon, N.Y.
Ewald Instrs. Corp., Kent, Conn.
Hollis Engrg., Inc., Nashua, N.H.
Hughes Aircraft Co., Welding Equip./Ind'l. Prods. Div., Oceanside, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
MacDonald & Co., Glendale, Calif.
OAL Assocs., Inc., Westbury, N.Y.
Precision Elec. Co., Kezar Falls, Me.

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General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 3•1237
American Elec. Heater, Detroit, Mich.
Americon Microwave Inds., Inc., Waltham, Mass.
Ewald Instrs. Corp., Kent, Conn.
Hughes Aircraft Co., Welding Equip./Ind'l. Prods. Div., Oceanside, Calif.
Ideal Industries, Inc., Sycamore, Ill.
MacDonald & Co., Glendale, Calif.
Solid State Equipment Corp., Fort Washington, Pa.
Taylor-Winfield Corp., Warren, Ohio
Techni-Tool, Inc., Philadelphia, Pa.
Wall-Lenk Mfg. Co., Kinston, N.C.

Soldering Systems, Temperature Controlled

Caig Labs., Inc., Westbury, N.Y. Vol 4•558*
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Anchor Alloys, Inc., Brooklyn, N.Y.
Chemical Etching Equip. & Supply, Alexandria, Va.
Circon Corp., Santa Barbara, Ca.
Cooper Group, Apex, N.C.
Edsyn, Inc., Van Nuys, Cal.
Electrovert, Mt. Vernon, N.Y.
Gardiner Solder Co., Chicago, Ill.
General Electric, Shelbyville, Ind.
Hollis Engrg., Inc., Nashua, N.H.
MacDonald & Co., Glendale, Calif.
OAL Assocs., Inc., Westbury, N.Y.
Tech. Devices Co., Culver City, Calif.

Soldering Equip., Ultrasonic

Enterprise Development Corp., Indianapolis, Ind. ..... Vol 3•1236
Anchor Alloys, Inc., Brooklyn, N.Y.
Electrovert, Mt. Vernon, N.Y.
Norelcom Inds., Inc., Farmingdale, N.Y.
Sonobond Corp., West Chester, Pa.

Soldering Flux—See Flux, Brazing & Soldering Materials

Soldering Guns, Irons & Desoldering Tools

GC Electronics, Rockford, Ill. .. Vol 3•679
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 3•1237
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Circon Corp., Santa Barbara, Ca.
Cooper Group, Apex, N.C.
Edsyn, Inc., Van Nuys, Cal.
Electric Soldering Iron Co., Inc., Deep River, Conn.
Enterprise Development Corp., Indianapolis, Ind.
Gardiner Solder Co., Chicago, Ill.
General Electric, Shelbyville, Ind.
Hollis Engrg., Inc., Nashua, N.H.
Hunter Tools, El Monte, Calif
MacDonald & Co., Glendale, Calif.
Precision Elec. Co., Kezar Falls, Me.
Solder Removal Co., Covina, Cal.
Union Carbide, Linde Div., New York, N. Y.
Wen Prods., Inc., Chicago, Ill.
Zeva Elec. Corp., Hanover, N.J.

Solenoid Drivers, Solid-State

Artisan Elctrns. Corp., Parsippany, N.J.
Coil Co. of Amer., Northvale, N.J.
Controlcraft Corp., West Chicago, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Fork Standards, W. Chicago, Ill.
Guardian California, Culver City, Cal.
Ledex, Inc., Dayton, Ohio
Tech Serv., Inc., Fogelsville, Pa.
Triac Elctrn. Sys., Forest Hills, N. Y.
Voltex Co., Inc., Farmingdale, N.Y.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Solenoids, Linear

Guardian Elec. Mfg. Co., Chicago, Ill. Vol 2•768-773
Hi-G, Windsor Locks, Conn. .... Vol 2•785
Ledex, Inc., Dayton, Ohio ..... Vol 2•652
Liberty Controls, Inc., Shorewood, Ill. Vol 2•813-815
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Allen-Bradley Co., Milwaukee, Wisc.
American Zettler, Irvine, Ca.
Artisan Elctrns. Corp., Parsippany, N.J.
Barber Corp., Waynesville, Ohio
Bicron Elctrns. Co., Canaan, Conn.
Coil Co. of Amer., Northvale, N.J.
Component Specialties, Temple City, Cal.
Delevan Div., Coil Prods., E. Aurora, N.Y.
Deltrol Controls, Milwaukee, Wisc.
Dormeyer Inds., Chicago, Ill.
Electro-Mechanisms, Inc., Azusa, Cal.
Endicott Coil Co., Binghamton, N.Y.
General Valve Corp., E. Hanover, N.J.
Hartman Electrical Mfg., Mansfield, Ohio
IMC Magnetics Corp., Westbury, N.Y.
IMC Magnetics Corp., Rochester, N.H.
IMC Magnetics Corp., Maywood, Cal.
Ingraham Inds., Controls Div., Elizabethtown, Ky.
James Elctrns., Inc., Chicago, Ill.
Lisk, G.W. Co., Clifton Springs, N.Y.
Mark Specialties, Costa Mesa, Cal.
Meltronics Inc., Leeds, Ala.
Omega Electric, Chicago, Ill.
Servotronics, Inc., Buffalo, N.Y.
Synchro-Start Prods., Skokie, Ill.
Triac Elctrn. Sys., Forest Hills, N. Y.
Universal Relay Corp., New York, N.Y.
U.S. Elctrns., Long Branch, N.J.

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Oak Inds. Inc., Crystal Lake, Ill. Vol 2•1125
Barber Corp., Waynesville, Ohio
Clifton Precision, Clifton Hgts., Pa.
Daco Instr. Co., Milford, Conn.
IMC Magnetics Corp., Maywood, Cal.
Lisk, G.W. Co., Clifton Springs, N.Y.
Universal Relay Corp., New York, N.Y.

Solvents—See Cleaners & Solvents

Sonic Analyzers—See Analyzers, Sonic & Subsonic

Sound Absorbing Materials

Anchor Alloys, Inc., Brooklyn, N.Y.
Dow Chemical Co., Midland, Mich.
3M Co., St. Paul, Minn.
Tracor, Inc., Austin, Tex.
Zippertubing Co., Los Angeles, Calif.

Sound Level Indicators—See Meters, Audio Level

Sound Recording Equip.—See Microphones; Recorders; etc.

Sources, Light, Radioactive

3M Co., St. Paul, Minn.

Sources, Light, Stroboscopic —See Lights, Stroboscopic Source

Spacers

Bivar, Inc., Santa Ana, Cal. Vol 3•1070,1071; Vol 4•311*
Concord Elctrns., New York, N.Y. Vol 3•655
GC Electronics, Rockford, Ill. .. Vol 3•679
Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•820,821
Thermalloy Co., Inc., Dallas, Tex. Vol 2•945
Transcon Mfg. Co., Dallas, Tex. Vol 3•1412
Waldom Elctrns., Inc., Chicago, Ill. Vol 3•1070-1073; Vol 4•311*
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Control Inds. Inc., Inwood, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Delbert Blinn. Co., Pomona, Calif.
Edal Inds., Inc., E. Haven, Conn.
Elctrn. Molding Corp., Woonsocket, R.I.
Fischer Special Mfg. Co., Cincinnati, Ohio
General Mfg. Co., Glendale, Calif.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Johnson E. F. Co., Waseca, Minn.
Keystone Elctrns. Corp., New York, N.Y.
National Tel-Tronics, Meadville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
PIC Design Division, Ridgefield, Conn.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Plessey Ceramic Div., Frenchtown, N.J.
Positronic Inds., Springfield, Mo.
Resdel Corp., Rio Grande, N.J.
Sealectro Corp., Mamaroneck, N.Y.
Sterling Instr., New Hyde Pk., NY
3M Co., St. Paul, Minn.
Useco Div., Van Nuys, Cal.

Vero Electronics, Inc., Hauppauge, N.Y.
Weckesser Co., Inc., Chicago, Ill.

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Kilovolt Corp., Hackensack, N.J. Vol 1•757
Radio Materials Co., Chicago, Ill. Vol 3•494
Ross Engrg. Corp., Campbell, Cal. Vol 2•871
Signalite, Neptune, N.J. Vol 2•1134,1135
Amperex Electronic Corp., Hicksville, N.Y.
Bel Fuse, Inc., Jersey City, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Dale Elctrns., Inc., Yankton, S.D.
EG & G, Inc., Salem, Mass.
Electrons Co., Fairfield, N.J.
Energy Systems, Palo Alto, Cal.
General Lab. Assocs., Norwich, N.Y.
ITT Electron Tube, Easton, Pa.
Joslyn Elctrn. Sys., Goleta, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Megavolt, Inc., New York, N.Y.
Murata Mfg. Co. Ltd., Kyoto, Japan
Raytheon Co., Quincy, Mass.
Tobe Deutschmann Labs., Inc., Canton, Mass.
Varian Assocs., Palo Alto, Cal.
Victoreen Instr., Cleveland, Ohio

Speaker Drivers—See Drivers, Speaker

Speaker Systems

CTS Corp, Elkhart, Ind..... Vol 1•310,311
Altec Div., Anaheim, Calif.
Amperex Electronic Corp., Hicksville, N.Y.
Argos Prods. Co., Inc., Genoa, Ill.
Atlas Sound Div., Parsippany, N.J.
Bell P/A Prods. Corp., Columbus, Ohio
Bogen Div., Paramus, N.J.
Collins Radio Co., Dallas, Tex.
Dukane Corp., St. Charles, Ill.
Dynaco, Inc., Philadelphia, Pa.
Electro-Voice, Inc., Buchanan, Mich.
Electronic Resch. Assocs., Moonachie, N.J.
Era Acoustics, Moonachie, N.J.
Executone, Inc., Long Island City, N.Y.
Jensen Sound Labs., Schiller Park, Ill.
Knowles Elctrns., Inc., Franklin Park, Ill.
Magitran Co., Moonachie, N.J.
Mobil Elctrns., Inc., Anderson, Ind.
Oaktron Inds., Monroe, Wisc.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.
University Sound, Anaheim, Cal.
Utah Elctrns., Huntington, Ind.
Webster Elec. Co., Inc., Racine, Wisc.

Speakers, Dynamic

Amperex Electronic Corp., Hicksville, N.Y. ..... Vol 1•308
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Atlas Sound Div., Parsippany, N.J.
Components Specialties, Freeport, N.Y.
Electro-Voice, Inc., Buchanan, Mich.
Era Acoustics, Moonachie, N.J.
Gotham Audio Corp., New York, N.Y.
Jensen Sound Labs., Schiller Park, Ill.
Magitran Co., Moonachie, N.J.
National Tel-Tronics, Meadville, Pa.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Rola-Jenson Div./Pemcor, Inc., Cleveland, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Utah Elctrns., Huntington, Ind.

Speakers, Explosion & Flame Proof

Atlas Sound Div., Parsippany, N.J.
Electronic Resch. Assocs., Moonachie, N.J.
Executone, Inc., Long Island City, N.Y.
Oaktron Inds., Monroe, Wisc.
University Sound, Anaheim, Cal.

Speakers, Horn

Allied Elctrns., Chicago, Ill.
Altec Div., Anaheim, Calif.
Atlas Sound Div., Parsippany, N.J.
Bogen Div., Paramus, N.J.
Components Specialties, Freeport, N.Y.
Dukane Corp., St. Charles, Ill.
Electro-Voice, Inc., Buchanan, Mich.
Electronic Resch. Assocs., Moonachie, N.J.
Executone, Inc., Long Island City, N.Y.
Jensen Sound Labs., Schiller Park, Ill.
Rola-Jenson Div./Pemcor, Inc., Cleveland, Ohio
Shigoto Inds., Ltd., New York, N.Y.
University Sound, Anaheim, Cal.
Utah Elctrns., Huntington, Ind.

Speakers, Pillow

Components Specialties, Freeport, N.Y.
Saxton Prods., Congers, N.Y.

Speakers, Submergence-Proof

Electronic Resch. Assocs., Moonachie, N.J.
Era Acoustics, Moonachie, N.J.
Magitran Co., Moonachie, N.J.
Shigoto Inds., Ltd., New York, N.Y.
University Sound, Anaheim, Cal.

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Atlas Sound Div., Parsippany, N.J.
Bogen Div., Paramus, N.J.
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Dukane Corp., St. Charles, Ill.
Electro-Voice, Inc., Buchanan, Mich.
Electronic Resch. Assocs., Moonachie, N.J.
Era Acoustics, Moonachie, N.J.
Executone, Inc., Long Island City, N.Y.
Jensen Sound Labs., Schiller Park, Ill.
Magitran Co., Moonachie, N.J.
RCA, Mobile Communications Sys., Meadow Lands, Pa.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.
University Sound, Anaheim, Cal.
Utah Elctrns., Huntington, Ind.

Spectrometers

Coleman Instr. Div., Oak Brook, Ill.
Edwards High Vacuum, Grand Island, N.Y.
Vacumetrics Inc., Waltham, Mass.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Spectrum Analyzers—See Analyzers, Spectrum

Speed Drives, Motor—See Controls, Motor Speed

Spiral Wrap—See Tubing, Spiral Wrap

Splicers, Coaxial Cable

Amp Inc., Harrisburg, Pa.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Communications Technology Corp., Los Angeles, Cal.
Jonard Inds. Corp., Bronx, N.Y.
Phelps Dodge Comm., North Haven, Conn.
Sealectro Corp., Mamaroneck, N.Y.
Thomas & Betts Co., Elizabeth, N.J.

Splicers, Wire (Including Butt & Cap Types)

ETC, Div. ITT, Cleveland, Ohio Vol 3•664
Panduit Corp., Tinley Pk., Ill. Vol 3•1409; Vol 4•571*
Amp Inc., Harrisburg, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Burndy Corp., Norwalk, Conn.
Communications Technology Corp., Los Angeles, Cal.
Jonard Inds. Corp., Bronx, N.Y.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Sonobond Corp., West Chester, Pa.
Thomas & Betts Co., Elizabeth, N.J.
3M Co., St. Paul, Minn.
Waldom Elctrns., Inc., Chicago, Ill.

Splicing Equipment, Magnetic Tape

Ampex Corp., Redwood City, Calif.
Communications Technology Corp., Los Angeles, Cal.
GC Electronics, Rockford, Ill.
Jonard Inds. Corp., Bronx, N.Y.
Robins Ind's. Corp., Consumer Products Div., Commack, N.Y.
3M Co., St. Paul, Minn.

Splicing Equipment, Paper Tape

Brady, W.H. Co., Milwaukee, Wisc.
Data Specialties Inc., Highland Park, Ill.
Jonard Inds. Corp., Bronx, N.Y.

Spoolers, Punched Tape—See Readers, Punched Tape

Springs (All Types)

Instrument Specialties, Little Falls, N.J. Vol 3•1016,1017
Acme Model Engrg. Co., Ridgefield, N.J.
Amersil, Inc., Hillside, N.J.
Bram Metallurgical-Chem. Co., Phila., Pa.
Chatillon John & Sons, Kew Gardens, N.Y.
Dzus Fastener Co., Inc., West Islip, N.Y.
Eaton Corp., Engired. Fasteners Div., Cleveland, Ohio
GC Electronics, Rockford, Ill.
Helical Prods. Co., Inc., Hermosa Beach, Cal.
Helix Spring Corp., Long Island City, N.Y.
Hunter Spring, Hatfield, Pa.
PIC Design Division, Ridgefield,, Conn.
Potter & Brumfield, Princeton, Ind.
Suffolk Etched Prods., Inc., Riverhead, N.Y.
Templeman, D.R. Co., Plainville, Conn.

Sputtering Equipment

CCA Elctrns. Corp., Gloucester, N.J.
Edwards High Vacuum, Grand Island, N.Y.
High Voltage Engrg. Corp., Burlington, Mass.
Inficon Inc., E. Syracuse, N.Y.
Lepel High Frequency Labs., Maspeth, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Perkin-Elmer Ultek Inc., Palo Alto, Calif.
Sloan Technology Corp., Santa Barbara, Calif.
Thin Film Services, Gile, Wisc.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Stabilizers, Line Impedance

Geo Space, Houston, Tex.
Georator Corporation, Manassas, Va.
NH Research, Inc., Santa Ana, Calif.
Power-Matic, Inc., San Diego, Cal.
Sola Elec. Div., Elk Grove Village, Ill.

Stabilizers, Voltage—See Regulators & Stabilizers, Voltage-Also See Transformers, Voltage Regulating

Stalos—See Oscillators, Microwave

Stamped Circuit Boards—See Circuit Boards, Stamped

Standards, Atomic Beam

Frequency Elctrns., New Hyde Pk., N.Y.
Tracor, Inc., Austin, Tex.

Standards, Capacitance

ARCO Elctrns., Inc., Great Neck, N.Y.
Beckman Instrs., Cedar Grove, N.J.
Boonton Elctrns., Parsippany, N.J.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Electro Sci. Inds., Portland, Ore.
Elctrn. Assocs., W. Long Branch, N.J.
General Radio Co., Concord, Mass.
Guildline Instrs., Inc., Larchmont, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Rohde & Schwarz Sls., Passaic, N.J.

Standards, Current

Electronic Dev. Corp., Boston, Mass. Vol 1•428,429
RFL Inds., Instr. Div., Boonton, N.J. Vol 1•497
CEA, San Luis Obispo, Cal.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
General Resistance, Inc., Mt. Vernon, N.Y.
Glentronics, Div. Sawyer Inds., Glendora, Cal.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Holt Instr. Labs., Oconto, Wisc.
Julie Research Lab., New York, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Optimation, Inc., Chatsworth, Cal.
Sawyer Inds., Arcadia, Cal.
Weston Instruments, Inc., Newark, N.J.

Standards, Delay Line

Kappa Networks, Inc., Carteret, N.J.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.

Standards, Frequency

Greenray Inds., Inc., Mechanicsburg, Pa. ..... Vol 2•415
Monitor Prods., S. Pasadena, Cal. Vol 2•430
Accutronics, Geneva, Ill.
Advanced Energy Conversion, Belmont, Cal.
American Time Products, Woodside, N.Y.
AMF Electical Prods., Alexandria, Va.
Austron, Inc., Austin, Tex.
Beukers Labs., Inc., Hauppauge, N.Y.
Bramco Controls, Piqua, Ohio
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Connor-Winfield Corp., West Chicago, Ill.
Cox & Co., Inc., New York, N.Y.
CTS Corp, Elkhart, Ind.
Esterline Angus Div., Indianapolis, Ind.
Fairchild Space & Defense Sys., Syosset, N.Y.
Ferwalt, W.H., Inc., Lapwai, Idaho
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Fork Standards, W. Chicago, Ill.
Frequency Elctrns., New Hyde Pk., N.Y.
Ind'l. Test Equip., Clifton, NJ
ITT Mackay Marine, Elizabeth, N.J.
Meloy Laboratories Inc., Springfield, Va.
Microlab/FXR, Livingston, N.J.
NH Research, Inc., Santa Ana, Calif.
Ovenaire, Charlottesville, Va.
Palomar Engrs., Escondido, Cal.
Philamon, Inc., Westbury, N.Y.
PPM, Inc., Bedford, Ohio
Riverbank Labs., Geneva, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
T-F Electronics, Inc., Austin, Tex.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tracor, Inc., Austin, Tex.
Vectron Labs., Inc., Norwalk, Conn.

Standards, Inductance

Dietz Design, Inc., Belton, Mo.
General Radio Co., Concord, Mass.
North Hills Elctrns., Inc., Glen Cove, N.Y.
RFL Inds., Instr. Div., Boonton, N.J.

Standards, Noise

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Quan-Tech, Whippany, N.J.

Standards, Phase

Dytronics Co., Columbus, Ohio Vol 1•422
Dranetz Engrg. Labs., So. Plainfield, N.J.
Ind'l. Test Equip., Clifton, NJ
North Atlantic Inds., Plainview, N.Y.
Optimation, Inc., Chatsworth, Cal.
Theta Instr. Corp., Fairfield, N.J.

Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.

Standards, Resistance

Biddle, James G., Plymouth Meeting, Pa. ..... Vol 1•399
Beckman Instrs., Cedar Grove, N.J.
Electro Sci. Inds., Portland, Ore.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
General Resistance, Inc., Mt. Vernon, N.Y.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Leeds & Northrup Corp., No. Wales, Pa.
Penn Airborne Prods., Southampton, Pa.
Precision Resistor Co., Hillside, N.J.
RFL Inds., Instr. Div., Boonton, N.J.
Shallcross, Selma, N.C.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Thermal Sys., Los Angeles, Cal.
Vishay Resistor Prod. Div., Malvern, Pa.

Standards, Synchro & Resolver

Astrosystems, Inc., Lake Success, N.Y.
C & A Products, Inc., Woodside, N. Y.
North Atlantic Inds., Plainview, N.Y.
Singer Co., Little Falls, N.J.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Theta Instr. Corp., Fairfield, N.J.

Standards, Temperature

Barnes Engrg. Co., Stamford, Conn.
Cox & Co., Inc., New York, N.Y.
Fisher Sci. Co., Pittsburgh, Pa.
Guildline Instrs., Inc., Larchmont, N.Y.
H-B Instr. Co., Phila., Pa.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Harrel, Inc., E. Norwalk, Conn.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Oven Industries, Inc., Mechanicsburg, Pa.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Riverbank Labs., Geneva, Ill.
Rosemount Inc., Minneapolis, Minn.
Trans-Sonics, Inc., Lexington, Mass.

Standards, Time

Chrono-log Corp., Broomall, Pa. Vol 1•333
American Time Products, Woodside, N.Y.
Austron, Inc., Austin, Tex.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Cognitronics Corp., Stamford, Conn.
Connor-Winfield Corp., West Chicago, Ill.
Ferwalt, W.H., Inc., Lapwai, Idaho
Fork Standards, W. Chicago, Ill.
Hathaway Instruments, Inc., Denver, Colo.
Phelps Dodge Comm., North Haven, Conn.
PPM, Inc., Bedford, Ohio
Riverbank Labs., Geneva, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Tracor, Inc., Austin, Tex.

Standards, Voltage

Connor-Winfield Corp., West Chicago, Ill. ..... Vol 2•401
Electronic Dev. Corp., Boston, Mass. Vol 1•428,429
Greenray Inds., Inc., Mechanicsburg, Pa. ..... Vol 2•415
Julie Research Lab., New York, N.Y. Vol 1•469
RFL Inds., Instr. Div., Boonton, N.J. Vol 1•497
AMF Electical Prods., Alexandria, Va.
AUL Instrs., Inc., Flushng, N.Y.
Ballantine Laboratories, Inc., Boonton,, N. J.
Beckman Instrs., (AISSD), Fullerton, Cal.
Beckman Instrs., Cedar Grove, N.J.
Biddle, James G., Plymouth Meeting, Pa.
CEA, San Luis Obispo, Cal.
Computer Diode, Fair Lawn, N.J.
Dynage, Bloomfield, Conn.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Esterline Angus Div., Indianapolis, Ind.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Fork Standards, W. Chicago, Ill.
General Microwave Corp., Farmingdale, N.Y.
General Rand Corp., Edison, N.J.
General Resistance, Inc., Mt. Vernon, N.Y.
Glentronics, Div. Sawyer Inds., Glendora, Cal.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Holt Instr. Labs., Oconto, Wisc.
Ind'l. Test Equip., Clifton, NJ
Kepco, Inc., Flushing, N.Y.
Kilovolt Corp., Hackensack, N.J.
Megavolt, Inc., New York, N.Y.
NH Research, Inc., Santa Ana, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Optimation, Inc., Chatsworth, Cal.
Power Designs, Westbury, N.Y.
Precision Standards Corp., Santa Ana, Cal.
Sawyer Inds., Arcadia, Cal.
Simpson Elec. Co., Chicago, Ill.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Velonex, Santa Clara, Calif.
Weston Instruments, Inc., Newark, N.J.
Zi-Tech Div., Palo Alto, Cal.

Standards, Voltage Ratio

Collins, G.L. Corp., Long Beach, Calif.
Electro Sci. Inds., Portland, Ore.
General Resistance, Inc., Mt. Vernon, N.Y.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Julie Research Lab., New York, N.Y.
North Atlantic Inds., Plainview, N.Y.
RFL Inds., Instr. Div., Boonton, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Wiltron Co., Palo Alto, Calif.

Standing Wave Detectors—See Detectors, Standing Wave

Standoffs—See Bushings, Glass, Plastic, Metal, etc.

Stators, Motor & Generator—See Motor & Generator Armatures,Rotors, Stators

—Status Displays -- See Displays, Status

Stools—See Benches, Consoles, Stools, Tables (Lab & Shop)

Stops, Limit—See Limit Stops, Mechanical

Staighteners, Tube Pin—See Pin Straighteners, Tube

Strain Gauges—See Gauges, Strain

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Strain Reliefs, Cable & Wire

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Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•812
Amphenol Cadre Div., Endicott, N.Y.
Amphenol Ind'l. Div., Chicago, Ill.
Eaton Corp., Engired. Fasteners Div., Cleveland, Ohio
GC Electronics, Rockford, Ill.
Heyman Mfg. Co., Kenilworth, N.J.
Molex Inc., Lisle, Ill.
Richco Plastic Co., Chicago, Ill.
Rowe Inds., Div., Toledo, Ohio
Sjoberg, C. & Son, Inc., Cranston, R.I.
Thomas & Betts Co., Elizabeth, N.J.
Transcon Mfg. Co., Dallas, Tex.
Waldom Elctrns., Inc., Chicago, Ill.
Zippertubing Co., Los Angeles, Calif.

Stretchers, Microwave—See Microwave Line Stretchers

Strip-Line Components, Microwave

Aertech Inds., Sunnyvale, Calif.
Airtron, Morris Plains, N.J.
Alford Mfg. Co., Winchester, Mass.
American Tech. Ceramics, Huntington Sta., N.Y.
Americon Microwave Inds., Inc., Waltham, Mass.
Anaren Microwave, Inc., Syracuse, N.Y.
Arra Inc., Bay Shore, N.Y.
Avantek, Inc., Santa Clara, Cal.
Bendix, Franklin, Ind.
Dynalab Corp., Van Nuys, Cal.
E & M Laboratories, Inc., Westlake Village, Cal.
EMC Technology Inc, Cherry Hill, N.J.
Environmental Communications Inc., Santa Ana, Cal.
Lorch Elctrns. Corp., Englewood, N.J.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Merrimac Inds., Inc., West Caldwell, N.J.
Metavac, Inc., Flushing, N.Y.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Prods., Inc., Chatsworth, Cal.
Modpak, Waltham, Mass.
Narda Microwave Corp., Plainview, N.Y.
Norsal Industries, Inc., Brentwood, N.Y.
Premier Microwave, Port Chester, N.Y.
Scientific Communications, Garland, Tex.
Sealectro Corp., Mamaroneck, N.Y.
Solitron/Microwave, Port Salerno, Fla.
Systron-Donner Microwave Div., Van Nuys, Cal.
Technical Research & Mfg. Co., Manchester, N.H.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Vector Industries, Palo Alto, Cal.
Wiltron Co., Palo Alto, Calif.

Strippers & Twisters, Wire—See Wire Strippers

Strippers, Wire, Chemical—See Chemicals, Wire Stripping

Strips, Ground

Berg Electronics, New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Chem Aero, Inc., Wilmington, Cal.
Christiansen Radio Inc., Laguna Beach, Cal.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Jettron Prods., Hanover, N.J.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Vector Elctrn. Co., Inc., Sylmar, Cal.

Strips, Marker & Fanning

Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill. Vol 3•854,886-896
Hathaway Industries Inc., Tulsa, Okla. Vol 3•686
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Accurate Elctrns. Corp., Elyria, Ohio
El Instruments, Derby, Conn.
ETC, Div. ITT, Cleveland, Ohio
Kulka Elec. Corp., Mt. Vernon, N.Y.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Thomas & Betts Co., Elizabeth, N.J.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Zippertubing Co., Los Angeles, Calif.

Strips, Terminal

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Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Acme Model Engrg. Co., Ridgefield, N.J.
ADC Prods., Minneapolis, Minn.
Advanced Circuitry Div., Springfield, Mo.
Aeronautical Elec. Co., Inc., Chicago, Ill.
Alco Elctrn. Prods., North Andover, Mass.
Apahouser Corp. of N.E., Boston, Mass.
A P Products, Inc., Painesville, Ohio
Ark-Les Switch Corp., Watertown, Mass.
Berg Electronics, New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Buchanan Elec. Prods., Union, N.J.
Burndy Corp., Norwalk, Conn.
Christiansen Radio Inc., Laguna Beach, Cal.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Custom Connector Corp., Cleveland, Ohio
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
De Soto Elec. Prods., De Soto, Mo.
Electrical Plastics Corp., Long Branch, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
Electrovert, Mt. Vernon, N.Y.
GC Electronics, Rockford, Ill.
Jackson Bros., (London) Ltd., New York, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Magnum Elec. Corp., Erie, Mich.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Molex Inc., Lisle, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Square D Co., Park Ridge, Ill.
Texas Instruments, Attleboro, Mass.
3M Co., St. Paul, Minn.
Useco Div., Van Nuys, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

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Bird, Richard H. & Co., Inc., Waltham, Mass.
Electro Stylus, Colorado Springs, Colo.
General Elec., W. Lynn, Mass.

Substrates, Ceramic

American Lava Corp., Chattanooga, Tenn. ..... Vol 3•1074
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Radio Materials Co., Chicago, Ill. Vol 3•494
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Aremco Prods., Inc., Briarcliff Manor, N.Y.
Basic Ceramics Inc., Hawthorne, N.J.
Bram Metallurgical-Chem. Co., Phila., Pa.
Carborundum Co., Niagara Falls, N.Y.
Ceramic Magnetics, Inc., Fairfield, N.J.
Coors Porcelain Co., Golden, Colo.
Electro-Science Labs., Pennsauken, N. J.
Emerson & Cuming, Inc., Canton, Mass.
Erie Technological Prods. (EEM), Erie, Pa.

Film Microelectronics, Inc., Burlington, Mass
Gte Sylvania Inc., Belmont, Cal.
Honeywell, Minneapolis, Minn.
Materials Resch. Corp., Orangeburg, N.Y.
Mepco/Electra, Substrate Div., San Diego, Cal.
Metalized Ceramics, Providence, R.I.
National Beryllia Corp., Haskell, N.J.
Statek Corp., Orange, Cal.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
3M Co., St. Paul, Minn.
Trans-Tech, Gaithersburg, Md.
Union Carbide, San Diego, Cal.
Valpey Corp., Holliston, Mass.

Substrates, Flexible

Emerson & Cuming, Inc., Canton, Mass.
Flexible Circuits, Inc., Warrington, Pa.
GTE Sylvania Inc., Newark, N.J.
Schjeldahl, G.T. Co., Northfield, Minn.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Westinghouse Elec., W. Mifflin, Pa.

Substrates, Glass

Triac Elctrn. Sys., Forest Hills, N. Y. Vol 2•371
Amersil, Inc., Hillside, N.J.
Atlantic Optical Moulding Co., Dudley, Mass.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Statek Corp., Orange, Cal.

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Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Joslyn Elctrn. Sys., Goleta, Cal.
Ledex, Inc., Dayton, Ohio
Presin Co., Inc., Shelton, Conn.
RtroN Corp., Skokie, Ill.
Sarkes Tarzian, Inc., Bloomington, Ind.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Transtector Systems, Monterey Park, Cal.

Suppressors, Noise

Computer Diode, Fair Lawn, N.J.
Corcom Inc., Chicago, Ill.
CW Industries, Warminster, Pa.
Erie Technological Prods. (EEM), Erie, Pa.
Estes Engrg. Co., Gardena, Calif.
GC Electronics, Rockford, Ill.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hopkins Engrg., San Fernando, Cal.
Maury Microwave Corp., Cucamonga, Calif.
Narda Microwave Corp., Plainview, N.Y.
RtroN Corp., Skokie, Ill.
Smith, Herman H., Inc., Bklyn., N.Y.
Standard Condenser Corp., Chicago, Ill.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
Weinschel Engrg. Co., Gaithersburg, Md.

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Edal Inds., Inc., E. Haven, Conn.
Elgar Corp., San Diego, Cal.
Elin Div., San Diego, Cal.
FMC Corp., Homer City, Pa.
General Semiconductor Inds., Tempe, Ariz.
Integrated Systems, Inc., Norcross, Ga.
Joslyn Elctrn. Sys., Goleta, Cal.
Microsemiconductor Corp., Culver City, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Power Conversion Prods. Inc., Crystal Lake, Ill.
Sanford-Miller Corp., Brooklyn, N.Y.
Sarkes Tarzian, Inc., Bloomington, Ind.
Sprague Elec. Co., No. Adams, Mass.
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Surge Arresters, Electrical—See Arresters, Electrical Surge

Switch Handle Boots

Micro Switch, Freeport, Ill. Vol 2•1117,1118
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Alco Elctrn. Prods., North Andover, Mass.
APM-Hexseal, Englewood, N.J.
Arcolectric Switch Corp., No. Hollywood, Cal.

Switch Mounting Plates

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Waldom Elctrns., Inc., Chicago, Ill.

Switchboards

Amtron Inc., Midlothian, Ill.
Anchor Specialty Mfg., Teterboro, N.J.
Basler Elec. Co., Highland, Ill.
Clare-Pendar Co., Post Falls, Idaho
Cutler-Hammer, Milwaukee, Wisc.
Devco Engrg., W. Caldwell, N.J.
Electrospace Systems Inc., Richardson, Tex.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Key Tronic Corp., Spokane, Wash.
LVC Inds. Inc., Flushing, N.Y.
Methode Elctrns., Inc., Chicago, Ill.
North Electric Co., Galion, Ohio
Sealectro Corp., Mamaroneck, N.Y.
Square D Co., Park Ridge, Ill.
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Webster Elec. Co., Inc., Racine, Wisc.

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Switches, Air Flow Actuated

Amphenol Controls Oper. of Connector Div., Broadview, Ill.
Anderson, W.E., Inc., Kansas City, Mo.
Automation Devices, Inc., Fairview, Pa.
Cherry Electrical Prods., Waukegan, Ill
Columbus Elec. Mfg. Co., Columbus, Ohio
Cook Elec. Co., Morton Grove, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Gems Sensors Div., Farmington, Conn.
Honeywell, Mpls., Minn.
Micro Switch, Freeport, Ill.
Reed Switch Dev. Co., Greenwich, Conn.
Rotron, Inc., Woodstock, N.Y.
Square D Co., Park Ridge, Ill.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
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Switches, Antenna Changeover

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Andrew Corp., Orland Pk., Ill.
Cole Instrument Corp., Costa Mesa, Cal.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Daico Inds. Inc., Compton, Cal.
Fifth Dimension, Princeton, N.J.
ITT Jennings, Vacuum Elctrn. Prods., San Jose, Cal.
Johnson E. F. Co., Waseca, Minn.
Kilovac Corp., Santa Barbara, Cal.
Machine Components Corp., Plainview, N.Y.
Matrix Systems Corp., Chatsworth, Calif.
Mobil Elctrns., Inc., Anderson, Ind.
Norsal Industries, Inc., Brentwood, N.Y.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Ross Engrg. Corp., Campbell, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Teledyne Microwave, Mountain View, Cal.
Torr Labs., Los Angeles, Cal.
Transco Prods., Inc., Venice, Cal.
Trompeter Elctrns., Chatsworth, Cal.

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Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bowmar/TIC, Inc., Newbury Park, Calif.
Bristol Saybrook Co., Old Saybrook, Conn.
Carter-Mfg. Corp., Hudson, Mass.
Cherry Electrical Prods., Waukegan, Ill
Chicago Lock Co., Chicago, Ill.
Cole Instrument Corp., Costa Mesa, Cal.
Connector Corp., Chicago, Ill.
Control Switch, Inc., Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
General Control Co., Boston, Mass.
Guardian Elec. Mfg. Co., Chicago, Ill.
Ingraham Inds., Controls Div., Elizabethtown, Ky.
Licon Div., Chicago, Ill.
Maxwell Labs., Inc., San Diego, Calif.
Midtex/Aemco, Mankato, Minn.
Otto Engrg. Inc., Carpentersville, Ill.
Poly-Scientific, Blacksburg, Va.
Relay Service Co., Chicago, Ill.
Relay Specialties Inc., Fair Lawn, N.J.
Sealectro Corp., Mamaroneck, N.Y.
Smith, Herman H., Inc., Bklyn., N.Y.
Zenith Controls Inc., Chicago, Ill.

Switches, Centrifugal

Cole Instrument Corp., Costa Mesa, Cal.
Gibbs Mfg. & Resch., Janesville, Wisc.
Jones Motrola Corp., Stamford, Conn.
Mag-Con, Inc., New Brighton, Minn.
Synchro-Start Prods., Skokie, Ill.

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Aertech Inds., Sunnyvale, Calif.
Andrew Corp., Orland Pk., Ill.
Arra Inc., Bay Shore, N.Y.
Automated Meas., Oakland, Calif.
Barker & Williamson, Inc., Bristol, Pa.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
CES Elctrns., Brooklyn, N.Y.
Collins Radio Co., Dallas, Tex.
E & M Laboratories, Inc., Westlake Village, Cal.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Instr. & Specialty, Stoneham, Mass.
Fifth Dimension, Princeton, N.J.
General Microwave Corp., Farmingdale, N.Y.
GHZ Devices, Inc., So. Chelmsford, Mass.
ITT Jennings, Vacuum Elctrn. Prods., San Jose, Cal.
Jerrold Electronics Corp., Philadelphia, Pa.
Kay Elemetrics, Pine Brook, N.J.
Kilovac Corp., Santa Barbara, Cal.
Matrix Systems Corp., Chatsworth, Calif.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Norsal Industries, Inc., Brentwood, N.Y.
Priority Services, Burbank, Cal.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Ross Engrg. Corp., Campbell, Cal.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Teledyne Microwave, Mountain View, Cal.
Transco Prods., Inc., Venice, Cal.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.

Switches, Coded

Applied Research Inc., Port Washington, N.Y. Vol 2•607
Chicago Dynamic Inds., Chicago, Ill. Vol 2•1028
Digitran Co., Pasadena, Cal. Vol 2•1048,1049
Interswitch, Burlingame, Cal. Vol 2•1077
Airflyte Elctrns. Co., Bayonne, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Cherry Electrical Prods., Waukegan, Ill
Chomerics, Inc., Woburn, Mass.
Cole Instrument Corp., Costa Mesa, Cal.
Counterscan Systems, Sutton, Neb.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Flex Key Corp., Gloucester, Mass.
Grayhill Inc., LaGrange, Ill.
Key Tronic Corp., Spokane, Wash.
LVC Inds. Inc., Flushing, N.Y.
North Electric Co., Galion, Ohio
RCL Elctrns., Inc., Irvington, N.J.
Zippertubing Co., Los Angeles, Calif.

Switches, Crossbar

Applied Research Inc., Port Washington, N.Y. Vol 2•607
Cherry Electrical Prods., Waukegan, Ill Vol 2•1036
Cunningham, Honeoye Falls, N.Y. Vol 4•327-332*
ITT Jennings, San Jose, Cal.. Vol 2•1073
North Hills Elctrns., Inc., Glen Cove, N.Y. Vol 1•366
Trompeter Elctrns., Chatsworth, Cal. Vol 2•1142-1147
A. D. Data Sys., Inc., Rochester, N.Y.
Adams-Russell Co., Inc., AR - Waltham Div., Waltham, Mass.
ADC Prods., Minneapolis, Minn.
Amphenol RF Div., Danbury, Conn.
Clare-Pendar Co., Post Falls, Idaho
Dynair Elctrns. Inc., San Diego, Calif.
International Electro Exchange Corp., Eden Prairie, Minn.
ITT Jennings, Vacuum Elctrn. Prods., San Jose, Cal.
LVC Inds. Inc., Flushing, N.Y.
Matrix Systems Corp., Chatsworth, Calif.
Mechanical Enterprises, Alexandria, Va.
Norsal Industries, Inc., Brentwood, N.Y.
North Electric Co., Galion, Ohio
Priority Services, Burbank, Cal.

Ross Engrg. Corp., Campbell, Cal.
Scientific Communications, Garland, Tex.
Square D Co., Park Ridge, Ill.
T-Bar Inc., Wilton, Conn.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
Zehntel, Inc., Concord, Cal.

Switches, Data-Sampling

Cunningham, Honeoye Falls, N.Y. Vol 1•337
Matrix Corp., Beech Grove, Ind. Vol 1•355
Trompeter Elctrns., Chatsworth, Cal. Vol 2•1142-1147
A. D. Data Sys., Inc., Rochester, N.Y.
Airflyte Elctrns. Co., Bayonne, N.J.
Amphenol RF Div., Danbury, Conn.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
Chicago Dynamic Inds., Chicago, Ill.
Cole Instrument Corp., Costa Mesa, Cal.
Counterscan Systems, Sutton, Neb.
Datametrics Inc., Wilmington, Mass.
Digitran Co., Pasadena, Cal.
Fifth Dimension, Princeton, N.J.
General Devices, Inc., Princeton, N.J.
Hickok Elect. Instr., Cleveland, Ohio
LVC Inds. Inc., Flushing, N.Y.
Monitor Labs, Inc., San Diego, Cal.
National Semiconductor, Santa Clara, Cal.
NES, Inc., Itasca, Ill.
RCL Elctrns., Inc., Irvington, N.J.
Sealectro Corp., Mamaroneck, N.Y.
T-Bar Inc., Wilton, Conn.
Transco Prods., Inc., Venice, Cal.

Switches, Decade

Chicago Dynamic Inds., Chicago, Ill. Vol 2•1028
Digitran Co., Pasadena, Cal. Vol 2•1048,1049
Durant Digital Instrs., Watertown, Wisc. Vol 2•335
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. Vol 2•1052
Amp Inc., Harrisburg, Pa.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Cherry Electrical Prods., Waukegan, Ill
Chicago Lock Co., Chicago, Ill.
Cole Instrument Corp., Costa Mesa, Cal.
Edison Elctrns. Div., Manchester, N.H.
GTE Automatic Elec., Northlake, Ill.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Electro Exchange Corp., Eden Prairie, Minn.
LVC Inds. Inc., Flushing, N.Y.
Oak Inds. Inc., Crystal Lake, Ill.
RCL Elctrns., Inc., Irvington, N.J.
Sealectro Corp., Mamaroneck, N.Y.
Shallcross, Selma, N.C.
Tech Labs., Inc., Palisades Pk., N.J.
Veeder-Root, Hartford, Conn.
Weinschel Engrg. Co., Gaithersburg, Md.

Switches, Foot-Pedal, Mat, Ribbon, etc.

Tapeswitch Corp. Amer., Farmingdale, N.Y. Vol 2•1138
Allen-Bradley Co., Milwaukee, Wisc.
Allied Elctrns., Chicago, Ill.
Allis-Chalmers, Milwaukee, Wisc.
Chicago Switch, Chicago, Ill.
Cole Instrument Corp., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Flex Key Corp., Gloucester, Mass.
Furnas Elec. Co., Batavia, Ill.
General Control Co., Boston, Mass.
Lektra Labs., Inc., College Point, N.Y.
Line Electric Co. Unit Esterline Corp., Parsippany, N.J.
Linemaster Switch Corp., Woodstock, Conn.
Relay Specialties Inc., Fair Lawn, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Square D Co., Park Ridge, Ill.
Vemaline Prods. Co., Wyckoff, N.J.

Switches, High-Voltage (Over 250 Volts)

Advanced Kinetics, Costa Mesa, Calif.
Allen-Bradley Co., Milwaukee, Wisc.
Beckman Instrs., Cedar Grove, N.J.
Centralab Elctrns Div., Milwaukee, Wisc
Cole Instrument Corp., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Del Electronics Corp., Mt. Vernon, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Gordos Corp., Bloomfield, N.J.
Hamlin, Inc., Lake Mills, Wisc.
Hipotronics, Inc., Brewster, N.Y.
ITT Jennings, Vacuum Elctrn. Prods., San Jose, Cal.
Janco Corp., Burbank, Cal.
Kilovac Corp., Santa Barbara, Cal.
Kilovolt Corp., Hackensack, N.J.
Magnecraft Elec., Chicago, Ill.
Maxwell Labs., Inc., San Diego, Calif.
Megavolt, Inc., New York, N.Y.
Millen, James Mfg., Malden, Mass.
Nanotron Relay Co., Burbank, Cal.
Queensboro Transformer & Mach., College Pt., N.Y.
Ross Engrg. Corp., Campbell, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Shallco, Inc., Smithfield, N.C.
Shallcross, Selma, N.C.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Square D Co., Park Ridge, Ill.
Tech Labs., Inc., Palisades Pk., N.J.
Texas Instruments, Attleboro, Mass.
Torr Labs., Los Angeles, Cal.
UID Elctrns. Corp., Hollywood, Fla.
Varian Assocs., Palo Alto, Cal.

Switches, Illuminated

Alco Elctrn. Prods., North Andover, Mass. Vol 2•995,996
American Zettler, Irvine, Ca. Vol 2•1004,1005
Arcolectric Switch Corp., No. Hollywood, Cal. Vol 2•993
Capitol Machine & Switch Co., Danbury, Conn. Vol 2•999
Carling Electric, W. Hartford, Conn. Vol 2•1023
Centralab Elctrns Div., Milwaukee, Wisc Vol 2•1026,1027
Chicago Dynamic Inds., Chicago, Ill. Vol 2•1028
Chicago Switch, Chicago, Ill. Vol 2•1044,1045
Dialight Corp., Brooklyn, N.Y. Vol 2•482
Electro-Mech Comps. Inc., S. El Monte, Cal. Vol 2•1050
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. Vol 2•1052
Grayhill Inc., LaGrange, Ill. Vol 2•1056-1061
Ind'l. Devices, Edgewater, N.J. Vol 2•507
International Electro Exchange Corp., Eden Prairie, Minn. Vol 2•1079-1082
ITT Jennings, San Jose, Cal. Vol 2•1075
Ledex, Inc., Dayton, Ohio Vol 2•1086
Licon Div., Chicago, Ill. Vol 2•1089,1092,1093
Magic Dot, Inc., Minneapolis, Minn. Vol 2•1100
Marco-Oak, Anaheim, Cal. Vol 2•1101
McGill Mfg. Co., Valparaiso, Ind. Vol 4•545*
Micro Switch, Freeport, Ill. Vol 2•1104-1111,1116-1119
Oak Inds. Inc., Crystal Lake, Ill. Vol 2•1124
Seacor, Inc., Norwood, N.J. Vol 2•1132
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan Vol 3•786
Specialties Mfg. Co., Inc., St. Clair Shores, Mich. Vol 4•552*
UID Elctrns. Corp., Hollywood, Fla. Vol 2•1149
Unimax Switch Corp., Wallingford, Conn. Vol 2•1150
Waldom Elctrns., Inc., Chicago, Ill. Vol 2•1151; Vol 4•383*
Wild Rover Corp., Norwood, N.J. Vol 2•1152,1153
Airpax Elctrns., Inc., Cambridge, Md.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Burgess Switch Co., Scarborough, Ont., Can.
Clare, C.P. & Co., Chicago, Ill.
Clare-Pendar Co., Post Falls, Idaho
Cole Instrument Corp., Costa Mesa, Cal.
Control Switch, Inc., Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Digitran Co., Pasadena, Cal.
Edison Elctrns. Div., Manchester, N.H.
Electro Switch Corp., Weymouth, Mass.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Flex Key Corp., Gloucester, Mass.
Furnas Elec. Co., Batavia, Ill.
General Automatic Corp., Bayonne, N.J.
General Control Co., Boston, Mass.
General Illumination, Inc., St. Paul, Minn.
Genisco Technology Corp., Eldema Div., Compton, Cal.
Gordos Corp., Bloomfield, N.J.
Guardian Elec. Mfg. Co., Chicago, Ill.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Interswitch, Burlingame, Cal.
Jay-El Prods., Gardena, Calif.
Key Tronic Corp., Spokane, Wash.
Korry Mfg. Co., Seattle, Wash.
Leecraft Mfg. Co., Inc., Long Island City, N.Y.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
LVC Inds. Inc., Flushing, N.Y.
Master Specialties, Costa Mesa, Cal.
The Maxi-Switch Co., Minneapolis, Minn.
Molex Inc., Lisle, Ill.
Oshino Electric Lamp Works, Ltd, Shinagawa-ku, Tokyo, Japan
Relay Specialties Inc., Fair Lawn, N.J.
Risk, George, Inds., Inc., Kimball, Neb.
Shigoto Inds., Ltd., New York, N.Y.
Stacoswitch, Inc., Costa Mesa, Cal.
Switchcraft, Inc., Chicago, Ill.
TEC, Inc., Tucson, Ariz.
Vemaline Prods. Co., Wyckoff, N.J.

Switches, Inertia—See Accelerometers

Switches, Joystick

Cole Instrument Corp., Costa Mesa, Cal.
Edison Elctrns. Div., Manchester, N.H.
Machine Components Corp., Plainview, N.Y.
Orbit Instr. Corp., Syosset, N.Y.
Otto Engrg. Inc., Carpentersville, Ill.

Switches, Keyboard

Alco Elctrn. Prods., North Andover, Mass. Vol 2•998
Centralab Elctrns Div., Milwaukee, Wisc Vol 2•1026,1027
Cherry Electrical Prods., Waukegan, Ill Vol 2•1034
Chicago Switch, Chicago, Ill. Vol 2•1040
Hathaway Industries Inc., Tulsa, Okla. Vol 2•1067
Hathaway Instruments, Inc., Denver, Colo. Vol 2•1067
ITT Jennings, San Jose, Cal. Vol 2•1074
Licon Div., Chicago, Ill. Vol 1•354
Magic Dot, Inc., Minneapolis, Minn. Vol 2•1100
The Maxi-Switch Co., Minneapolis, Minn. Vol 2•1102,1103
Micro Switch, Freeport, Ill. Vol 2•1119
Oak Inds. Inc., Crystal Lake, Ill. Vol 2•1124
Raytheon Co., Quincy, Mass. Vol 2•1191
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan Vol 3•786
Wild Rover Corp., Norwood, N.J. Vol 2•1152,1153
Amp Inc., Harrisburg, Pa.
Ark-Les Switch Corp., Watertown, Mass.
Clare, C.P. & Co., Chicago, Ill.
Clare-Pendar Co., Post Falls, Idaho
Dialight Corp., Brooklyn, N.Y.
Elec-Trol, Inc., Saugus, Cal.
Flex Key Corp., Gloucester, Mass.
Gordos Corp., Bloomfield, N.J.
Grayhill Inc., LaGrange, Ill.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Electro Exchange Corp., Eden Prairie, Minn.
Key Tronic Corp., Spokane, Wash.
Marco-Oak, Anaheim, Cal.
Mechanical Enterprises, Alexandria, Va.
Risk, George, Inds., Inc., Kimball, Neb.
Seacor, Inc., Norwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Stackpole Comps. Co., Raleigh, N.C.
Stacoswitch, Inc., Costa Mesa, Cal.
TEC, Inc., Tucson, Ariz.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.

Switches, Key-Lock

Alco Elctrn. Prods., North Andover, Mass. Vol 2•998
Chicago Lock Co., Chicago, Ill. Vol 2•1037
Specialties Mfg. Co., Inc., St. Clair Shores, Mich. Vol 4•555,556*
Trimm, Inc., Libertyville, Ill. Vol 3•944
Allen-Bradley Co., Milwaukee, Wisc.
Ark-Les Switch Corp., Watertown, Mass.
Birnbach Co., Inc., Freeport, N.Y.
Chicago Switch, Chicago, Ill.
Clare-Pendar Co., Post Falls, Idaho
Cole Instrument Corp., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Edison Elctrns. Div., Manchester, N.H.
Electro Switch Corp., Weymouth, Mass.
Furnas Elec. Co., Batavia, Ill.
GC Electronics, Rockford, Ill.
General Elec. Company, Providence, R.I.
Grayhill Inc., LaGrange, Ill.
Honeywell, Ft. Washington, Pa.
ITT Jennings, San Jose, Cal
Janco Corp., Burbank, Cal.
Leecraft Mfg. Co., Inc., Long Island City, N.Y.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
McGill Mfg. Co., Valparaiso, Ind.
Micro Switch, Freeport, Ill.
Relay Specialties Inc., Fair Lawn, N.J.
Stettner-Trush Inc., Cazenovia, N.Y.
Unimax Switch Corp., Wallingford, Conn.

Switches, Lever

Alco Elctrn. Prods., North Andover, Mass. Vol 2•997
Arcolectric Switch Corp., No. Hollywood, Cal. Vol 2•993
Capitol Machine & Switch Co., Danbury, Conn. Vol 2•999
Chicago Switch, Chicago, Ill. Vol 2•1042
International Electro Exchange Corp., Eden Prairie, Minn. Vol 2•1082
ITT Jennings, San Jose, Cal. Vol 2•1074
J-B-T Instrs., Inc., New Haven, Conn. Vol 2•1083
Specialties Mfg. Co., Inc., St. Clair Shores, Mich. Vol 4•553,554,556*
Allied Elctrns., Chicago, Ill.
American Switch Corp., Gloucester, Mass.
AMF Electical Prods., Alexandria, Va.
Birnbach Co., Inc., Freeport, N.Y.
C & K Components, Watertown, Mass.
Carling Electric, W. Hartford, Conn.
Centralab Elctrns Div., Milwaukee, Wisc
Cherry Electrical Prods., Waukegan, Ill
Cole Instrument Corp., Costa Mesa, Cal.
Control Switch, Inc., Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Digitran Co., Pasadena, Cal.
Edison Elctrns. Div., Manchester, N.H.
Furnas Elec. Co., Batavia, Ill.
General Control Co., Boston, Mass.
GTE Automatic Elec., Northlake, Ill.
Guardian Elec. Mfg. Co., Chicago, Ill.
Haydon Switch & Instr., Waterbury, Conn.
Licon Div., Chicago, Ill.
Mallory Controls, Frankfort, Ind.
McGill Mfg. Co., Valparaiso, Ind.
Micro Switch, Freeport, Ill.
Milli-Switch Corp., Gladwyne, Pa.
Oak Inds. Inc., Crystal Lake, Ill.
Otto Engrg. Inc., Carpentersville, Ill.
Potter & Brumfield, Princeton, Ind.
Reed Switch Dev. Co., Greenwich, Conn.
Relay Specialties Inc., Fair Lawn, N.J.
Robertshaw Controls, Columbus, Ohio
Seacor, Inc., Norwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Signet Scientific Co., Burbank, Cal.
Singer Co., Schiller Park, Ill.
Smith, Herman H., Inc., Bklyn., N.Y.
Square D Co., Park Ridge, Ill.
Switchcraft, Inc., Chicago, Ill.
T-Bar Inc., Wilton, Conn.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Unimax Switch Corp., Wallingford, Conn.

Switches, Limit

Licon Div., Chicago, Ill... Vol 2•1090,1091
Precision Mechanisms Corp., Westbury, N.Y. ..... Vol 2•990
Alco Elctrn. Prods., North Andover, Mass.
Allen-Bradley Co., Milwaukee, Wisc.
Allis-Chalmers, Milwaukee, Wisc.
AMF Electical Prods., Alexandria, Va.
Amphenol Controls Oper. of Connector Div., Broadview, Ill.
Arrow-Hart, Inc., Hartford, Conn.
Astrosystems, Inc., Lake Success, N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Burgess Switch Co., Scarborough, Ont., Can.
Chatham Controls Corp., Chatham, N.J.
Cole Instrument Corp., Costa Mesa, Cal.
Control Switch, Inc., Folcroft, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Dillon, W.C. & Co., Van Nuys 340, Calif.
Douglas Randall Div., Pawcatuck, Conn.
Fifth Dimension, Princeton, N.J.
Flex Key Corp., Gloucester, Mass.
Furnas Elec. Co., Batavia, Ill.
General Control Co., Boston, Mass.
General Electric, Shelbyville, Ind.
Gordos Corp., Bloomfield, N.J.
Grayhill Inc., LaGrange, Ill.
GTE Automatic Elec., Northlake, Ill.
Haydon Switch & Instr., Waterbury, Conn.
Janco Corp., Burbank, Cal.
Machine Components Corp., Plainview, N.Y.
McGill Mfg. Co., Valparaiso, Ind.
Metrix Instr. Co., Houston, Tex.
Micro Switch, Freeport, Ill.
Otto Engrg. Inc., Carpentersville, Ill.
PECO Corp., Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Reed Switch Dev. Co., Greenwich, Conn.
Relay Specialties Inc., Fair Lawn, N.J.
Risk, George, Inds., Inc., Kimball, Neb.
Robertshaw Controls, Columbus, Ohio
Signet Scientific Co., Burbank, Cal.
Singer Co., Schiller Park, Ill.
Skan-A-Matic Corp., Elbridge, N. Y.
Smith, Herman H., Inc., Bklyn., N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Specialties Mfg. Co., Inc., St. Clair Shores, Mich.
Square D Co., Park Ridge, Ill.
Sterling Instr., New Hyde Pk., NY
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Teledyne Kinetics, Solana Beach, Cal.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Unimax Switch Corp., Wallingford, Conn.
Westinghouse Elec., Buffalo, N. Y.
Wild Rover Corp., Norwood, N.J.

Switches, Liquid Level/Pressure

AMF Electical Prods., Alexandria, Va.
Amphenol Controls Oper. of Connector Div., Broadview, Ill.
Bourns, Inc., Instr. Div., Riverside, Calif.
Bristol Div, Waterbury, Conn
Computer Instrs., Hempstead, N.Y.
Consolidated Controls Corp., Bethel, Conn.
Cook Elec. Co., Morton Grove, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Delavan Electronics, Scottsdale, Ariz.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
Gagne Assocs., Inc., Binghamton, N.Y.
Gems Sensors Div., Farmington, Conn.
Gordos Corp., Bloomfield, N.J.
Harwil Co., Santa Monica, Calif.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Kratos, Pasadena, Cal
Landis & Gyr, Inc., Elmsford, N.Y.
National Sonics, Farmingdale, N.Y.
Photobell Co., Inc., New York, N.Y.
Revere Elctrn. Div., Wallingford, Conn.
Robertshaw Controls Co., Richmond, Va.
Scientific Technology, Mountain View, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Square D Co., Park Ridge, Ill.
Statham Instrs., Inc., Oxnard, Cal.
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Control Prods. Div., Attleboro, Mass.
Trans-Sonics, Inc., Lexington, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
United Elec. Controls Co., Watertown, Mass.
Wild Rover Corp., Norwood, N.J.
Zi-Tech Div., Palo Alto, Cal.

Switches, Lock—See Switches, Key-Lock

Switches, Magnetic Reed

Alco Elctrn. Prods., North Andover, Mass. ..... Vol 2•997
Coto-Coil Co., Inc., Providence, R.I. Vol 2•720
Cunningham, Honeoye Falls, N.Y. Vol 1•337; Vol 4•331,332*
Hamlin, Inc., Lake Mills, Wisc. Vol 2•1069; Vol 4•543*
Trompeter Elctrns., Chatsworth, Cal. Vol 2•1142-1147
Allen-Bradley Co., Milwaukee, Wisc.
Amperex Electronic Corp., Hicksville, N.Y.
Clare, C.P. & Co., Chicago, Ill.
Clare-Pendar Co., Post Falls, Idaho
Cole Instrument Corp., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Disc Instruments, Inc., Costa Mesa, Ca.
Douglas Randall Div., Pawcatuck, Conn.
Gordos Corp., Bloomfield, N.J.
GTE Automatic Elec., Northlake, Ill.
ITT Jennings, San Jose, Cal
Kahl Scientific Instr. Corp., El Cajon, Calif.
Key Tronic Corp., Spokane, Wash.
Magnecraft Elec., Chicago, Ill.
Marco-Oak, Anaheim, Cal.
Matrix Systems Corp., Chatsworth, Calif.
The Maxi-Switch Co., Minneapolis, Minn.
Micro Switch, Freeport, Ill.
New Prod. Engrg., Wabash, Ind.
Potter & Brumfield, Princeton, Ind.
Risk, George, Inds., Inc., Kimball, Neb.
Ross Engrg. Corp., Campbell, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
TEC, Inc., Tucson, Ariz.
Tech Labs., Inc., Palisades Pk., N.J.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Torr Labs., Los Angeles, Cal.
Transco Prods., Inc., Venice, Cal.

Switches, Magnetically Actuated

Alco Elctrn. Prods., North Andover, Mass. ..... Vol 2•997,998
Cunningham, Honeoye Falls, N.Y. Vol 1•337; Vol 4•332*
Hamlin, Inc., Lake Mills, Wisc. Vol 4•543*
Ross Engrg. Corp., Campbell, Cal. Vol 2•871
Adams & Westlake, Elkhart, Ind.
Airpax Elctrns., Inc., Cambridge, Md.
Allen-Bradley Co., Milwaukee, Wisc.
Allis-Chalmers, Milwaukee, Wisc.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Birnbach Co., Inc., Freeport, N.Y.
Clare, C.P. & Co., Chicago, Ill.
Clare-Pendar Co., Post Falls, Idaho
Cole Instrument Corp., Costa Mesa, Cal.
Coto-Coil Co., Inc., Providence, R.I.
Cutler-Hammer, Milwaukee, Wisc.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Denison, R.B., Inc., Bedford, Ohio
Douglas Randall Div., Pawcatuck, Conn.
Electro-Mechanisms, Inc., Azusa, Cal.
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
Gems Sensors Div., Farmington, Conn.
General Electric, Shelbyville, Ind.
Gordos Corp., Bloomfield, N.J.
GTE Automatic Elec., Northlake, Ill.
GTE Sylvania Inc., Danvers, Mass.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
H-B Instr. Co., Phila., Pa.
Information Transfer, Inc., Holcomb, N.Y.
ITT Jennings, San Jose, Cal
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Key Tronic Corp., Spokane, Wash.
Kilovac Corp., Santa Barbara, Cal.
Leece-Neville Co., Cleveland, Ohio
Liberty Controls, Inc., Shorewood, Ill.
Licon Div., Chicago, Ill.
Magnecraft Elec., Chicago, Ill.
The Maxi-Switch Co., Minneapolis, Minn.
Micro Switch, Freeport, Ill.
Ohmite Mfg. Co., Skokie, Ill.
Potter & Brumfield, Princeton, Ind.
Reed Devices, Inc., Glen Ellyn, Ill.
Reed Switch Dev. Co., Greenwich, Conn.
Relay Specialties Inc., Fair Lawn, N.J.
Risk, George, Inds., Inc., Kimball, Neb.
Signet Scientific Co., Burbank, Cal.
Sprague Elec. Co., No. Adams, Mass.
Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Pitman, N.J.
TEC, Inc., Tucson, Ariz.
Teledyne Kinetics, Solana Beach, Cal.
Texas Instruments, Attleboro, Mass.
Trompeter Elctrns., Chatsworth, Cal.
Veeder-Root, Hartford, Conn.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Switches, Matrix—See Switches, Crossbar; Switches, Reed; Boards, Programming

Switches, Mercury Displacement

Gordos Corp., Bloomfield, N.J. Vol 2•1053
Adams & Westlake, Elkhart, Ind.
Beltone Electronics Corp., Chicago, Ill.
H-B Instr. Co., Phila., Pa.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Mack Elec. Devices, Wyncote, Pa.
Magnecraft Elec., Chicago, Ill.
Mechanical Enterprises, Alexandria, Va.
Micro Switch, Freeport, Ill.
Risk, George, Inds., Inc., Kimball, Neb.

Switches, Mercury Wetted Contacts

Hamlin, Inc., Lake Mills, Wisc. Vol 2•1068,1069
Trompeter Elctrns., Chatsworth, Cal. Vol 2•1142-1147
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American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol RF Div., Danbury, Conn.
Arra Inc., Bay Shore, N.Y.
E & M Laboratories, Inc., Westlake Village, Cal.
Fifth Dimension, Princeton, N.J.
General Microwave Corp., Farmingdale, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Norsal Industries, Inc., Brentwood, N.Y.
Nurad, Inc., Baltimore, Md.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Microwave Div., Van Nuys, Cal.
Teledyne Microwave, Mountain View, Cal.
Torr Labs., Los Angeles, Cal.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
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Synchro Transmitters, Solid-State

Astrosystems, Inc., Lake Success, N.Y.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
C & A Products, Inc., Woodside, N. Y.
Computer Conversions Corp., East Northport, N.Y.
Control Technology Co., L.I.C., N.Y.
General Magnetics, Bloomfield, N.J.
ILC Data Device Corp., Hicksville, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Natel Engrg. Co., Canoga Pk., Cal.
North Atlantic Inds., Plainview, N.Y.
Republic Advanced System Technology Group, Chatsworth, Calif.
Singer Co., Little Falls, N.J.

Synchronizers, Klystron & BWO

Frequency Engrg. Labs., Farmingdale, N.J.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.

Synchros

Vernitron Control Comps., Torrance, Cal. ..... Vol 2•992
American Elctrns., Inc., Fullerton, Cal.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Clifton Precision, Clifton Hgts., Pa.
Electric Indicator Co., Inc., Norwalk, Conn.
Harowe Servo Controls, W. Chester, Pa.
Henschel Corp., Amesbury, Mass.
IMC Magnetics Corp., Westbury, N.Y.
IMC Magnetics Corp., Maywood, Cal.
Singer Co., Little Falls, N.J.
Transicoil, Inc., Worcester, Pa.

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Austron, Inc., Austin, Tex. ..... Vol 1•391
Rockland Sys. Corp., W. Nyack, N.Y. Vol 1•499
Advanced Energy Conversion, Belmont, Cal.
A.R.F. Products, Inc., Boulder, Colo.
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
Damon Corp., Westwood, Mass.
Dana Labs., Inc., Irvine, Calif.
Digitech Data Inds., Inc., Ridgefield, Conn.
Epsco, Inc., Westwood, Mass.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Frederick Electronics Corp., Frederick, Md.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
General Radio Co., Concord, Mass.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
HRB-Singer, Inc., State College, Pa.
ITT Mackay Marine, Elizabeth, N.J.
Logimetrics, Inc., Greenvale, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Melpar, Falls Church, Va.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
Oeco Corp., Portland, Ore.
Omni-Spectra, Inc., Tempe, Ariz.
Pacific Meas., Inc., Palo Alto, Calif.
PRD Elctrns., Inc., Westbury, N.Y.
Resdel Engrg. Corp., Arcadia, Cal.
Rohde & Schwarz Sls., Passaic, N.J.
Sierra Sys., Mountain View, Cal.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Technical Mat'l., Mamaroneck, N.Y.
Vibration Instrs. Co., Anaheim, Cal.
Watkins Johnson Co., Palo Alto, Cal.

Synthesizers, Waveform

Wavetek, San Diego, Cal. ..... Vol 1•532
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Exact Elctrns., Inc., Hillsboro, Ore.
NH Research, Inc., Santa Ana, Calif.

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Tachometers, Pulse

Electronic Research Co., Shawnee Mission, Kan. ..... Vol 1•431
Ailtech, City of Industry, Cal.
Airpax Elctrns., Ft. Lauderdale, Fla.
Avtron Mfg., Inc., Cleveland, Ohio
Baldwin Elctrns., Little Rock, Ark.
Bendix Corp., Sidney, N.Y.
Controlcraft Corp., West Chicago, Ill.
Electro Corp., Sarasota, Fla.
Faria, Thomas G. Corp., Uncasville, Conn.
Mag-Con, Inc., New Brighton, Minn.
Metrix Instr. Co., Houston, Tex.
New Era Products, Cleveland, Ohio
Parametrics, Inc., Orange, Conn.
PECO Corp., Milpitas, Cal.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
Sensor Corp., Scottsdale, Pa.
Sequential Information Systems, Elmsford, N.Y.
Solid State Elctrns. Corp., Sepulveda, Cal.
Speed Detectors, Bedford, Ohio
Trump-Ross Ind'l. Controls, Inc., Billerica, Mass.

Tachometers, Generator

Bowmar Instr. Corp., Ft. Wayne, Ind. Vol 2•334
Carter Motor Co., Chicago, Ill. Vol 2•635
Eastern Air Devices, Inc., Dover, N.H. Vol 2•640
Hathaway Industries Inc., Tulsa, Okla. Vol 1•451
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Servo-Tek Prods. Co., Hawthorne, N.J. Vol 2•661
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Airpax Elctrns., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Norwalk, Conn.
Electric Tachometer Corp., Philadelphia, Pa.
Electro-Craft Corp, Hopkins, Minn
Esterline Angus Div., Indianapolis, Ind.
Georator Corporation, Manassas, Va.
Harowe Servo Controls, W. Chester, Pa.
Indiana Gen'l. Div., Oglesby, Ill.
Kollsman Instr. Co., Syosset, N.Y.
Magnedyne Inc., Carlsbad, Calif.
Norden Div., Norwalk, Conn.
Parametrics, Inc., Orange, Conn.
Renco Corp., Goleta, Cal.
Sequential Information Systems, Elmsford, N.Y.
Singer Co., Little Falls, N.J.
Sticht, Herman H. Co., Inc., New York, N.Y.
Superior Elec., Bristol, Conn.
Torque Systems, Waltham, Mass.
Triplett Corp., Bluffton, Ohio
TRW/Globe Motors, Dayton, Ohio
Vibrac Corp., Chelmsford, Mass.

Tachometers, Stroboscopic

Slaughter Co., Ardmore, Okla. Vol 1•504
General Radio Co., Concord, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
Power Instrs., Skokie, Ill.
Sticht, Herman H. Co., Inc., New York, N.Y.
U.S. Scientific Instrs., Watertown, Mass.
Waters Mfg., Inc., Wayland, Mass.

Tape Decks—See Tape Transports

Tape Duplicators—See Duplicators, Magnetic Tape; Perforators,Paper Tape

Tape Editing Equipment—See Editing Equipment, Tape

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Tape Recording Accessories

Int'l. Electro-Magnetics, Palatine, Ill. Vol 1•313
Ampex Corp., Redwood City, Calif.
Audio Devices, Inc., Glenbrook, Conn.
Bell & Howell Co., Pasadena, Calif.
Calico Div., San Diego, Cal.
California Instrs. Co., San Diego, Cal.
Concord Communications Sys., Farmingdale, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Cramer Division, Old Saybrook, Conn.
Datum, Inc., Anaheim, Calif.
Electro-Voice, Inc., Buchanan, Mich.
GC Electronics, Rockford, Ill.
Honeywell, Denver, Colo.
Instrumentation Prods., Camarillo, Cal.
Int'l. Computer Prods., Dallas, Tex.
Kenton Engrg. Corp., Skokie, Ill.
Laminated Shim Co., Inc., Glenbrook, Conn.
Mac Panel Co., High Pt., N.C.
Raymond Engrg. Inc., Middletown, Conn.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Robins Ind's. Corp., Consumer Products Div., Commack, N.Y.
TDK Elctrns. Corp., Long Island City, N.Y.
Telectro Sys. Corp., Corona, N.Y.
Telex Comm. Div., Minneapolis, Minn.
3M Co., St. Paul, Minn.
Video Research Corp., Gaithersburg, Md.

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Tape Search Equipment

Chrono-log Corp., Broomall, Pa. Vol 1•333
Datatron, Inc., Santa Ana, Cal Vol 1•338
Datum, Inc., Anaheim, Calif. .... Vol 1•341
Ampex Corp., Redwood City, Calif.
Collins Radio Co., Dallas, Tex.
Cramer Division, Old Saybrook, Conn.
Datametrics Inc., Wilmington, Mass.
Geo Space Sys., Tampa, Fla.
Int'l. Computer Prods., Dallas, Tex.
Kyros Corp., Madison, Wisc.
Metric Sys., Ft. Walton Beach, Fla.
RCA Corp., Camden, N.J.
Redactron Corp., Hauppauge, N.Y.
Remex, Santa Ana, Cal.
SRC Div., Newport Bch., Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
Telectro Sys. Corp., Corona, N.Y.
Video Research Corp., Gaithersburg, Md.
Voiceprint Laboratories Corp., Somerville, N. J.

Tape Transports, Computer

Almond Instrs. Co., Covina, Cal Vol 1•935
Burroughs Corp., Pasadena, Cal. Vol 1•330
MFE Corporation, Salem, N.H. Vol 1•358
Ampex Corp., Redwood City, Calif.
Bell & Howell Co., Pasadena, Calif.
California Computer Prods., Anaheim, Cal
Cramer Division, Old Saybrook, Conn.
Crown Int'l., Elkhart, Ind.
Data Disc, Inc., Sunnyvale, Cal.
Data Recording Sys., Sunnyvale, Cal.
Data Specialties Inc., Highland Park, Ill.
Datacom, Inc., Ft. Walton Bch., Fla.
Datum, Inc., Anaheim, Calif.
Digital Equip. Corp., Maynard, Mass.
Elctrn. Memories, Hawthorne, Cal.
GRI Computer Corporation, Newton, Mass.
Interdyne, Van Nuys, Cal.
Int'l. Computer Prods., Dallas, Tex.
Int'l. Electro-Magnetics, Palatine, Ill.
KYBE Corp., Waltham, Mass.
Memodyne Corp., Newton Upper Falls, Ma.
PSC Technology Inc., Glendale, Cal.
Raymond Engrg. Inc., Middletown, Conn.
Remex, Santa Ana, Cal.
Telectro Sys. Corp., Corona, N.Y.
Telex Comm. Div., Minneapolis, Minn.
Texas Instruments, Inc., Houston, Tex.
Video Research Corp., Gaithersburg, Md.
Xerox Data Sys., El Segundo, Cal

Tape Winders

Data Specialties Inc., Highland Park, Ill.
Remex, Santa Ana, Cal.
Telectro Sys. Corp., Corona, N.Y.
3M Co., St. Paul, Minn.

Tapes, Electrical Insulation

3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn. ..... Vol 3•1078-1082
Birnbach Co., Inc., Freeport, N.Y.
Brady, W.H. Co., Milwaukee, Wisc.
Brand Dielectrics, Inc., N. Windham, Conn.
Burlington Opers. Div., Burlington, Mass.
Cadilac Plastics & Chems., Detroit, Mich.
Chemical Etching Equip. & Supply, Alexandria, Va.
Chemplast, Inc., Wayne, N.J.
Cole-Flex Corp., W. Babylon, N.Y.
Dixon Corp., Bristol, R.I.
General Elec., Insulating Matl's., Schenectady, N.Y.
General Elec. Company, Providence, R.I.
IE Mfg. Co., Chicago, Ill.
Markel, L. Frank & Sons, Norristown, Pa.
Mystik Tape, Div. Borden Chem., Winnetka, Ill.
Natvar Corp., Rahway, N.J.
Norton Coated Abrasive & Tape Divs., Troy, N.Y.
Okonite Co., Ramsey, N.J.
Plymouth Rubber Co., Inc., Canton, Mass.
Press-On Prods., Addison, Ill.
Russell Inds., Inc., Lynbrook, N.Y.
Schjeldahl, G.T. Co., Northfield, Minn.
Tensolite, Tarrytown, N.Y.
3M Co., St. Paul, Minn.
Transcon Mfg. Co., Dallas, Tex.
Union Carbide, Carbon Prods. Div., New York, N.Y.
United Mineral & Chem. Corp., New York, N.Y.
Westinghouse Elec., W. Mifflin, Pa.

Tapes, Films & Foils, Pressure Sensitive

Bishop Graphics, No. Hollywood, Cal.
Brady, W.H. Co., Milwaukee, Wisc.
Centron Engrg., Torrance, Cal.
Chartpak, Leeds, Mass.
Chemical Etching Equip. & Supply, Alexandria, Va.
Chemplast, Inc., Wayne, N.J.
Circuit-Stik, Inc., Torrance, Cal.
Cole-Flex Corp., W. Babylon, N.Y.
Fitchburg Coated Products, Scranton, Pa.
Freudenberg, B., Inc., New York, N.Y.
Labelon Corp., Canandaigua, N.Y.
Morgan Adhesives Co., Stow, Ohio
Mystik Tape, Div. Borden Chem., Winnetka, Ill.
Norton Coated Abrasive & Tape Divs., Troy, N.Y.
Plymouth Rubber Co., Inc., Canton, Mass.
Press-On Prods., Addison, Ill.
Schjeldahl, G.T. Co., Northfield, Minn.
Schweitzer, Peter J. Div., Lee, Mass.
Tapecon, Inc., Rochester, N.Y.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Topflight Corp., York, Pa.
Union Carbide, Carbon Prods. Div., New York, N.Y.
United Mineral & Chem. Corp., New York, N.Y.
Westinghouse Elec., W. Mifflin, Pa.
Zippertubing Co., Los Angeles, Calif.

Tapes, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable

Tapes, Paper, Plastic, etc. (For Punching)

Chemplast, Inc., Wayne, N.J.
Data Specialties Inc., Highland Park, Ill.
New England Laminates Co., Inc., Glenbrook, Conn.
Tapecon, Inc., Rochester, N.Y.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
United Mineral & Chem. Corp., New York, N.Y.

Tapes, Recording, Magnetic (All Types)

Sangamo Elec. Co., Springfield, Ill. Vol 1•371
AGFA-Gevaert, Inc., Teterboro, N.J.
Allied Elctrns., Chicago, Ill.
Amperex Electronic Corp., Hicksville, N.Y.
Ampex Corp., Redwood City, Calif.
Audio Devices, Inc., Glenbrook, Conn.
Automedia, Inc., Sunnyvale, Cal.
Bell & Howell Co., Pasadena, Calif.
Concord Communications Sys., Farmingdale, N.Y.
Infodex, Inc., Waterbury, Conn.
Int'l. Computer Prods., Dallas, Tex.
Javelin Div., Apollo Lasers, Inc., Los Angeles, Ca.
Mac Panel Co., High Pt., N.C.
MFE Corporation, Salem, N.H.
RCA Corp., Camden, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Robins Ind's. Corp., Consumer Products Div., Commack, N.Y.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
3M Co., St. Paul, Minn.

Technical Books

Allied Elctrns., Chicago, Ill.
American Radio Relay League, Inc., Newington, Conn.
Barnes & Reinecke, Inc., Chicago, Ill.
Beckman Instrs., (AISSD), Fullerton, Cal.
D.A.T.A. Inc., Orange, N.J.
International Rectifier, El Segundo, Cal.
Johnson Research Corp., Farmingdale, N.Y.
Lockheed Elctrns. Co., Watchung, N.J.
Motorola Semiconductor Prods., Phoenix, Ariz.
RCA Elctrns. Comps., Harrison, N.J.
Sams, Howard W. & Co., Inc., Indianapolis, Ind.
Tektronix, Inc., Beaverton, Ore.

Tees, Coaxial

Alford Mfg. Co., Winchester, Mass.
Americon Microwave Inds., Inc., Waltham, Mass.
Amphenol RF Div., Danbury, Conn.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Arra Inc., Bay Shore, N.Y.
CES Elctrns., Brooklyn, N.Y.
General Radio Co., Concord, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Norsal Industries, Inc., Brentwood, N.Y.
OMNI Spectra, Farmington, Mich.
Phelps Dodge Comm., North Haven, Conn.
Premier Microwave, Port Chester, N.Y.
Pyrofilm Corp., Whippany, N.J.
RF Systems, Inc., Cohasset, Mass.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Saxton Prods., Congers, N.Y.
Sealectro Corp., Mamaroneck, N.Y.
Sinclair Radio Labs., Maple, Ont., Can.
Telonic Inds., Inc., Laguna Beach, Calif.
Trompeter Elctrns., Chatsworth, Cal.
Vector Industries, Palo Alto, Cal.
Weinschel Engrg. Co., Gaithersburg, Md.

Tees, Waveguide

Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Amphenol RF Div., Danbury, Conn.
Arra Inc., Bay Shore, N.Y.
CES Elctrns., Brooklyn, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Somerset Radiation Lab., Arlington, Va.
Systron-Donner Microwave Div., Van Nuys, Cal.
TRG Prods., E. Boston, Mass.
Vector Industries, Palo Alto, Cal.
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Comstron Corp., Richmond Hill, N.Y. Vol 1•500; Vol 2•577
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Teleprinters

Design Elements, Columbus, Ohio
Di/An Controls, Inc., Boston, Mass.
E-Systems Inc., Dallas, Tex.
ITT Mackay Marine, Elizabeth, N.J.
Link Communications Inc., New York, N.Y.
NES, Inc., Itasca, Ill.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Service Co., Camden, N.J.
Teletype Corp., Skokie, Ill.
Texas Instruments, Inc., Houston, Tex.

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Teletypewriters & Equipment

Data General Corp. (E), Southboro, Ma.
Di/An Controls, Inc., Boston, Mass.
Electrocom Inds., So. Bend, Indiana
ITT Mackay Marine, Elizabeth, N.J.
Link Communications Inc., New York, N.Y.
NES, Inc., Itasca, Ill.
RCA Govt. & Comm. Sys., Moorestown, N.J.
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Texscan Corp., Indianapolis, Ind. Vol 1•514
AEL Communications Corp., Sub. of Amer. Elctrn. Labs. Inc., Lansdale, Pa.
Andersen Labs. Inc., Bloomfield, Conn.
Cleveland Elctrns., Inc., Cleveland, Ohio
Copperweld Bimetallics, Glassport, Pa.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Sitco Antennas, Portland, Ore.
Theta-Com CATV, Phoenix, Ariz
Tri-Ex Tower Corp., Visalia, Calif.
Varian Assocs., Palo Alto, Cal.

Television Systems & Equipment Closed-Circuit

Colorado Video, Inc., Boulder, Colo. Vol 1•413-416
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AEL Communications Corp., Sub. of Amer. Elctrn. Labs. Inc., Lansdale, Pa.
Ampex Corp., Redwood City, Calif.
Andersen Labs. Inc., Bloomfield, Conn.
Arvin Sys., Inc., Dayton, Ohio
Audiotronics, N. Hollywood, Cal.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Circon Corp., Santa Barbara, Ca.
Cleveland Elctrns., Inc., Cleveland, Ohio
Collins Radio Co., Dallas, Tex.
Concord Communications Sys., Farmingdale, N.Y.
Cunningham, Honeoye Falls, N.Y.
Data Disc, Inc., Sunnyvale, Cal.
Dynair Elctrns. Inc., San Diego, Calif.
Edo Western Corp., Salt Lake City, Utah
Fairchild Space & Defense Sys., Syosset, N.Y.
General Electrodynamics Corp., Garland, Tex.
General TV Network, Ferndale, Mich.
Hamamatsu Corp. (E), Middlesex, N. J.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Inter-Market, Inc., Glenview, Ill.
ITI Electronics, Inc., Clifton, N.J.
Javelin Div., Apollo Lasers, Inc., Los Angeles, Ca.
Jerrold Electronics Corp., Philadelphia, Pa.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Lenox Instr. Co., Philadelphia, Pa.
Marconi Elctrns. Inc., Elmsford, N.Y.
Opto-Metric Tools, Rockleigh, N.J.

RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Service Co., Camden, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Stereotronics Television Co., Sherman Oaks, Cal.
Telectro Sys. Corp., Corona, N.Y.
Teledyne Camera Sys., Arcadia, Cal.
Thomson-CSF Inc., New York, N.Y.
Varian Assocs., Palo Alto, Cal.
Varian Assoc., Solid State East Div., Micro-Link Prods., Beverly, Mass
Westinghouse Elec., Elmira, N.Y.
Winegard Co., Burlington, Iowa

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Templates, Printed Circuit Design

HAPCO, Boulder, Colo.

Tempo Regulators—See Regulators, Pitch & Tempo

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Berg Electronics, New Cumberland, Pa. Vol 3•653
Buchanan Elec. Prods., Union, N.J. Vol 3•558
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Allied Elctrns., Chicago, Ill.
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Controls Div., Elizabeth, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
Electrovert, Mt. Vernon, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Laminated Fabricators, San Bruno, Calif.
Methode Elctrns., Inc., Chicago, Ill.
Molex Inc., Lisle, Ill.
Rostone Corp., Lafayette, Ind.
Shigoto Inds., Ltd., New York, N.Y.
Square D Co., Park Ridge, Ill.
Thomas & Betts Co., Elizabeth, N.J.

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Allied Systems Corp., Greensboro, N.C.
Amphenol Ind'l. Div., Chicago, Ill.
Astrodyne, Inc., Wilmington, Mass.
Buchanan Elec. Prods., Union, N.J.
Christiansen Radio Inc., Laguna Beach, Cal.
Chromalloy-Alcon Inc., Chicago, Ill.
Comco Plastics, Inc., Richmond Hill, N.Y.
Continental Connector, Woodside, N.Y.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
EI Instruments, Derby, Conn.
Elctrn. Molding Corp., Woonsocket, R.I.
Elgin Elctrns. Inc., Waterford, Pa.
Grayhill Inc., LaGrange, Ill.
Keystone Elctrns. Corp., New York, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Laminated Fabricators, San Bruno, Calif.
Malco, A Microdot Co., Inc., Chicago, Ill.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Meson Electronics Co. Inc., Rochester, N. Y.
Reed Devices, Inc., Glen Ellyn, Ill.
Rostone Corp., Lafayette, Ind.
Shigoto Inds., Ltd., New York, N.Y.
Smith, Herman H., Inc., Bklyn., N.Y.

Terminal Equipment, Digital

Monitor Prods., S. Pasadena, Cal. Vol 2•430,431
AMP Capitron Div./AMP Incorporated, Elizabethtown, Pa.
Applied Digital Data Systems, Inc., Hauppauge, N.Y.
Ark-Les Switch Corp., Watertown, Mass.
Autocon Inds., Inc., Minneapolis, Minn.
Burroughs Corp., Pasadena, Cal.
Clary Corp., San Gabriel, Calif.
Codex Corp., Newton, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Control Equip. Corp., Lowell, Mass.
Demex, Inc., Kansas City, Mo.
Design Elements, Columbus, Ohio
Di/An Controls, Inc., Boston, Mass.
Digital Equip. Corp., Maynard, Mass.
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitron Corp., Norristown, Pa.
Eldorado Electrodata, Concord, Cal.
Electrocom Inds., So. Bend, Indiana
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Information Displays, Inc., Mt. Kisco, N.Y.
Instrumentation Tech. Corp., Northbridge, Cal.
Int'l. Computer Prods., Dallas, Tex.
Landis & Gyr, Inc., Elmsford, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Memodyne Corp., Newton Upper Falls, Ma.
NES, Inc., Itasca, Ill.
Pinlites, Fairfield, N.J.
Princeton Elctrn. Prods., New Brunswick, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Re-el Circuits, Inc., Saddle Brook, N.J.
Republic Advanced System Technology Group, Chatsworth, Calif.
Singer - Tele-Signal, Woodbury, N.Y.
TEC, Inc., Tucson, Ariz.
Tektronix, Inc., Beaverton, Ore.
Teletype Corp., Skokie, Ill.
Varian Assocs., Palo Alto, Cal.
Varian Data Machines, Palo Alto, Cal.
Victor Comptometer Corp., Chicago, Ill.
Western Telematic, Inc., Costa Mesa, Cal.
Wyle Computer Prods., Inc., El Segundo, Calif.

Terminal Strips—See Strips, Terminal

Terminals, Data Display

Burroughs Corp., Pasadena, Cal.
CPS, Sunnyvale, Calif.
Digitech Data Inds., Inc., Ridgefield, Conn.
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Oceanside, Calif.
Infodex, Inc., Waterbury, Conn.
Princeton Elctrn. Prods., New Brunswick, N.J.
Spatial Data Systems, Inc., Goleta, Cal.

Terminals, Feedthru

Concord Elctrns., New York, N.Y. Vol 3•655
Hiram Jones Elctrns., No. Hollywood, Cal. ..... Vol 3•684,685
Precision Metal Prods. Co., Stoneham, Mass. ..... Vol 3•767
Sealectro Corp., Mamaroneck, N.Y. Vol 3•775,776,779,780
Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•838-841
Vector Elctrn. Co., Inc., Sylmar, Cal. Vol 3•956,957
Victoreen Instr., Cleveland, Ohio Vol 3•959
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Alberox Corp., New Bedford, Mass.
American Lava Corp., Chattanooga, Tenn.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
Amphenol Sams Div., Chatsworth, Cal.
Art Wire & Stamping Co., Cedar Knolls, N.J.
Atlee Corp., Woburn, Mass.
Augat Inc., Attleboro, Mass.
Basic Ceramics Inc., Hawthorne, N.J.
Beman Mfg., Inc., New Cumberland, Pa.
Berg Electronics, New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Cambridge Thermionic, Cambridge, Mass
Ceramaseal, Inc., New Lebanon Center, N.Y.
Coors Porcelain Co., Golden, Colo.
Curtis Dev. & Mfg., Milwaukee, Wisc.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dixon Corp., Bristol, R.I.
Eaton Corp., Engired. Fasteners Div., Cleveland, Ohio
Eimac, San Carlos, Calif.
EI Instruments, Derby, Conn.
Elco, Willow Grove, Pa.
Electrical Inds., Murray Hill, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
Elctrn. Seals, Van Nuys, Cal.
Flex-Link Products, Inc., San Fernando, Cal.
General Mfg. Co., Glendale, Calif.
Glass Beads Co., Latrobe, Pa.
Goe Engrg. Co., City of Industry, Calif.
GTI Corp. (E), Pittsburgh, Pa.
Hermetic Seal Corp., Rosemead, Cal.
Heyman Mfg. Co., Kenilworth, N.J.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Johnson E. F. Co., Waseca, Minn.
Keystone Elctrns. Corp., New York, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Latronics Corp., Latrobe, Pa.
National Tel-Tronics, Meadville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Positronic Inds., Springfield, Mo.
Pylon Co., Inc., Attleboro, Mass.
Rostone Corp., Lafayette, Ind.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Statham Instrs., Inc., Oxnard, Cal.
Sterling Instr., New Hyde Pk., NY
Taurus Corp., Lambertville, N.J.
Teledyne Positive Connector, Ansonia, Conn.
3M Co., St. Paul, Minn.
Torwico Elctrns., Inc., Lakewood, N.J.
United Prods. Co., New Hyde Pk., N.Y.
Useco Div., Van Nuys, Cal.
Varian Assocs., Palo Alto, Cal.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

Terminals, Ferrule, Cable-End

Glenair, Inc., Glendale, Calif... Vol 4•370*
Amp Inc., Harrisburg, Pa.
Bead Elctrns., Bridgeport, Conn.
Berg Electronics, New Cumberland, Pa.
Burndy Corp., Norwalk, Conn.
Cambridge Thermionic, Cambridge, Mass
Eimac, San Carlos, Calif.
Flex-Link Products, Inc., San Fernando, Cal.
Sjoberg, C. & Son, Inc., Cranston, R.I.

Terminals, Lug

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Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•794
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Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Acme Model Engrg. Co., Ridgefield, N.J.
Amp Inc., Harrisburg, Pa.
Anchor Alloys, Inc., Brooklyn, N.Y.
Ark-Les Switch Corp., Watertown, Mass.
Augat Inc., Attleboro, Mass.
Beman Mfg., Inc., New Cumberland, Pa.
Berg Electronics, New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Burndy Corp., Norwalk, Conn.
Cambridge Thermionic, Cambridge, Mass
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill.
Circon Corp., Santa Barbara, Ca.
Concord Elctrns., New York, N.Y.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Electrical Inds., Murray Hill, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
ETC, Div. ITT, Cleveland, Ohio
GC Electronics, Rockford, Ill.
General Mfg. Co., Glendale, Calif.
Hoffman Industrial Prods., Farmingdale, N.Y.
Hollingsworth Solderless Terminal, Phoenixville, Pa.
ITT Thermotech, Hopkins, Minn.
Jackson Bros., (London) Ltd., New York, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Malco, A Microdot Co., Inc., Chicago, Ill.
Molex Inc., Lisle, Ill.
National Tel-Tronics, Meadville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Seastrom Mfg. Co., Glendale, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Sjoberg, C. & Son, Inc., Cranston, R.I.
Taurus Corp., Lambertville, N.J.
Teledyne Penn-Union Elec., Edinboro, Pa.
Teledyne Positive Connector, Ansonia, Conn.
Thomas & Betts Co., Elizabeth, N.J.
United Prods. Co., New Hyde Pk., N.Y.
Useco Div., Van Nuys, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

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Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
American Lava Corp., Chattanooga, Tenn.
Amp Inc., Harrisburg, Pa.
Amphenol Ind'l. Div., Chicago, Ill.
Ark-Les Switch Corp., Watertown, Mass.
Art Wire & Stamping Co., Cedar Knolls, N.J.
Augat Inc., Attleboro, Mass.

Bead Elctrns., Bridgeport, Conn.
Berg Electronics, New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Burndy Corp., Norwalk, Conn.
Cambridge Thermionic, Cambridge, Mass
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill.
Curtis Dev. & Mfg., Milwaukee, Wisc.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
El Instruments, Derby, Conn.
Elco, Willow Grove, Pa.
Electrical Inds., Murray Hill, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
Flex-Link Products, Inc., San Fernando, Cal.
GC Electronics, Rockford, Ill.
General Mfg. Co., Glendale, Calif.
Goe Engrg. Co., City of Industry, Calif.
Hathaway Industries Inc., Tulsa, Okla.
Jackson Bros., (London) Ltd., New York, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Malco, A Microdot Co., Inc., Chicago, Ill.
Molex Inc., Lisle, Ill.
National Tel-Tronics, Meadville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Positronic Inds., Springfield, Mo.
Pylon Co., Inc., Attleboro, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Smith, Herman H., Inc., Bklyn., N.Y.
Teledyne Penn-Union Elec., Edinboro, Pa.
Teledyne Positive Connector, Ansonia, Conn.
United Prods. Co., New Hyde Pk., N.Y.
Useco Div., Van Nuys, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

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Texas Instruments, Attleboro, Mass. Vol 3•925
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Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Amp Inc., Harrisburg, Pa.
Amphenol Ind'l. Div., Chicago, Ill.
Ark-Les Switch Corp., Watertown, Mass.
Associated Engrg. & Mfg. Corp., Upper Montclair, N. J.
Bead Elctrns., Bridgeport, Conn.
Beman Mfg., Inc., New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Burndy Corp., Norwalk, Conn.
Cambridge Thermionic, Cambridge, Mass
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill.
Circon Corp., Santa Barbara, Ca.
Curtis Dev. & Mfg., Milwaukee, Wisc.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
El Instruments, Derby, Conn.
Elco, Willow Grove, Pa.
Flex-Link Products, Inc., San Fernando, Cal.
General Mfg. Co., Glendale, Calif.
Goe Engrg. Co., City of Industry, Calif.
Hathaway Industries Inc., Tulsa, Okla.
Keystone Elctrns. Corp., New York, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Magnum Elec. Corp., Erie, Mich.
Malco, A Microdot Co., Inc., Chicago, Ill.
Methode Elctrns., Inc., Chicago, Ill.
Molex Inc., Lisle, Ill.
National Tel-Tronics, Meadville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Penn Engrg. & Mfg. Corp., Doylestown, Pa.
Positronic Inds., Springfield, Mo.
Shigoto Inds., Ltd., New York, N.Y.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Stanford Applied Engrg., Inc., Santa Ana, Cal.
Teledyne Positive Connector, Ansonia, Conn.
Useco Div., Van Nuys, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
Viking Inds., Inc., Chatsworth, Calif.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

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Terminals, Solderless

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GC Electronics, Rockford, Ill.. Vol 3•679
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Panduit Corp., Tinley Pk., Ill. Vol 3•1409; Vol 4•571*
Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•814,816
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Accurate Elctrns. Corp., Elyria, Ohio
Amp Inc., Harrisburg, Pa.
Amphenol Ind'l. Div., Chicago, Ill.
Ark-Les Switch Corp., Watertown, Mass.
Augat Inc., Attleboro, Mass.
Beman Mfg., Inc., New Cumberland, Pa.
Berg Electronics, New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Burndy Corp., Norwalk, Conn.
Bussco Engrg., El Segundo, Cal.
Cambridge Thermionic, Cambridge, Mass
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill.
Circon Corp., Santa Barbara, Ca.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
El Instruments, Derby, Conn.
Elco, Willow Grove, Pa.
Elctrn. Molding Corp., Woonsocket, R.I.
Flex-Link Products, Inc., San Fernando, Cal.
Hathaway Industries Inc., Tulsa, Okla.
Hoffman Industrial Prods., Farmingdale, N.Y.
Hollingsworth Solderless Terminal, Phoenixville, Pa.
ITT Holub Inds., Sycamore, Ill.
Keystone Elctrns. Corp., New York, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Lance Inds., Sylmar, Calif.
Magnum Elec. Corp., Erie, Mich.
Malco, A Microdot Co., Inc., Chicago, Ill.
Molex Inc., Lisle, Ill.
National Tel-Tronics, Meadville, Pa.
Sealectro Corp., Mamaroneck, N.Y.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Square D Co., Park Ridge, Ill.
Teledyne Penn-Union Elec., Edinboro, Pa.
Teledyne Positive Connector, Ansonia, Conn.
Thomas & Betts Co., Elizabeth, N.J.
Useco Div., Van Nuys, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

Terminals, Standoff

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Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Alberox Corp., New Bedford, Mass.
Alco Elctrn. Prods., North Andover, Mass.
American Lava Corp., Chattanooga, Tenn.
Art Wire & Stamping Co., Cedar Knolls, N.J.
Atlee Corp., Woburn, Mass.
Basic Ceramics Inc., Hawthorne, N.J.
Berg Electronics, New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Cambridge Thermionic, Cambridge, Mass
Ceramaseal, Inc., New Lebanon Center, N.Y.
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill.
Circon Corp., Santa Barbara, Ca.
Coors Porcelain Co., Golden, Colo.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dixon Corp., Bristol, R.I.
Edal Inds., Inc., E. Haven, Conn.
Elco, Willow Grove, Pa.
Electrical Inds., Murray Hill, N.J.
Flex-Link Products, Inc., San Fernando, Cal.
General Mfg. Co., Glendale, Calif.
Goe Engrg. Co., City of Industry, Calif.
Grayhill Inc., LaGrange, Ill.
Grayhill Moldtronics, Inc., Downers Grove, Ill.
Hermetic Seal Corp., Rosemead, Cal.
Jackson Bros., (London) Ltd., New York, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Johnson E. F. Co., Waseca, Minn.
Keystone Elctrns. Corp., New York, N.Y.
Latronics Corp., Latrobe, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Penn Engrg. & Mfg. Corp., Doylestown, Pa.
Positronic Inds., Springfield, Mo.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Sterling Instr., New Hyde Pk., NY
Taurus Corp., Lambertville, N.J.
Teledyne Positive Connector, Ansonia, Conn.
3M Co., St. Paul, Minn.
Torwico Elctrns., Inc., Lakewood, N.J.
United Prods. Co., New Hyde Pk., N.Y.
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Accurate Elctrns. Corp., Elyria, Ohio
Basic Ceramics Inc., Hawthorne, N.J.
Cambridge Thermionic, Cambridge, Mass
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill.
Concord Elctrns., New York, N.Y.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Eaton Corp., Engired. Fasteners Div., Cleveland, Ohio
Elctrn. Molding Corp., Woonsocket, R.I.
GC Electronics, Rockford, Ill.
General Mfg. Co., Glendale, Calif.
Keystone Elctrns. Corp., New York, N.Y.
Magnum Elec. Corp., Erie, Mich.
National Tel-Tronics, Meadville, Pa.
Penn Engrg. & Mfg. Corp., Doylestown, Pa.
Positronic Inds., Springfield, Mo.
Sterling Instr., New Hyde Pk., NY
Useco Div., Van Nuys, Cal.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

Terminals, Turret

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Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Augat Inc., Attleboro, Mass.
Bead Elctrns., Bridgeport, Conn.
Cambridge Thermionic, Cambridge, Mass
Concord Elctrns., New York, N.Y.
D-Cemco, Inc., Burbank, Calif.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
El Instruments, Derby, Conn.
Electrical Inds., Murray Hill, N.J.
Flex-Link Products, Inc., San Fernando, Cal.
General Mfg. Co., Glendale, Calif.
Johnson E. F. Co., Waseca, Minn.
Keystone Elctrns. Corp., New York, N.Y.
Kulka Elec. Corp., Mt. Vernon, N.Y.
National Tel-Tronics, Meadville, Pa.
Positronic Inds., Springfield, Mo.
Sealectro Corp., Mamaroneck, N.Y.
United Prods. Co., New Hyde Pk., N.Y.
Useco Div., Van Nuys, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.

Terminals, Wirewrap

Berg Electronics, New Cumberland, Pa. Vol 3•650
Elctrn. Molding Corp., Woonsocket, R.I. Vol 3•666
Amp Inc., Harrisburg, Pa.
Augat Inc., Attleboro, Mass.
Bussco Engrg., El Segundo, Cal.
Concord Elctrns., New York, N.Y.
Curtis Dev. & Mfg., Milwaukee, Wisc.
General Mfg. Co., Glendale, Calif.
Ico/Rally, Palo Alto, Cal.
IFE Div., E. Providence, R. I.
Mupac Corp., Brockton, Mass.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Viking Inds., Inc., Chatsworth, Calif.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

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Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Barker & Williamson, Inc., Bristol, Pa.
Berg Electronics, New Cumberland, Pa.
Collins Radio Co., Dallas, Tex.
Elcom Sys., Deer Pk., N.Y.
Electro Impulse, Inc., Red Bank, N.J.
EMC Technology Inc, Cherry Hill, N.J.
Engelmann Microwave, Montville, N.J.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Rowe Inds., Div., Toledo, Ohio
Sealectro Corp., Mamaroneck, N.Y.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Microwave Div., Van Nuys, Cal.
Technical Mat'l., Mamaroneck, N.Y.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Vector Industries, Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.

Terminations, High-Voltage (1,000 Volts & Over)

Alberox Corp., New Bedford, Mass.
Amphenol Sams Div., Chatsworth, Cal.
Barth Elctrns., Inc., Cleveland, Ohio
Basic Ceramics Inc., Hawthorne, N.J.
Del Electronics Corp., Mt. Vernon, N.Y.
Deltaray Corp., Woburn, Mass.
Electro Impulse, Inc., Red Bank, N.J.
General Elec., Insulating Matl's., Schenectady, N.Y.
General Lab. Assocs., Norwich, N.Y.
Hathaway Industries Inc., Tulsa, Okla.
Hipotronics, Inc., Brewster, N.Y.
Julie Research Lab., New York, N.Y.
Kilovolt Corp., Hackensack, N.J.
Manger Elec. Co., Inc., Stamford, Conn.
Megavolt, Inc., New York, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Peschel Instrs., Cape Coral, Fla.
Plymouth Rubber Co., Inc., Canton, Mass.
Ross Engrg. Corp., Campbell, Cal.
Rowe Inds., Div., Toledo, Ohio

Universal Voltronics Corp., Mt. Kisco, N.Y.

Terminations, Microwave

Arra Inc., Bay Shore, N.Y. ..... Vol 2•608
Bendix, Franklin, Ind. ..... Vol 2•609
Bird Elctrn., Cleveland, Ohio.... Vol 1•397
Texscan Corp., Indianapolis, Ind. Vol 1•514
Weinschel Engrg. Co., Gaithersburg, Md. ..... Vol 1•534
Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Americon Microwave Inds., Inc., Waltham, Mass.
Applied Research Inc., Port Washington, N.Y.
Barth Elctrns., Inc., Cleveland, Ohio
Basic Ceramics Inc., Hawthorne, N.J.
CES Elctrns., Brooklyn, N.Y.
Collins Radio Co., Dallas, Tex.
E & M Laboratories, Inc., Westlake Village, Cal.
Elcom Sys., Deer Pk., N.Y.
Electro Impulse, Inc., Red Bank, N.J.
EMC Technology Inc, Cherry Hill, N.J.
Engelmann Microwave, Montville, N.J.
General Radio Co., Concord, Mass.
Manger Elec. Co., Inc., Stamford, Conn.
Maury Microwave Corp., Cucamonga, Calif.
Merrimac Inds., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Pyrofilm Corp., Whippany, N.J.
Radiation Devices Co., Baltimore, Md.
RF Systems, Inc., Cohasset, Mass.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Rowe Inds., Div., Toledo, Ohio
Sealectro Corp., Mamaroneck, N.Y.
Solitron/Microwave, Port Salerno, Fla.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Microwave Div., Van Nuys, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Transco Prods., Inc., Venice, Cal.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Vector Industries, Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.

Terminations, VHF, Video, Pulse

Bird Elctrn., Cleveland, Ohio.... Vol 1•397
American Elctrn. Labs., Inc., Lansdale, Pa.
Barth Elctrns., Inc., Cleveland, Ohio
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Collins Radio Co., Dallas, Tex.
Elcom Sys., Deer Pk., N.Y.
Electro Impulse, Inc., Red Bank, N.J.
Engelmann Microwave, Montville, N.J.
General Radio Co., Concord, Mass.
Jerrold Electronics Corp., Philadelphia, Pa.
Manger Elec. Co., Inc., Stamford, Conn.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Farmington, Mich.
Priority Services, Burbank, Cal.
Radiation Devices Co., Baltimore, Md.
Rohde & Schwarz Sls., Passaic, N.J.
Rowe Inds., Div., Toledo, Ohio
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Corp., Indianapolis, Ind.
Trompeter Elctrns., Chatsworth, Cal.
Waveline, Inc., W. Caldwell, N.J.
Wide Band Engrg. Co., Phoenix, Ariz.

Test Equipment, Closed Circuit TV-Also See Television Systems & Equipment, Closed-Circuit

Ailtech, City of Industry, Cal.
Colorado Video, Inc., Boulder, Colo.
Kay Elemetrics, Pine Brook, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Tektronix, Inc., Beaverton, Ore.

Test Equipment, Color TV

Dynascan Corp., Chicago, Ill.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
Jerrold Electronics Corp., Philadelphia, Pa.
Kay Elemetrics, Pine Brook, N.J.
Marconi Elctrns. Inc., Elmsford, N.Y.
Marconi Instrs., Englewood, N.J.
Mercury Elctrns. Corp., Mineola, N.Y.
Nelson Ross Elctrns., Lake Success, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Photo Resch. Corp., Burbank, Calif.
Radio Resch. Co., Rockaway, N.J.
RCA Corp., Camden, N.J.
RCA Elctrns. Comps., Harrison, N.J.
RIL Elctrns., Inc., Southampton, Pa.
Rohde & Schwarz Sls., Passaic, N.J.
Scientronics, Barrington, N.J.
Seco Elctrns. Corp., Hopkins, Minn.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Tektronix, Inc., Beaverton, Ore.
Telectro Sys. Corp., Corona, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Vector Elctrn. Co., Inc., Sylmar, Cal.

Test Equipment, Mechanical Impedance

Bafco, Inc., Warminster, Pa.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Delta Design, San Diego, Cal
Digitech Data Inds., Inc., Ridgefield, Conn.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Endevco, Pasadena, Calif.
New Era Products, Cleveland, Ohio
Quan-Tech, Whippany, N.J.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Universal Ad-Yu Elctrns., Inc., Milwaukee, Wi.

Test Lead Probes—See Probes, Test Lead

Test Leads & Adapters

E-Z Hook, Test Prods., Arcadia, Cal. Vol 3•667-677
Pomona Elctrns. Co., Inc., Pomona, Cal. Vol 3•721,731,732,738,739,751-756, 760-765
Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•798-800,803-805,807,808
Accurate Elctrns. Corp., Elyria, Ohio
Air-O-Tronics Prods., Morrisville, N.Y.
Anchor Specialty Mfg., Teterboro, N.J.
A P Products, Inc., Painesville, Ohio
Birnbach Co., Inc., Freeport, N.Y.
Circon Corp., Santa Barbara, Ca.
Collins Radio Co., Dallas, Tex.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
De Soto Elec. Prods., De Soto, Mo.
Desco Mfg. Co., Glendale, Calif.
Electro Sci. Inds., Portland, Ore.
Excel Specialty Corp., Chicago, Ill.
GC Electronics, Rockford, Ill.
Hickok Elect. Instr., Cleveland, Ohio
Jonard Inds. Corp., Bronx, N.Y.
Lynn Elctrns. Corp., Feasterville, Pa.
McDonnell Douglas Electronics Co., St. Charles, Mo.
National Tel-Tronics, Meadville, Pa.
New Era Products, Cleveland, Ohio
Paraplegics Mfg., Bensenville, Ill.
Projects Unlimited, Inc., Dayton, Ohio
Pylon Co., Inc., Attleboro, Mass.
Rowe Inds., Div., Toledo, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Textool Prods., Inc., Irving, Tex.
Vector Elctrn. Co., Inc., Sylmar, Cal.

Test Systems, Automatic D-C

AD Automation, Rochester, N.Y. Vol 1•386
Julie Research Lab., New York, N.Y. Vol 1•466

Testers, Accelerometer—See Calibrators, Accelerometer

Testers, Battery

CML-Macarr, Inc., Edison, N.J. Vol 1•645
Aerotronic Assocs., Inc., Contoocook, N.H.
Altair Resch. & Mfg. Co., Ontario, Calif.
Anchor Specialty Mfg., Teterboro, N.J.
Austin Elctrns., Roselle, N.J.
Christie Elec., Los Angeles, Cal.
Components Specialties, Freeport, N.Y.
Dytro Corp., Hicksville, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Hoyt Elec. Instr. Works, Belmont, Mass.
Kahl Scientific Instr. Corp., El Cajon, Calif.
New Era Products, Cleveland, Ohio
N.Y. Testing Labs., Inc., Westbury, N.Y.
Opad Elec. Co., Inc., New York, N.Y.
Q.V.S., Inc., East Orange, N.J.
Ratelco, Inc., Seattle, Wash.
Schauer Mfg. Corp., Cincinnati, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
W-F Products, Inc., Denver, Co.
Western Reserve Elctrns., Twinsburg, Ohio

Testers Burn-In, Aging

Aerotronic Assocs., Inc., Contoocook, N.H.
Applied Control Co., Fairfield, N.J.
Austin Elctrns., Roselle, N.J.
Blue M Engrg. Co., Blue Island, Ill.
CGS Units, Inc., Rochester, N.Y.
Delta Design, San Diego, Cal
EI Instruments, Derby, Conn.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Jettron Prods., Hanover, N.J.
Julie Research Lab., New York, N.Y.
Kilovolt Corp., Hackensack, N.J.
Megavolt, Inc., New York, N.Y.
Micro Instr. Co., Hawthorne, Cal.
Opad Elec. Co., Inc., New York, N.Y.
PSC Technology Inc., Glendale, Cal.
Slaughter Co., Ardmore, Okla.
Wakefield Engrg., Inc., Systems Div., Wakefield, Mass.

Testers, Cable

Counterscan Systems, Sutton, Neb. Vol 1•417
Slaughter Co., Ardmore, Okla. Vol 1•505
AD Automation, Rochester, N.Y.
A. D. Data Sys., Inc., Rochester, N.Y.
Amprobe Instr., Lynbrook, N.Y.
Anchor Specialty Mfg., Teterboro, N.J.
Associated Resch., Chicago, Ill.
Automatic Production Systems Inc., Pennsauken, N.J.
Automation Dynamics, Northvale, N.J.
Beckman Instrs., Cedar Grove, N.J.
Belden Corp. Elctrn. Div., Richmond, Ind.
Biddle, James G., Plymouth Meeting, Pa.
Cablemaster Div., No. Hollywood, Cal.
Cole Instrument Corp., Costa Mesa, Cal.
Communications Technology Corp., Los Angeles, Cal.
Computer Automation, Inc., Irvine, Cal.
Custom Sci. Instrs., Inc., Whippany, N.J.
Del Electronics Corp., Mt. Vernon, N.Y.
Dit-MCO International, Kansas City, Mo.
General Radio Co., Concord, Mass.
Guildline Instrs., Inc., Larchmont, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Hughes Aircraft Co., Ind'l. Prods. Div. FACT Sys., Los Angeles, Cal.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Jonard Inds. Corp., Bronx, N.Y.
Kilovolt Corp., Hackensack, N.J.
MacDonald & Co., Glendale, Calif.
Megavolt, Inc., New York, N.Y.
Peschel Instrs., Cape Coral, Fla.
PSC Technology Inc., Glendale, Cal.
Railway Comm., Raytown, Mo.
Ross Engrg. Corp., Campbell, Cal.
Shallcross, Selma, N.C.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
T-Bar Inc., Wilton, Conn.
Tektronix, Inc., Beaverton, Ore.
Teradyne, Inc., Boston, Mass.
Triplett Corp., Bluffton, Ohio
Universal Voltronics Corp., Mt. Kisco, N.Y.
V. J. Elctrns., Ontario, Cal.

Testers, Capacitor

Beckman Instrs., Cedar Grove, N.J.
Boonton Electronics Corp., Parsippany, N.J.
Clarke - Hess, New York, N.Y.
Davidson Elctrn. Dev. Co., Erie, Pa.
Del Electronics Corp., Mt. Vernon, N.Y.
Dynascan Corp., Chicago, Ill.
Electro Sci. Inds., Portland, Ore.
Freed Transformer Co., Bklyn., N.Y.
Freudenberg, B., Inc., New York, N.Y.
General Radio Co., Concord, Mass.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Test Equip., Clifton, NJ
IPT Corp., Sunnyvale, Cal.
Jonard Inds. Corp., Bronx, N.Y.
Kahle Engrg. Co., Union City, N.J.
Kilovolt Corp., Hackensack, N.J.
Megavolt, Inc., New York, N.Y.
Mercury Elctrns. Corp., Mineola, N.Y.
Micro Instr. Co., Hawthorne, Cal.
Optimized Devices Inc., Pleasantville, N.Y.
Peschel Instrs., Cape Coral, Fla.
Sennheiser Elctrn. Corp., New York, NY
Simpson Elec. Co., Chicago, Ill.
Slaughter Co., Ardmore, Okla.
Sprague Elec. Co., No. Adams, Mass.
Teradyne, Inc., Boston, Mass.

Testers, Circuit—See Testers, Signal Tracing

Testers, Coil

AD Automation, Rochester, N.Y. Vol 1•386
Freed Transformer Co., Bklyn., N.Y. Vol 1•446,447
Slaughter Co., Ardmore, Okla. Vol 1•505
Anchor Specialty Mfg., Teterboro, N.J.
Avtron Mfg., Inc., Cleveland, Ohio
Beckman Instrs., Cedar Grove, N.J.
Collins Radio Co., Dallas, Tex.
Counterscan Systems, Sutton, Neb.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Ind'l. Test Equip., Clifton, NJ
J-Omega Co., Mountain View, Calif.
New Prod. Engrg., Wabash, Ind.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Zehntel, Inc., Concord, Cal.

Testers, Component Linearity

Ind'l. Test Equip., Clifton, NJ
IPT Corp., Sunnyvale, Cal.
London Co., Cleveland, Ohio
Microdyne Instruments Inc., Burlington, Mass.
Slaughter Co., Ardmore, Okla.
Solatron Enterprises, Inglewood, Calif.
Teledyne Philbrick, Dedham, Mass.

Testers, Computer Memory

Adar Assocs., Cambridge, Mass.
Chronetics, Inc., Mt. Vernon, N.Y.
Comaltest, Danbury, Conn.
Counterscan Systems, Sutton, Neb.
E-H Resch. Labs., Inc., Oakland, Cal.
Honeywell, Minneapolis, Minn.
Optimized Devices Inc., Pleasantville, N.Y.
Pioneer Magnetics, Santa Monica, Cal.
PSC Technology Inc., Glendale, Cal.
Systron Donner Computer Systems Div., Concord, Cal.
Tau-Tron, Inc., Lowell, Mass.
Zehntel, Inc., Concord, Cal.

Testers, Corona

Associated Resch., Chicago, Ill. Vol 1•388
Biddle, James G., Plymouth Meeting, Pa. ..... Vol 1•399
Bertan Assocs., Inc., Hicksville, N.Y.
Hipotronics, Inc., Brewster, N.Y.
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Kilovolt Corp., Hackensack, N.J.
Megavolt, Inc., New York, N.Y.
Peschel Instrs., Cape Coral, Fla.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Techsonics, El Prado, N.M.
Velonex, Santa Clara, Calif.

Testers, Diode

Kurz-Kasch Incorporated, Dayton, Ohio Vol 1•475; Vol 4•415*
Precision Standards Corp., Santa Ana, Cal. ..... Vol 1•495
Accurate Elctrns. Corp., Elyria, Ohio
Aerotronic Assocs., Inc., Contoocook, N.H.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
AMF Electical Prods., Alexandria, Va.
Automated Meas., Oakland, Calif.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Biddle, James G., Plymouth Meeting, Pa.
Boonton Electronics Corp., Parsippany, N.J.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dynascan Corp., Chicago, Ill.
E-H Resch. Labs., Inc., Oakland, Cal.
Fairchild Sys. Technology, Palo Alto, Cal.
Heath Co., Benton Harbor, Mich.
Hickok Elect. Instr., Cleveland, Ohio
IPT Corp., Sunnyvale, Cal.
J-Omega Co., Mountain View, Calif.
Julie Research Lab., New York, N.Y.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Larson Aero Dev., Concord, Calif.
Luft Instrs., Inc., Lincoln, Mass.
Mastech, Inc., Syracuse, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Optimized Devices Inc., Pleasantville, N.Y.
Peschel Instrs., Cape Coral, Fla.
Quan-Tech, Whippany, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Tektronix, Inc., Beaverton, Ore.
Telvac Instr. Co., Van Nuys, Cal.
Teradyne, Inc., Boston, Mass.
Trio-Tech, Inc. of Calif., Burbank, Calif.
Velonex, Santa Clara, Calif.

Testers, Electric Power—See Monitors, Power, A-C & D-C

Testers, Encoder

Astrosystems, Inc., Lake Success, N.Y.
Beckman Instrs., Cedar Grove, N.J.
Counterscan Systems, Sutton, Neb.
Fork Standards, W. Chicago, Ill.
NES, Inc., Itasca, Ill.
Norden Div., Norwalk, Conn.
Theta Instr. Corp., Fairfield, N.J.
Zehntel, Inc., Concord, Cal.

Testers, Ground Resistance—See Meters, Ohm

Testers, Hardness

Hacker Instrs., Inc., Fairfield, N.J.
Opto-Metric Tools, Rockleigh, N.J.
Pacific Transducer Corp., Los Angeles, Calif.
Thomas & Betts Co., Elizabeth, N.J.

Testers, Hi-Pot—See Testers, Insulation Breakdown

Testers, Insulation Breakdown

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Freed Transformer Co., Bklyn., N.Y. Vol 1•444,447
Hipotronics, Inc., Brewster, N.Y. Vol 1•454,455
Kilovolt Corp., Hackensack, N.J. Vol 1•755,757
Megavolt, Inc., New York, N.Y. Vol 1•761
Slaughter Co., Ardmore, Okla. Vol 1•504
Advanced Kinetics, Costa Mesa, Calif.
Anchor Specialty Mfg., Teterboro, N.J.
Austin Elctrns., Roselle, N.J.
Automatic Production Systems Inc., Pennsauken, N.J.
Automation Dynamics, Northvale, N.J.
Avtron Mfg., Inc., Cleveland, Ohio
Beckman Instrs., Cedar Grove, N.J.
Bendix Corp., Sidney, N.Y.
Bertan Assocs., Inc., Hicksville, N.Y.
Blue M Engrg. Co., Blue Island, Ill.
Cablemaster Div., No. Hollywood, Cal.
Cincinnati Sub-Zero Prods., Cincinnati, Ohio
Cober Elctrns., Inc., Stamford, Conn.
Cole Instrument Corp., Costa Mesa, Cal.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dielectric Instr. Corp., Pittsburgh, Pa.
Dit-MCO International, Kansas City, Mo.
Energy Systems, Palo Alto, Cal.
GAR Enterprises, Pasadena, Cal.
Grand Transformers, Grand Haven, Mich.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Ind'l. Test Equip., Clifton, NJ
ITT Jennings, Instrus. & Systems, San Jose, Calif.
Janco Corp., Burbank, Cal.
Japanese Prods. Corp., New Rochelle, N. Y.
Kahle Engrg. Co., Union City, N.J.
Opad Elec. Co., Inc., New York, N.Y.
Penn Airborne Prods., Southampton, Pa.
Peschel Instrs., Cape Coral, Fla.
Rohde & Schwarz Sls., Passaic, N.J.
Sotcher Measurement, Cupertino, Cal.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Sticht, Herman H. Co., Inc., New York, N.Y.
T-Bar Inc., Wilton, Conn.
Universal Voltronics Corp., Mt. Kisco, N.Y.
Velonex, Santa Clara, Calif.

Testers, Integrated Circuit (Automatic)

Precision Standards Corp., Santa Ana, Cal. ..... Vol 1•495
Adar Assocs., Cambridge, Mass.
Automated Meas., Oakland, Calif.
Automatic Production Systems Inc., Pennsauken, N.J.
Automedia, Inc., Sunnyvale, Cal.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Bulova Watch Co., Valley Stream, N.Y.
CGS Units, Inc., Rochester, N.Y.
Comaltest, Danbury, Conn.
Counterscan Systems, Sutton, Neb.
Datatron, Inc., Santa Ana, Cal
Digital Gen'l. Corp., Cleveland, Ohio
Dit-MCO International, Kansas City, Mo.
E-H Resch. Labs., Inc., Oakland, Cal.
Fairchild Sys. Technology, Palo Alto, Cal.
General Radio Co., Concord, Mass.
General Rand Corp., Edison, N.J.
Headway Research, Inc., Garland, Tex.
IPT Corp., Sunnyvale, Cal.
Julie Research Lab., New York, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Microdyne Instruments Inc., Burlington, Mass.
NES, Inc., Itasca, Ill.
Optimized Devices Inc., Pleasantville, N.Y.
PSC Technology Inc., Glendale, Cal.
Pylon Co., Inc., Attleboro, Mass.
Quan-Tech, Whippany, N.J.
Singer Co., Little Falls, N.J.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Tektronix, Inc., Beaverton, Ore.
Telectro Sys. Corp., Corona, N.Y.
Teledyne Philbrick, Dedham, Mass.
Teradyne, Inc., Boston, Mass.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Houston, Tex.
Trio-Tech, Inc. of Calif., Burbank, Calif.
Watkins Johnson Co., Palo Alto, Cal.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.
Zehntel, Inc., Concord, Cal.

Testers, Integrated Circuit (Manual)

Kurz-Kasch Incorporated, Dayton, Ohio Vol 1•475; Vol 4•415*
Adar Assocs., Cambridge, Mass.
Applied Control Co., Fairfield, N.J.
A P Products, Inc., Painesville, Ohio
Automatic Production Systems Inc., Pennsauken, N.J.
Automedia, Inc., Sunnyvale, Cal.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
CGS Units, Inc., Rochester, N.Y.
Circon Corp., Santa Barbara, Ca.
Comaltest, Danbury, Conn.
Dataprobe, Inc., So. Hackensack, N.J.
EI Instruments, Derby, Conn.
Fairchild Sys. Technology, Palo Alto, Cal.
General Radio Co., Concord, Mass.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
IPT Corp., Sunnyvale, Cal.
Microdyne Instruments Inc., Burlington, Mass.
Nu-Concept Computer Sys., Norristown, Pa.
Optimized Devices Inc., Pleasantville, N.Y.
Ostby & Barton Co., Providence, R.I.
Precision Standards Corp., Santa Ana, Cal.
Pylon Co., Inc., Attleboro, Mass.
Quan-Tech, Whippany, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Spectrum Dynamics, Inc., Ft. Lauderdale, Fla.
Tektronix, Inc., Beaverton, Ore.
Telectro Sys. Corp., Corona, N.Y.
Teledyne Philbrick, Dedham, Mass.
Teradyne, Inc., Boston, Mass.
Texas Instruments, Dallas, Tex.

Testers, Life, Component

Aerotronic Assocs., Inc., Contoocook, N.H.
Austin Elctrns., Roselle, N.J.
Barnes & Reinecke, Inc., Chicago, Ill.
Blue M Engrg. Co., Blue Island, Ill.
Cole Instrument Corp., Costa Mesa, Cal.
Custom Sci. Instrs., Inc., Whippany, N.J.
Davidson Elctrn. Dev. Co., Erie, Pa.
Delta Design, San Diego, Cal
General Radio Co., Concord, Mass.
Jade Corp., Huntingdon Valley, Pa.
Kilovolt Corp., Hackensack, N.J.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Megavolt, Inc., New York, N.Y.
Micro Instr. Co., Hawthorne, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Solatron Enterprises, Inglewood, Calif.
Wakefield Engrg., Inc., Systems Div., Wakefield, Mass.

Testers, Logic Card

Adar Assocs., Cambridge, Mass.
Alco Elctrn. Prods., North Andover, Mass.
A P Products, Inc., Painesville, Ohio
Austin Elctrns., Roselle, N.J.
Automated Meas., Oakland, Calif.
Automatic Production Systems Inc., Pennsauken, N.J.
Automation Dynamics, Northvale, N.J.
Automedia, Inc., Sunnyvale, Cal.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Comaltest, Danbury, Conn.
Computer Automation, Inc., Irvine, Cal.
Controlcraft Corp., West Chicago, Ill.
Dataprobe, Inc., So. Hackensack, N.J.
Datatron, Inc., Santa Ana, Cal
Davidson Elctrn. Dev. Co., Erie, Pa.
Digital Gen'l. Corp., Cleveland, Ohio
Dit-MCO International, Kansas City, Mo.
Dytro Corp., Hicksville, N.Y.
Epsco, Inc., Westwood, Mass.
Fairchild Sys. Technology, Palo Alto, Cal.
General Radio Co., Concord, Mass.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Marconi Instrs., Englewood, N.J.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Monitor Systems, Ft. Washington, Pa
NES, Inc., Itasca, Ill.
Optimized Devices Inc., Pleasantville, N.Y.
Program Data Co., Carson, Cal.
Proto Matic Co., Cincinnati,, Ohio
PSC Technology Inc., Glendale, Cal.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Tau-Tron, Inc., Lowell, Mass.
Teradyne, Inc., Boston, Mass.
Texas Instruments, Inc., Houston, Tex.
Thermalloy Co., Inc., Dallas, Tex.
Zehntel, Inc., Concord, Cal.

Testers, LSI (Automatic)

AD Automation, Rochester, N.Y. Vol 1•386
Kurz-Kasch Incorporated, Dayton, Ohio Vol 1•475
Adar Assocs., Cambridge, Mass.
Automated Meas., Oakland, Calif.
Comaltest, Danbury, Conn.
Computer Automation, Inc., Irvine, Cal.
Counterscan Systems, Sutton, Neb.
Datatron, Inc., Santa Ana, Cal
Digital Gen'l. Corp., Cleveland, Ohio
E-H Resch. Labs., Inc., Oakland, Cal.
Fairchild Sys. Technology, Palo Alto, Cal.
IPT Corp., Sunnyvale, Cal.
Microdyne Instruments Inc., Burlington, Mass.
NES, Inc., Itasca, Ill.
Optimized Devices Inc., Pleasantville, N.Y.
Proto Matic Co., Cincinnati,, Ohio
PSC Technology Inc., Glendale, Cal.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Tau-Tron, Inc., Lowell, Mass.
Teradyne, Inc., Boston, Mass.
Texas Instruments, Inc., Houston, Tex.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.
Zehntel, Inc., Concord, Cal.

Testers, Magnetic Core

Chronetics, Inc., Mt. Vernon, N.Y.
E-H Resch. Labs., Inc., Oakland, Cal.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
LDJ Electronics, Troy, Mich.
Magnetic Metals Co., Camden, N.J.
Shallcross, Selma, N.C.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systron Donner Computer Systems Div., Concord, Cal.

Testers, Magnetron

Cober Elctrns., Inc., Stamford, Conn.
Energy Systems, Palo Alto, Cal.
Henry Prods. Co., Inc., Inwood, N.Y.
Kilovolt Corp., Hackensack, N.J.
Megavolt, Inc., New York, N.Y.

Testers, Material

Acromag, Inc., Wixom, Mich.
Associated Resch., Chicago, Ill.
Atlas Electric Devices, Chicago, Ill.
Automation Inds., Danbury, Conn.
Beckman Instrs., Cedar Grove, N.J.
Chatillon John & Sons, Kew Gardens, N.Y.
Custom Sci. Instrs., Inc., Whippany, N.J.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Electro Impulse, Inc., Red Bank, N.J.
Honeywell, Ft. Washington, Pa.
Kilovolt Corp., Hackensack, N.J.
LDJ Electronics, Troy, Mich.
Magnaflux Corp., Chicago, Ill.
Megavolt, Inc., New York, N.Y.
Ohio Semitronics, Columbus, Ohio
Peschel Instrs., Cape Coral, Fla.
RFL Inds., Instr. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Schaevitz Engrg., Pennsauken, N.J.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Thwing-Albert Instr. Co., Philadelphia, Pa.
O. S. Walker Co., Worcester, Mass.

Testers, Memory—See Testers, Computer Memory

Testers, Meter

Optimation, Inc., Chatsworth, Cal. Vol 1•492
Automation Dynamics, Northvale, N.J.
Corning Glass Works, Medfield, Mass.
Edison Elctrns. Div., Manchester, N.H.
Electro Sci. Inds., Portland, Ore.
Electronic Dev. Corp., Boston, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Holt Instr. Labs., Oconto, Wisc.
Ind'l. Test Equip., Clifton, NJ
Jewell Electrical Instrs., Manchester, N.H.
Jonard Inds. Corp., Bronx, N.Y.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
North Hills Elctrns., Inc., Glen Cove, N.Y.
RFL Inds., Instr. Div., Boonton, N.J.
Simpson Elec. Co., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Weston Instruments, Inc., Newark, N.J.
Zehntel, Inc., Concord, Cal.

Testers, Microwave

Waveline, Inc., W. Caldwell, N.J. Vol 2•629
Weinschel Engrg. Co., Gaithersburg, Md. ..... Vol 1•534
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alford Mfg. Co., Winchester, Mass.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Carco Elctrns., Menlo Park, Calif.
Cober Elctrns., Inc., Stamford, Conn.
Collins Radio Co., Dallas, Tex.
Electro Impulse, Inc., Red Bank, N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Kilovolt Corp., Hackensack, N.J.
Megavolt, Inc., New York, N.Y.
Micro-Tel Corp., Baltimore, Md.
Microlab/FXR, Livingston, N.J.
Pacific Meas., Inc., Palo Alto, Calif.
Polarad Elctrn. Instrs., Lake Success, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Rantec Div., Calabasas, Calif.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Vari-L Co., Inc., Denver, Colo.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.
Wiltron Co., Palo Alto, Calif.
Zehntel, Inc., Concord, Cal.

Testers, Motor

Slaughter Co., Ardmore, Okla. Vol 1•505
Chatillon John & Sons, Kew Gardens, N.Y.
De Soto Elec. Prods., De Soto, Mo.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Scientific Columbus, Columbus, Ohio
Singer Co., Little Falls, N.J.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.
Zehntel, Inc., Concord, Cal.

Testers, Potentiometer

Advance Instr. Corp., Belmar, N. J.
Associated Resch., Chicago, Ill.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Biddle, James G., Plymouth Meeting, Pa.
Bristol Div, Waterbury, Conn
Computer Instrs., Hempstead, N.Y.
Dytro Corp., Hicksville, N.Y.
Electro Sci. Inds., Portland, Ore.
Freudenberg, B., Inc., New York, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Litton Inds., Mt. Vernon, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Penn Airborne Prods., Southampton, Pa.
Solatron Enterprises, Inglewood, Calif.
Taylor Instr. Process Control Div., Rochester, N.Y.
Zehntel, Inc., Concord, Cal.

Testers, Power Supply

Arnold Magnetics, Culver City, Cal.
Automation Dynamics, Northvale, N.J.
Biddle, James G., Plymouth Meeting, Pa.
Del Electronics Corp., Mt. Vernon, N.Y.
Electronic Dev. Corp., Boston, Mass.
Hipotronics, Inc., Brewster, N.Y.
Julie Research Lab., New York, N.Y.
Kepco, Inc., Flushing, N.Y.
Kurz-Kasch Incorporated, Dayton, Ohio
Megavolt, Inc., New York, N.Y.
NH Research, Inc., Santa Ana, Calif.
Optimized Devices Inc., Pleasantville, N.Y.
Pacific Meas., Inc., Palo Alto, Calif.
Peschel Instrs., Cape Coral, Fla.
Universal Voltronics Corp., Mt. Kisco, N.Y.
Zehntel, Inc., Concord, Cal.

Testers, Pulse Jitter

Adar Assocs., Cambridge, Mass.
Wiltron Co., Palo Alto, Calif.

Testers, Radar

Bird Elctrn., Cleveland, Ohio
Cober Elctrns., Inc., Stamford, Conn.
Energy Systems, Palo Alto, Cal.
Epsco, Inc., Westwood, Mass.
Frequency Engrg. Labs., Farmingdale, N.J.
General Microwave Corp., Farmingdale, N.Y.
Kilovolt Corp., Hackensack, N.J.
Megavolt, Inc., New York, N.Y.
Melpar, Falls Church, Va.
Singer Co., Little Falls, N.J.
Tasker Systems, Chatsworth, Cal.
Vega Precision Labs., Vienna, Va.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Testers, Ratio Voltage

Biddle, James G., Plymouth Meeting, Pa.
Electro Sci. Inds., Portland, Ore.
General Resistance, Inc., Mt. Vernon, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Julie Research Lab., New York, N.Y.
NH Research, Inc., Santa Ana, Calif.
North Atlantic Inds., Plainview, N.Y.
RFL Inds., Instr. Div., Boonton, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Zehntel, Inc., Concord, Cal.

Testers, Relay

Anchor Specialty Mfg., Teterboro, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Associated Resch., Chicago, Ill.
Avtron Mfg., Inc., Cleveland, Ohio
Counterscan Systems, Sutton, Neb.
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
Dit-MCO International, Kansas City, Mo.
Freudenberg, B., Inc., New York, N.Y.
Hathaway Industries Inc., Tulsa, Okla.
Ind'l. Test Equip., Clifton, NJ
Jonard Inds. Corp., Bronx, N.Y.
Kurz-Kasch Incorporated, Dayton, Ohio
New Prod. Engrg., Wabash, Ind.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Optimized Devices Inc., Pleasantville, N.Y.
Ostby & Barton Co., Providence, R.I.
Qualco, Los Altos, Cal.
Sigma Instrs., Inc., Braintree, Mass.
Slaughter Co., Ardmore, Okla.
Solatron Enterprises, Inglewood, Calif.
Struthers-Dunn, Inc., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Teradyne, Inc., Boston, Mass.
Wilmar Elctrns. Inc., Torrance, Cal.
Zehntel, Inc., Concord, Cal.

Testers, Resistivity

W-F Products, Inc., Denver, Co. Vol 1•934
Associated Resch., Chicago, Ill.
Automation Dynamics, Northvale, N.J.
Beckman Instrs., Cedar Grove, N.J.
Biddle, James G., Plymouth Meeting, Pa.
Boonton Elctrns., Parsippany, N.J.
Cosar Corp., Garland, Texas
Custom Sci. Instrs., Inc., Whippany, N.J.
General Radio Co., Concord, Mass.
Hipotronics, Inc., Brewster, N.Y.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Matheson Gas Products, East Rutherford, N.J.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Ostby & Barton Co., Providence, R.I.
Penn Airborne Prods., Southampton, Pa.
PSC Technology Inc., Glendale, Cal.
Rohde & Schwarz Sls., Passaic, N.J.
Shallcross, Selma, N.C.

Testers, Resistor

A. D. Data Sys., Inc., Rochester, N.Y.
Anchor Specialty Mfg., Teterboro, N.J.
Beckman Instrs., Cedar Grove, N.J.
Biddle, James G., Plymouth Meeting, Pa.
Boonton Elctrns., Parsippany, N.J.
Boonton Electronics Corp., Parsippany, N.J.
Davidson Elctrn. Dev. Co., Erie, Pa.
Electro Sci. Inds., Portland, Ore.
Freed Transformer Co., Bklyn., N.Y.
Freudenberg, B., Inc., New York, N.Y.
General Radio Co., Concord, Mass.
General Resistance, Inc., Mt. Vernon, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Ind'l. Test Equip., Clifton, NJ
IPT Corp., Sunnyvale, Cal.
Julie Research Lab., New York, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Luft Instrs., Inc., Lincoln, Mass.
Mercury Elctrns. Corp., Mineola, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Optimized Devices Inc., Pleasantville, N.Y.
Penn Airborne Prods., Southampton, Pa.
Peschel Instrs., Cape Coral, Fla.
Quan-Tech, Whippany, N.J.
RFL Inds., Instr. Div., Boonton, N.J.
Shallcross, Selma, N.C.
Simpson Elec. Co., Chicago, Ill.
Slaughter Co., Ardmore, Okla.
Teradyne, Inc., Boston, Mass.

Testers, Servo—See Analyzers, Servo

Testers, Shock

Cincinnati Sub-Zero Prods., Cincinnati, Ohio ..... Vol 1•383
Blue M Engrg. Co., Blue Island, Ill.
Impact-O-Graph Corp., Bedford, Ohio
IMPACT-O-GRAPH Div., Bedford, Ohio
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
L.A.B. Corp., Skaneateles, N.Y.
Larson Aero Dev., Concord, Calif.
Sotcher Measurement, Cupertino, Cal.
Spectral Dynamics Corp. San Diego, San Diego, Cal.

Testers, Short-Turn—See Testers, Coil

Testers, Signal Tracing

AD Automation, Rochester, N.Y. Vol 1•386
Counterscan Systems, Sutton, Neb. Vol 1•417
Kurz-Kasch Incorporated, Dayton, Ohio Vol 1•475
Vaco Prods. Co., Chicago, Ill. Vol 3•1242
Allied Elctrns., Chicago, Ill.
Automated Meas., Oakland, Calif.
Automation Dynamics, Northvale, N.J.
Barnes & Reinecke, Inc., Chicago, Ill.
Circon Corp., Santa Barbara, Ca.
Collins Radio Co., Dallas, Tex.
Comaltest, Danbury, Conn.
Computer Automation, Inc., Irvine, Cal.
Dataprobe, Inc., So. Hackensack, N.J.
Desco Mfg. Co., Glendale, Calif.
Dit-MCO International, Kansas City, Mo.
Dynascan Corp., Chicago, Ill.
Dytro Corp., Hicksville, N.Y.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Hunter Tools, El Monte, Calif
Ideal Industries, Inc., Sycamore, Ill.
IE Mfg. Co., Chicago, Ill.
IPT Corp., Sunnyvale, Cal.
Jerrold Electronics Corp., Philadelphia, Pa.
Program Data Co., Carson, Cal.
PSC Technology Inc., Glendale, Cal.
Simpson Elec. Co., Chicago, Ill.
Systron-Donner Corp., Concord, Cal.
Systron-Donner Concord Instr. Div., Concord, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Workman Elctrn. Prods., Inc., Sarasota, Fla.
Zehntel, Inc., Concord, Cal.

Testers, Solderability—See Machines, Solderability Testing

Testers, Spark

Henry Prods. Co., Inc., Inwood, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Micro Instr. Co., Hawthorne, Cal.
Slaughter Co., Ardmore, Okla.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.

Testers, Synchro/Resolver

Advance Instr. Corp., Belmar, N. J.
Astrosystems, Inc., Lake Success, N.Y.
Bendix Aerospace-Elctrns., Teterboro, N.J.
C & A Products, Inc., Woodside, N. Y.
Clifton Precision, Clifton Hgts., Pa.
Computer Conversions Corp., East Northport, N.Y.
Control Technology Co., L.I.C., N.Y.
ILC Data Device Corp., Hicksville, N.Y.
NH Research, Inc., Santa Ana, Calif.
North Atlantic Inds., Plainview, N.Y.
Singer Co., Little Falls, N.J.
Theta Instr. Corp., Fairfield, N.J.
Zehntel, Inc., Concord, Cal.

Testers, Tachometer

Advance Instr. Corp., Belmar, N. J.
New Era Products, Cleveland, Ohio
Singer Co., Little Falls, N.J.
Vibrac Corp., Chelmsford, Mass.
Zehntel, Inc., Concord, Cal.

Testers, Telephone - Also see Telephone Channel Test & Simulator Equipment

Comstron Corp., Richmond Hill, N.Y. Vol 1•500; Vol 2•577
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y. Vol 1•500; Vol 2•577
Communications Technology Corp., Los Angeles, Cal.
Computer Automation, Inc., Irvine, Cal.
Elgin Elctrns. Inc., Waterford, Pa.
Kurz-Kasch Incorporated, Dayton, Ohio
NES, Inc., Itasca, Ill.
Projects Unlimited, Inc., Dayton, Ohio
Voiceprint Laboratories Corp., Somerville, N. J.
Wiltron Co., Palo Alto, Calif.
Zehntel, Inc., Concord, Cal.

Testers, Teletypewriter

Re-el Circuits, Inc., Saddle Brook, N.J. Vol 1•320
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
NES, Inc., Itasca, Ill.

Testers, Thickness (All Types)

Bicron Elctrns. Co., Canaan, Conn.
Biddle, James G., Plymouth Meeting, Pa.
Chemical Etching Equip. & Supply, Alexandria, Va.
Custom Sci. Instrs., Inc., Whippany, N.J.
Edwards High Vacuum, Grand Island, N.Y.
Electron-Machine Corp., Umatilla, Fla.
Kaman Sciences Corp., Colorado Springs, Colo.
Kelk, George Ltd., Don Mills, Ont., Canada
Landis & Gyr, Inc., Elmsford, N.Y.
Lion Precision Corp, Newton, Mass.
Magnaflux Corp., Chicago, Ill.
Minnetech Labs, Minneapolis, Minn.
Sloan Technology Corp., Santa Barbara, Calif.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.

Testers, Torque

Anchor Specialty Mfg., Teterboro, N.J.
Applied Control Co., Fairfield, N.J.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bendix, Utica, N.Y.
BLH Elctrns., Inc., Waltham, Mass.
Bowmar/ALI, Inc., Acton, Mass.
Chatillon John & Sons, Kew Gardens, N.Y.
Cole-Parmer Instr. Co., Chicago, Ill.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Himmelstein, S. & Co., Elk Grove Village, Ill.
Jonard Inds. Corp., Bronx, N.Y.
McFadden Elctrns. Co., South Gate, Calif.
Owatonna Tool Co., Owatonna, Minn.
Power Instrs., Skokie, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Techni-Tool, Inc., Philadelphia, Pa.
Vibrac Corp., Chelmsford, Mass.
Waters Mfg., Inc., Wayland, Mass.
West Coast Resch. Corp., Los Angeles, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

Testers, Tracking & Erosion Resistance (Insulation)

Beckman Instrs., Cedar Grove, N.J.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
ITT Jennings, Instrus. & Systems, San Jose, Calif.

Testers, Transistor

Hickok Elect. Instr., Cleveland, Ohio Vol 4•411*
Kurz-Kasch Incorporated, Dayton, Ohio Vol 1•475; Vol 4•415*
Precision Standards Corp., Santa Ana, Cal. ..... Vol 1•495
American Elctrn. Labs., Inc., Lansdale, Pa.
Automated Meas., Oakland, Calif.
Beckman Instrs., (AISSD), Fullerton, Cal.
Bulova Watch Co., Valley Stream, N.Y.
Custom Sci. Instrs., Inc., Whippany, N.J.
Desco Mfg. Co., Glendale, Calif.
Dynascan Corp., Chicago, Ill.
Fairchild Sys. Technology, Palo Alto, Cal.
General Microwave Corp., Farmingdale, N.Y.
Gralex Inds., Div. Gen. Microwave, Farmingdale, N.Y.
Heath Co., Benton Harbor, Mich.
IPT Corp., Sunnyvale, Cal.
MacDonald & Co., Glendale, Calif.
Mastech, Inc., Syracuse, N.Y.
Optimized Devices Inc., Pleasantville, N.Y.
Quan-Tech, Whippany, N.J.
RCA Elctrns. Comps., Harrison, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Spectra Sonics, Ogden, Utah
Systron-Donner Concord Instr. Div., Concord, Cal.
Tektronix, Inc., Beaverton, Ore.
Telvac Instr. Co., Van Nuys, Cal.
Teradyne, Inc., Boston, Mass.
Texas Instruments, Dallas, Tex.
Trio-Tech, Inc. of Calif., Burbank, Calif.
Triplett Corp., Bluffton, Ohio
Velonex, Santa Clara, Calif.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Testers, Transmission & Delay

Comstron Corp., Richmond Hill, N.Y. Vol 1•500
Marconi Instrs., Englewood, N.J. Vol 1•484
Seg Elctrns. Sub. Comstron Corp., Richmond Hill, N.Y. ..... Vol 1•500
Bowmar/ALI, Inc., Acton, Mass.
Digitech Data Inds., Inc., Ridgefield, Conn.
Digitech Data Inds., Inc., Ridgefield, Conn.
Dranetz Engrg. Labs., So. Plainfield, N.J.
Edison Elctrns. Div., Manchester, N.H.
International Data Sciences, Providence, R.I.
Phelps Dodge Comm., North Haven, Conn.
Railway Comm., Raytown, Mo.
Rantec Div., Calabasas, Calif.
Systron-Donner Datapulse Div., Culver City, Cal.
Systron-Donner Kruse Elctrns. Sub., Sunnyvale, Cal.
Vari-L Co., Inc., Denver, Colo.
Wiltron Co., Palo Alto, Calif.
Zehntel, Inc., Concord, Cal.

Testers, Tube

Cober Elctrns., Inc., Stamford, Conn. Vol 1•545
Hickok Elect. Instr., Cleveland, Ohio Vol 4•411*
Venus Scientific, Farmingdale, N.Y. Vol 1•929
Dynascan Corp., Chicago, Ill.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heath Co., Benton Harbor, Mich.
Henry Prods. Co., Inc., Inwood, N.Y.
Lattin Radio Labs., Owensboro, Ky.
Mercury Elctrns. Corp., Mineola, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
RIL Elctrns., Inc., Southampton, Pa.
Scientronics, Barrington, N.J.
Seco Elctrns. Corp., Hopkins, Minn.

Testers, Vibration—See Vibration Test Systems

Testers, Voltage Breakdown

Associated Resch., Chicago, Ill. Vol 1•388,389
Hipotronics, Inc., Brewster, N.Y. Vol 1•455
ITT Jennings, San Jose, Cal Vol 1•458,459
ITT Jennings, Instrus. & Systems, San Jose, Calif. ..... Vol 1•458,459
Slaughter Co., Ardmore, Okla. Vol 1•505
Advanced Kinetics, Costa Mesa, Calif.
Aerotronic Assocs., Inc., Contoocook, N.H.
Automatic Production Systems Inc., Pennsauken, N.J.
Avtron Mfg., Inc., Cleveland, Ohio
Beckman Instrs., Cedar Grove, N.J.
Bendix Corp., Sidney, N.Y.
Bertan Assocs., Inc., Hicksville, N.Y.
Biddle, James G., Plymouth Meeting, Pa.
Cober Elctrns., Inc., Stamford, Conn.
Cole Instrument Corp., Costa Mesa, Cal.
Counterscan Systems, Sutton, Neb.
Del Electronics Corp., Mt. Vernon, N.Y.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Hughes Aircraft Co., Ind'l. Prods. Div.
FACT Sys., Los Angeles, Cal.
IPT Corp., Sunnyvale, Cal.
Kahle Engrg. Co., Union City, N.J.
Kikusui Elctrns. Corp., Kawasaki City, Kanagawa-Pref., Japan
Kilovolt Corp., Hackensack, N.J.
Malco, A Microdot Co., Inc., Chicago, Ill.
Megavolt, Inc., New York, N.Y.
Micro Instr. Co., Hawthorne, Cal.
Opad Elec. Co., Inc., New York, N.Y.
Peschel Instrs., Cape Coral, Fla.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Tektronix, Inc., Beaverton, Ore.
Teradyne, Inc., Boston, Mass.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Velonex, Santa Clara, Calif.

Testing, Environmental—See Services, Environmental Testing

Thermistors

Carborundum Co., Niagara Falls, N.Y. Vol 2•1157-1159
Fenwal Elctrns., Framingham, Mass. Vol 2•1162
Keystone Carbon Co., St. Marys, Pa. Vol 2•1165-1169
NL Inds., Inc., Hightstown, N.J. Vol 2•1170,1171
Omega Engrg., Inc., Stamford, Conn. Vol 2•1173
Triac Elctrn. Sys., Forest Hills, N. Y. Vol 2•371,375
Arcidy Assocs., Manchester, N. H.
Bacharach Instr. Co., Pittsburgh, Pa.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Carbone Corp., Boonton, N.J.
Ceramic Magnetics, Inc., Fairfield, N.J.
Conax Corp., Buffalo, N.Y.
Cox & Co., Inc., New York, N.Y.
Electro Mats. Corp. Amer., Mamaroneck, N.Y.
GC Electronics, Rockford, Ill.
General Microwave Corp., Farmingdale, N.Y.
Gulton Inds., Inc., Metuchen, N.J.
Honeywell, Ft. Washington, Pa.
Interelectronics Corp., Congers, N.Y.
Mepco, Inc., Morristown, N.J.
Murata Corp. of America, Elmsford, N.Y.
Murata Mfg. Co. Ltd., Kyoto, Japan
P.E.T., Inc., Pittsburgh, Pa.
PRD Elctrns., Inc., Westbury, N.Y.
RDF Corp., Hudson, N.H.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Rodan Ind's., Anaheim, Ca.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Attleboro, Mass.
Thermometrics, Inc., Edison, N.J.
United Elec. Controls Co., Watertown, Mass.
United Sys. Corp., Dayton, Ohio
Victory Engrg. Corp., Springfield, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Workman Elctrn. Prods., Inc., Sarasota, Fla.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Thermo Compression Bonding Equipment

Hughes Aircraft Co., Welding Equip./Ind'l. Prods. Div., Oceanside, Calif.

Thermocouples, Elements & Accessories

Modutec, Inc., Norwalk, Conn. Vol 1•486-489
North Hills Elctrns., Inc., Glen Cove, N.Y. ..... Vol 2•358
Omega Engrg., Inc., Stamford, Conn. Vol 2•1172,1173
PPM, Inc., Bedford, Ohio ..... Vol 1•493
Alnor Instr. Co., Chicago, Ill.
Amersil, Inc., Hillside, N.J.
Amperex Electronic Corp., Hicksville, N.Y.
Amphenol Connector Div., Broadview, Ill.
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill.
ARI Inds., Inc., Franklin Pk., Ill.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bailey Meter Co., Wickliffe, Ohio
Ballantine Laboratories, Inc., Boonton,, N. J.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barker Elec. Sls., Ship Bottom, NJ
Beckman Instrs., (AISSD), Fullerton, Cal.
Best Elecs. Div., Seattle, Wash.
Bram Metallurgical-Chem. Co., Phila., Pa.
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., Minneapolis, Minn.
Conax Corp., Buffalo, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Foxboro Co., Foxboro, Mass.
Fredericks Co., Huntingdon Valley, Pa.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
General Lab. Assocs., Norwich, N.Y.
Honeywell, Ft. Washington, Pa.
Hy-Cal Engrg., Santa Fe Springs, Cal.
J-B-T Instrs., Inc., New Haven, Conn.
Leeds & Northrup Corp., No. Wales, Pa.
Leico Inds., Inc., New York, N.Y.
Marlin Mfg. Corp., Cleveland, Ohio
Materials for Elctrns., Inc., Jamaica, N.Y.
National Beryllia Corp., Haskell, N.J.
NES, Inc., Itasca, Ill.
Nuclear Sys., Garland, Tex.
RDF Corp., Hudson, N.H.
Revere Elctrn. Div., Wallingford, Conn.
Recorder Systems Div., E. Greenwich, R.I.
Sigma Instrs., Inc., Braintree, Mass.
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Automatic Timing & Controls, Inc., King of Prussia, Pa.
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Ripley Co., Inc., Middletown, Conn.
Sangamo Elec. Co., Springfield, Ill.
Scientronics, Barrington, N.J.
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Signetics. Corp., Sunnyvale, Calif.
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Electro-Module, Inc., Pomona, Cal.
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PPM, Inc., Bedford, Ohio
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Ratelco, Inc., Seattle, Wash.
Raymond Controls Corp., Middletown, Conn.
Relay Specialties Inc., Fair Lawn, N.J.
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Signetics. Corp., Sunnyvale, Calif.
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Bulova Watch Co., Valley Stream, N.Y.
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Burr-Brown Resch. Corp., Tucson, Ariz.
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Controlcraft Corp., West Chicago, Ill.
Controls Div., Elizabeth, N.J.
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Datametrics Inc., Wilmington, Mass.
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Fairchild Space & Defense Sys., Syosset, N.Y.
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Harshaw Chem. Co., Cleveland, Ohio
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Ingraham Inds., Controls Div., Elizabethtown, Ky.
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Master Elctrn. Controls, Santa Monica, Cal.
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MKC Elctrns. Corp., Kansas City, Kans.
NES, Inc., Itasca, Ill.
North American Philips Controls Corp., Cheshire, Conn.
Paragon Elec. Co., Two Rivers, Wisc.
PPM, Inc., Bedford, Ohio
Precision Dynamics Corp., Burbank, Cal.
Precision Mechanisms Corp., Westbury, N.Y.
Precision Timer Co., Westbrook, Conn.
Raymond Controls Corp., Middletown, Conn.
Relay Specialties Inc., Fair Lawn, N.J.
Ripley Co., Inc., Middletown, Conn.
Scientronics, Barrington, N.J.
Signetics. Corp., Sunnyvale, Calif.
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Struthers-Dunn, Inc., Bettendorf, Iowa
Syracuse Elctrns. Corp., Syracuse, N.Y.
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Curtis Dev. & Mfg., Milwaukee, Wisc.
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Datum, Inc., Anaheim, Calif.
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MKC Elctrns. Corp., Kansas City, Kans.
National Semiconductor, Santa Clara, Cal.
NES, Inc., Itasca, Ill.
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Signetics. Corp., Sunnyvale, Calif.
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Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Pitman, N.J.
Struthers-Dunn, Inc., Bettendorf, Iowa
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Warren G-V Communications, Livingston, N.J.

Timers, Thermal

Cutler-Hammer, Milwaukee, Wisc.
E-T-A Prods. Co. America, Chicago, Ill.
Hoagland Instr., Dayton, N.J.
Industrial Timer Corp., Parsippany, N.J.
Raymond Controls Corp., Middletown, Conn.
Relay Specialties Inc., Fair Lawn, N.J.
Ripley Co., Inc., Middletown, Conn.
Struthers-Dunn, Inc., Pitman, N.J.
Struthers-Dunn, Inc., Bettendorf, Iowa
Tempo Instrument, Inc., Plainview, N.Y.
Texas Instruments, Attleboro, Mass.
Triac Elctrn. Sys., Forest Hills, N. Y.
Warren G-V Communications, Livingston, N.J.

Timing Switches—See Timers

Tool Kits & Sets

Channellock, Inc., Meadville, Pa. Vol 3•1235
GC Electronics, Rockford, Ill. Vol 3•679
Jonard Inds. Corp., Bronx, N.Y. Vol 4•559*
Allied Elctrns., Chicago, Ill.
Amphenol Connector Div., Broadview, Ill.
Bearing Inspection, Santa Fe Springs, Cal.
Circon Corp., Santa Barbara, Ca.
Cole-Parmer Instr. Co., Chicago, Ill.
Erikson Specialized Tool Co., Pico-Rivera, Cal.
General Hardware Mfg. Co., New York, N.Y.
Hunter Tools, El Monte, Calif
Kawecki Berylco Inds., Inc., New York, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Moody Tools, Inc., Providence, R.I.
Neuses, P.K., Inc., Arlington Hgts., Ill.
Skyo Industries Inc., Deer Park, N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Telvac Instr. Co., Van Nuys, Cal.
Thomas & Betts Co., Elizabeth, N.J.
Uber Grafic Instrs., Palo Alto, Calif.
UNGAR, Compton, Calif.
Utica Tool Co., Inc., Orangeburg, S.C.
Vaco Prods. Co., Chicago, Ill.
X-Acto, Long Island City, N.Y.
Xcelite, Inc., Orchard Park, N.Y.

Tools, Alignment & Tuning

GC Electronics, Rockford, Ill. Vol 3•679
Jonard Inds. Corp., Bronx, N.Y. Vol 4•559*
Erikson Specialized Tool Co., Pico-Rivera, Cal.
Keystone Elctrns. Corp., New York, N.Y.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Richco Plastic Co., Chicago, Ill.
Skyo Industries Inc., Deer Park, N.Y.
Smith, Herman H., Inc., Bklyn., N.Y.
Syntronic Instrs., Inc., Addison, Ill.
Techni-Tool, Inc., Philadelphia, Pa.
Vaco Prods. Co., Chicago, Ill.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Tools & Kits, Contact Insertion/Removal

Amphenol Connector Div., Broadview, Ill. Vol 3•572,626,627
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill. Vol 3•572,626,627
Mac Panel Co., High Pt., N.C. Vol 3•701
Robinson-Nugent, New Albany, Ind. Vol 4•380*
Mann, Henry Inc., Feasterville, Pa.
Solder Removal Co., Covina, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
Viking Inds., Inc., Chatsworth, Calif.

Tools, Connector

Amphenol Connector Div., Broadview, Ill. Vol 3•626,627
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill. Vol 3•626,627
Mac Panel Co., High Pt., N.C. Vol 3•701
Amp Inc., Harrisburg, Pa.
Mann, Henry Inc., Feasterville, Pa.
Molex Inc., Lisle, Ill.
Priority Services, Burbank, Cal.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Thomas & Betts Co., Elizabeth, N.J.
3M Co., St. Paul, Minn.
Viking Inds., Inc., Chatsworth, Calif.

Tools, Crimping & Swaging

Amphenol Connector Div., Broadview, Ill. Vol 3•572,573
Amphenol RF Div., Danbury, Conn. Vol 3•645
Amphenol Sales Div., Bunker Ramo Corp., Broadview, Ill. Vol 3•572,573,645
Beman Mfg., Inc., New Cumberland, Pa. Vol 3•649
Buchanan Elec. Prods., Union, N.J. Vol 3•558
Cinch Connectors, Oper of TRW Elctrn. Comps., Elk Grove Village, Ill. Vol 3•854,874
ETC, Div. ITT, Cleveland, Ohio Vol 3•665
Mac Panel Co., High Pt., N.C. Vol 3•701
Panduit Corp., Tinley Pk., Ill. Vol 3•1409
Smith, Herman H., Inc., Bklyn., N.Y. Vol 3•815,816
Vaco Prods. Co., Chicago, Ill. Vol 3•953,1242
Americon Microwave Inds., Inc., Waltham, Mass.
Amp Inc., Harrisburg, Pa.
Amphenol Cadre Div., Endicott, N.Y.
Amphenol Ind'l. Div., Chicago, Ill.
Ark-Les Switch Corp., Watertown, Mass.
Berg Electronics, New Cumberland, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Black & Webster, Inc., Waltham, Mass.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Burndy Corp., Norwalk, Conn.
Cambridge Thermionic, Cambridge, Mass
Circon Corp., Santa Barbara, Ca.
Concord Elctrns., New York, N.Y.
Elco, Willow Grove, Pa.
GC Electronics, Rockford, Ill.
General Hardware Mfg. Co., New York, N.Y.
General Radio Co., Concord, Mass.
Hollingsworth Solderless Terminal, Phoenixville, Pa.
Hughes Aircraft Co., Connecting Devices, Newport Beach, Cal.
Hunter Tools, El Monte, Calif
Ideal Industries, Inc., Sycamore, Ill.
ITT Cannon Electric, Santa Ana, Cal.
ITT Holub Inds., Sycamore, Ill.
Jonard Inds. Corp., Bronx, N.Y.

Keystone Elctrns. Corp., New York, N.Y.
Klein, Mathias & Sons, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Molex Inc., Lisle, Ill.
Pico Crimping Tools Co., Santa Fe Springs, Calif.
Porter, H.K., Inc., Somerville, Mass.
Shure Bros., Inc., Evanston, Ill.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Superior Mfg. & Instrument Corp., Long Island City, N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Thomas & Betts Co., Elizabeth, N.J.
3M Co. Electro Prods. Div., St. Paul, Minn.
3M Co., St. Paul, Minn.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Viking Inds., Inc., Chatsworth, Calif.
Waldom Elctrns., Inc., Chicago, Ill.
X-Acto, Long Island City, N.Y.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

Tools, Heat Sealing

Harwil Co., Santa Monica, Calif.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Techni-Tool, Inc., Philadelphia, Pa.

Tools, Microelectronic Handling

Buchanan Elec. Prods., Union, N.J. Vol 3•558
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Circon Corp., Santa Barbara, Ca.
General Hardware Mfg. Co., New York, N.Y.
Jonard Inds. Corp., Bronx, N.Y.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Matrix Engineering Corp., Gardena, Calif.
Orbit Inds., San Luis Obispo, Calif.
Techni-Tool, Inc., Philadelphia, Pa.
UNGAR, Compton, Calif.
Vigor Co., New York, N.Y.
Xcelite, Inc., Orchard Park, N.Y.

Tools, Parts-Handling, Vacuum Operated

Buchanan Elec. Prods., Union, N.J. Vol 3•558
Air-Vac Engrg. Co., Milford, Conn.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Engineering & Elctrn. Devices, Inc., Los Angeles, Calif.
General Hardware Mfg. Co., New York, N.Y.
Henes Mfg. Co., Phoenix, Ariz.
Jonard Inds. Corp., Bronx, N.Y.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Techni-Tool, Inc., Philadelphia, Pa.
Telvac Instr. Co., Van Nuys, Cal.

Tools, Relay Servicing

Jonard Inds. Corp., Bronx, N.Y. Vol 4•559•
GC Electronics, Rockford, Ill.
GTE Automatic Elec., Northlake, Ill.
Klein, Mathias & Sons, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Neuses, P.K., Inc., Arlington Hgts., Ill.
Techni-Tool, Inc., Philadelphia, Pa.

Tools, Resistance Soldering—See Soldering Equip., Resistance

Tools, Wire Wrapping-Also See Machines, Wire Wrapping

Gardner-Denver Co., Quincy, Ill.
Jonard Inds. Corp., Bronx, N.Y.
Mann, Henry Inc., Feasterville, Pa.
Mupac Corp., Brockton, Mass.
Ostby & Barton Co., Providence, R.I.
Standard Pneumatic Motor Co., Reno, Nev.

Torches, Soldering, Welding & Access.

Wall-Lenk Mfg. Co., Kinston, N.C. Vol 3• 1243
Mann, Henry Inc., Feasterville, Pa.

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Torque Testers—See Testers, Torque

Torquers, Gyro—See Motors, Torque

Totalizers, Digital

Hecon Corp., New Shrewsbury, N.J. Vol 1•344
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Landis & Gyr, Inc., Elmsford, N.Y. Vol 2•366
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Abrams Instr., Lansing, Mich.
Acromag, Inc., Wixom, Mich.
Anadex Instrs., Inc., Van Nuys, Calif.
Applied Control Co., Fairfield, N.J.
Ballantine Laboratories, Inc., Boonton,, N. J.
Bristol Div, Waterbury, Conn
Collins Radio Co., Dallas, Tex.
Controlcraft Corp., West Chicago, Ill.
Datametrics Inc., Wilmington, Mass.
Davidson Elctrn. Dev. Co., Erie, Pa.
Digital Equip. Corp., Maynard, Mass.
Dynapar Corp., Gurnee, Ill.
Dytro Corp., Hicksville, N.Y.
Eagle Signal, Davenport, Iowa
Eldorado Electrodata, Concord, Cal.
Electro-Numerics, Santa Clara, Cal.
Electronic Research Co., Shawnee Mission, Kan.
ENM Co., Chicago, Ill.
ESE, Inglewood, Cal.
Flow Technology, Inc., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
Geo Space Sys., Tampa, Fla.
Innovatek Enterprise, Millerton, N.Y.
Monitor Labs, Inc., San Diego, Cal.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
NES, Inc., Itasca, Ill.
Norden Div., Norwalk, Conn.
Pinlites, Fairfield, N.J.
Precision Dynamics Corp., Burbank, Cal.
Precision Timer Co., Westbrook, Conn.
Presin Co., Inc., Shelton, Conn.
Railway Comm., Raytown, Mo.
Speed Detectors, Bedford, Ohio
Struthers-Dunn, Inc., Bettendorf, Iowa
Systron-Donner Concord Instr. Div., Concord, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tektronix, Inc., Beaverton, Ore.
Theta Instr. Corp., Fairfield, N.J.
Thiem Industries, Inc., Torrance, Cal.
Toledo Scale, Toledo, Ohio

Towers, Antenna—See Antenna Towers

Tracers, Curve, Tube & Transistor

Dynascan Corp., Chicago, Ill.. Vol 1•401
Tektronix, Inc., Beaverton, Ore. Vol 1•513
Spectra Sonics, Ogden, Utah
Systron-Donner Concord Instr. Div., Concord, Cal.

Tracers, Signal—See Testers, Signal Tracing

Tracers, Voltage Curve

Systron-Donner Concord Instr. Div., Concord, Cal.
Tektronix, Inc., Beaverton, Ore.

Tracking Systems

Geo Space Sys., Tampa, Fla. .. Vol 1•550
Metric Sys., Ft. Walton Beach, Fla. Vol 1•356,357
Vega Precision Labs., Vienna, Va. Vol 1•568
ABA Industries, Inc., Pinellas Pk., Fla.
Aeroflex Labs., Plainview, N.Y.
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Barnes Engrg. Co., Stamford, Conn.
Beukers Labs., Inc., Hauppauge, N.Y.
Control Technology Co., L.I.C., N.Y.
Cubic Corp., San Diego, Cal.
Datron Systems, Chatsworth, Cal.
Electrac, Inc., Anaheim, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Honeywell, Minneapolis, Minn.
Ind'l. Control Co., Farmingdale, N.Y.
Kollsman Instr. Co., Syosset, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Measurement Sys., Inc., Norwalk, Conn.
Orbit Instr. Corp., Syosset, N.Y.
Parabam, Inc., Compton, Cal.
Quan-Tech, Whippany, N.J.
Rantec Div., Calabasas, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
Scientific-Atlanta, Inc., Atlanta, Ga.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Tasker Systems, Chatsworth, Cal.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.
Whittaker Corp., Los Angeles, Cal.

Transducers, Acceleration—See Accelerometers

Transducers, Displacement

Gould, Inc., Cleveland, Ohio .. Vol 2•1177
Ohio Semitronics, Columbus, Ohio Vol 1•491
SRC Div., Newport Bch., Cal. Vol 2•1178
American Aerospace Controls Inc., Farmingdale, N.Y.
Ametek/Instrs. & Controls, Feasterville, Pa.
Astrosystems, Inc., Lake Success, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Bourns, Inc., Instr. Div., Riverside, Calif.
Bowmar/TIC, Inc., Newbury Park, Calif.
Bristol Div, Waterbury, Conn
Carter Mfg. Corp., Hudson, Mass.
Clifton Precision, Clifton Hgts., Pa.
Collins, G.L. Corp., Long Beach, Calif.
Columbia Resch. Labs., Woodlyn, Pa.
Computer Conversions Corp., East Northport, N.Y.
Computer Instrs., Hempstead, N.Y.
Control Data Corp., Minneapolis, Minn.
Davidson Elctrn. Dev. Co., Erie, Pa.
Del Electronics Corp., Mt. Vernon, N.Y.
Disc Instruments, Inc., Costa Mesa, Ca.
Dynamic Data Corp., Columbus, Ohio
Dynapar Corp., Gurnee, Ill.
Dytronics Co., Columbus, Ohio
Electro Corp., Sarasota, Fla.
Engdahl Enterprises, Costa Mesa, Cal.
Foxboro Co., Foxboro, Mass.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
Hamlin, Inc., Lake Mills, Wisc.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Honeywell, Denver, Colo.
Humphrey, Inc., San Diego, Calif.
Jordan Controls, Milwaukee, Wisc.
Kaman Sciences Corp., Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Larson Aero Dev., Concord, Calif.
Lion Precision Corp, Newton, Mass.
Litton Inds., Mt. Vernon, N.Y.
Minnetech Labs, Minneapolis, Minn.
Norden Div., Norwalk, Conn.
Pickering & Co., Plainview, N.Y.
Rank Precision Inds., Des Plaines, Ill.
Research, Inc., Minneapolis, Minn.
Schaevitz Engrg., Pennsauken, N.J.
Scientific Technology, Mountain View, Cal.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Statham Instrs., Inc., Oxnard, Cal.
Tektronix, Inc., Beaverton, Ore.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
West Coast Resch. Corp., Los Angeles, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.

Transducers, Flow

Computer Instrs., Hempstead, N.Y. Vol 2•1175
Ametek/Instrs. & Controls, Feasterville, Pa.
Autocon Inds., Inc., Minneapolis, Minn.
Bailey Meter Co., Wickliffe, Ohio
Bell & Howell Co., Pasadena, Calif.
Bendix Corp., Davenport, Iowa
BLH Elctrns., Inc., Waltham, Mass.
Bristol Div, Waterbury, Conn
Carolina Medical Elctrns., Inc., King, N.C.
Datametrics Inc., Wilmington, Mass.
Disc Instruments, Inc., Costa Mesa, Ca.
Flow Technology, Inc., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
Honeywell, Denver, Colo.
Kaman Sciences Corp., Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Leeds & Northrup Corp., No. Wales, Pa.
Lion Precision Corp, Newton, Mass.
National Semiconductor, Santa Clara, Cal.
Robertshaw Controls Co., Richmond, Va.
Rosemount Inc., Minneapolis, Minn.
Schaevitz Engrg., Pennsauken, N.J.
Sensotec, Inc., Columbus, Ohio
Signet Scientific Co., Burbank, Cal.
Statham Instrs., Inc., Oxnard, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Thermo Sys., Inc., St. Paul, Minn.
Tylan Corp., Torrance, Calif.
West Coast Resch. Corp., Los Angeles, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.

Transducers, Force

SRC Div., Newport Bch., Cal. Vol 2•1178
Ailtech, City of Industry, Cal.
Aviation Elec., Ltd., Montreal 379, Que., Can.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Bristol Div, Waterbury, Conn
Coil Co. of Amer., Northvale, N.J.
Columbia Resch. Labs., Woodlyn, Pa.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Endevco, Pasadena, Calif.
Engdahl Enterprises, Costa Mesa, Cal.
Foxboro Co., Foxboro, Mass.
Honeywell, Denver, Colo.
Kaman Sciences Corp., Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Kulite Semiconductor Prod., Ridgefield, N.J.
Larson Aero Dev., Concord, Calif.
Measurement Sys., Inc., Norwalk, Conn.
Minnetech Labs, Minneapolis, Minn.
National Semiconductor, Santa Clara, Cal.
Norden Div., Norwalk, Conn.
PCB Piezotronics, Inc., Depew, N.Y.
Revere Elctrn. Div., Wallingford, Conn.
Schaevitz Engrg., Pennsauken, N.J.
Sensotec, Inc., Columbus, Ohio
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tektronix, Inc., Beaverton, Ore.
Thwing-Albert Instr. Co., Philadelphia, Pa.
Transducer Controls Corp., Covina, Calif.
Transducers, Inc., Whittier, Ca.
West Coast Resch. Corp., Los Angeles, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zonic Tech. Labs., Cincinnati, Ohio

Transducers, Incremental Digital Position, Rotary—See Encoders, Shaft Position

Transducers, Magnetic Pickup

Int'l. Electro-Magnetics, Palatine, Ill. Vol 1•313
ISC/Telephonics Div, Huntington, N.Y. Vol 2•346,347
Advanced Kinetics, Costa Mesa, Calif.
Airpax Elctrns., Ft. Lauderdale, Fla.
American Aerospace Controls Inc., Farmingdale, N.Y.
Amtron Inc., Midlothian, Ill.

Astrosystems, Inc., Lake Success, N.Y.
Automation Services Div., Windsor, N. Y.
B & K Instrs., Inc., Cleveland, Ohio
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Control Data Corp., Minneapolis, Minn.
Controlcraft Corp., West Chicago, Ill.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dynapar Corp., Gurnee, Ill.
Electro Corp., Sarasota, Fla.
Flow Technology, Inc., Tempe, Ariz.
Grado Labs., Inc., Brooklyn, N.Y.
Knowles Elctrns., Inc., Franklin Park, Ill.
LDJ Electronics, Troy, Mich.
Norden Div., Norwalk, Conn.
Ohio Semitronics, Columbus, Ohio
PECO Corp., Milpitas, Cal.
Power Instrs., Skokie, Ill.
RFL Inds., Instr. Div., Boonton, N.J.
Schaevitz Engrg., Pennsauken, N.J.
Sensor Corp., Scottsdale, Pa.
Solid State Elctrns. Corp., Sepulveda, Cal.
Sonotone Corp., Elmsford, N.Y.
Speed Detectors, Bedford, Ohio
SRC Div., Newport Bch., Cal.
Statham Instrs., Inc., Oxnard, Cal.
Telex Comm. Div., Minneapolis, Minn.

Transducers, Power—See Transducers, Volt, Watt, Currents, etc.

Transducers, Pressure

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Advanced Kinetics, Costa Mesa, Calif.
Ailtech, City of Industry, Cal.
Alnor Instr. Co., Chicago, Ill.
Ametek/Instrs. & Controls, Feasterville, Pa.
Autocon Inds., Inc., Minneapolis, Minn.
Aviation Elec., Ltd., Montreal 379, Que., Can.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bell & Howell Co., Pasadena, Calif.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp. Environmtl. Sci., Baltimore, Md.
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Bourns, Inc., Instr. Div., Riverside, Calif.
Bristol Div, Waterbury, Conn
Channel Inds., Santa Barbara, Cal.
Columbia Resch. Labs., Woodlyn, Pa.
Conrac Corp., Duarte, Cal.
Consolidated Controls Corp., Bethel, Conn.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Datametrics Inc., Wilmington, Mass.
Dynisco, Westwood, Mass.
Edison, Instr. Div., W. Orange, N.J.
Endevco, Pasadena, Calif.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., Batavia, Ill.
Genisco Technolgy Corp., Instrument Div. (Transducers), Compton, Cal.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
Harrel, Inc., E. Norwalk, Conn.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Honeywell, Mpls., Minn.
Honeywell, Denver, Colo.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kaman Sciences Corp., Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Kollsman Instr. Co., Syosset, N.Y.
Kratos, Pasadena, Cal
Kulite Semiconductor Prod., Ridgefield, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Linden Labs., Inc., State College, Pa.
Lion Precision Corp, Newton, Mass.
Metrix Instr. Co., Houston, Tex.
Minnetech Labs, Minneapolis, Minn.
MKS Instrs., Inc., Burlington, Mass.
National Semiconductor, Santa Clara, Cal.
PCB Piezotronics, Inc., Depew, N.Y.
Penn Engrg. & Mfg. Corp., Doylestown, Pa.
Plessey Enviromental Sys., San Diego, Cal.
Robertshaw Controls Co., Richmond, Va.
Rosemount Inc., Minneapolis, Minn.
Schaevitz Engrg., Pennsauken, N.J.
Sensotec, Inc., Columbus, Ohio
Standard Controls, Seattle, Wash.
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tektronix, Inc., Beaverton, Ore.
Teledyne Taber, No. Tonawanda, N.Y.
Texas Instruments, Attleboro, Mass.
Texas Instruments, Inc., Houston, Tex.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
Transducer Controls Corp., Covina, Calif.
Transducers, Inc., Whittier, Ca.
Validyne Engrg. Corp., Northridge, Cal.
West Coast Resch. Corp., Los Angeles, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Transducers, Strain Gauge

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ailtech, City of Industry, Cal.
Amphenol Controls Oper. of Connector Div., Broadview, Ill.
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
Columbia Resch. Labs., Woodlyn, Pa.
Consolidated Controls Corp., Bethel, Conn.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Doric Sci. Corp., San Diego, Calif.
Dynisco, Westwood, Mass.
Electro-Numerics, Santa Clara, Cal.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
Honeywell, Denver, Colo.
Kaman Sciences Corp., Colorado Springs, Colo.
Kulite Semiconductor Prod., Ridgefield, N.J.
Magnaflux Corp., Chicago, Ill.
Measurement Sys., Inc., Norwalk, Conn.
Micro-Measurements Div., Romulus, Mich.
Ormond Inc., Santa Fe Springs, Cal.
Revere Elctrn. Div., Wallingford, Conn.
Recorder Systems Div., E. Greenwich, R.I.
Sensotec, Inc., Columbus, Ohio
Statham Instrs., Inc., Oxnard, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Taber, No. Tonawanda, N.Y.
Thwing-Albert Instr. Co., Philadelphia, Pa.
Toledo Scale, Toledo, Ohio
Transducer Controls Corp., Covina, Calif.
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Acromag, Inc., Wixom, Mich.
Ametek/Instrs. & Controls, Feasterville, Pa.
Amprobe Instr., Lynbrook, N.Y.
ARI Inds., Inc., Franklin Pk., Ill.
Aviation Elec., Ltd., Montreal 379, Que., Can.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., Minneapolis, Minn.
Conax Corp., Buffalo, N.Y.
Consolidated Controls Corp., Bethel, Conn.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Datametrics Inc., Wilmington, Mass.
Edison, Instr. Div., W. Orange, N.J.
Faria, Thomas G. Corp., Uncasville, Conn.
Fenwal Elctrns., Framingham, Mass.
Foxboro Co., Foxboro, Mass.
General Elec., W. Lynn, Mass.
Genisco Technolgy Corp., Instrument Div. (Transducers), Compton, Cal.
Honeywell, Ft. Washington, Pa.
Honeywell, Mpls., Minn.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Keystone Carbon Co., St. Marys, Pa.
Kulite Semiconductor Prod., Ridgefield, N.J.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Mag-Con, Inc., New Brighton, Minn.
Marlin Mfg. Corp., Cleveland, Ohio
Micro-Measurements Div., Romulus, Mich.
National Semiconductor, Santa Clara, Cal.
Omega Engrg., Inc., Stamford, Conn.
P.E.T., Inc., Pittsburgh, Pa.
Plessey Enviromental Sys., San Diego, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
RDF Corp., Hudson, N.H.
Relco Prods., Denver, Colo.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Riverbank Labs., Geneva, Ill.
Robertshaw Controls Co., Richmond, Va.
Rodan Ind's., Anaheim, Ca.
Rosemount Inc., Minneapolis, Minn.
Scientific Columbus, Columbus, Ohio
Sensotec, Inc., Columbus, Ohio
Stow Labs., Inc., Hudson, Mass.
Syscon Int'l., Inc., So. Bend, Ind.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tektronix, Inc., Beaverton, Ore.
Teledyne Geotech, Dallas, Tex.
Texas Instruments, Attleboro, Mass.
Thermal Sys., Los Angeles, Cal.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
Thermometrics, Inc., Edison, N.J.
Trans-Met Engrg., La Habra, Cal.
Tylan Corp., Torrance, Calif.
West Coast Resch. Corp., Los Angeles, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Westinghouse Elec. Corp., Newark, N.J.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Transducers, Thermoelectric —See Transducers, Temperature

Transducers, Torque

SRC Div., Newport Bch., Cal. Vol 2•1178
Ametek/Instrs. & Controls, Feasterville, Pa.
Aviation Elec., Ltd., Montreal 379, Que., Can.
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Bendix Aerospace-Elctrns., Teterboro, N.J.
BLH Elctrns., Inc., Waltham, Mass.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Himmelstein, S. & Co., Elk Grove Village, Ill.
Honeywell, Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Larson Aero Dev., Concord, Calif.
Measurement Sys., Inc., Norwalk, Conn.
Minnetech Labs, Minneapolis, Minn.
Ormond Inc., Santa Fe Springs, Cal.
Sensotec, Inc., Columbus, Ohio
Transducer Controls Corp., Covina, Calif.
Triac Elctrn. Sys., Forest Hills, N. Y.
Vibrac Corp., Chelmsford, Mass.
West Coast Resch. Corp., Los Angeles, Calif.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Zonic Tech. Labs., Cincinnati, Ohio

Transducers, Ultrasonic

Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Automation Inds., Danbury, Conn.
Bendix Corp., Davenport, Iowa
Channel Inds., Santa Barbara, Cal.
Crystal Technology, Mountain View, Cal
Edo Western Corp., Salt Lake City, Utah
Electro-Voice, Inc., Buchanan, Mich.
Electronic Resch. Assocs., Moonachie, N.J.
Erie Technological Prods. (EEM), Erie, Pa.
Gulton Inds., Fullerton, Cal.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
James Elctrns., Inc., Chicago, Ill.
Kidde, Walter & Co., Belleville, N.J.
Linden Labs., Inc., State College, Pa.
Magnaflux Corp., Chicago, Ill.
Murata Mfg. Co. Ltd., Kyoto, Japan
National Sonics, Farmingdale, N.Y.
Pacific Technology, Renton, Wash.
Panametrics Inc., Waltham, Mass.
TDK Elctrns. Corp., Long Island City, N.Y.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Uthe Technology Int'l., Sunnyvale, Cal.
Vernitron Piezoelectric Div., Bedford, Ohio

Transducers, Velocity

Computer Instrs., Hempstead, N.Y. Vol 2•1175
ISC/Telephonics Div, Huntington, N.Y. Vol 2•346,347
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Ametek/Instrs. & Controls, Feasterville, Pa.
Collins, G.L. Corp., Long Beach, Calif.
Control Data Corp., Minneapolis, Minn.
Datametrics Inc., Wilmington, Mass.
Disc Instruments, Inc., Costa Mesa, Ca.
Edo Western Corp , Salt Lake City, Utah
Electro Corp., Sarasota, Fla.
Engdahl Enterprises, Costa Mesa, Cal.
Geo Space, Houston, Tex.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
Humphrey, Inc., San Diego, Calif.
Pickering & Co., Plainview, N.Y.
Schaevitz Engrg., Pennsauken, N.J.
Speed Detectors, Bedford, Ohio
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Thermo Sys., Inc., St. Paul, Minn.
Transducer Controls Corp., Covina, Calif.
Transicoil, Inc., Worcester, Pa.
Vibra-Metrics, Inc., E. Haven, Conn.

Transducers, Vibration

Unholtz-Dickie Corp., Hamden, Conn. Vol 1•530
Advanced Dynamic Instrs. Div., Alexandria, Va.
Amperex Electronic Corp., Hicksville, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Schiller Park, Ill.
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
Channel Inds., Santa Barbara, Cal.
Columbia Resch. Labs., Woodlyn, Pa.
Dynamic Data Corp., Columbus, Ohio
Dytronics Co., Columbus, Ohio
Edo Western Corp., Salt Lake City, Utah
Electro Corp., Sarasota, Fla.
Endevco, Pasadena, Calif.
General Radio Co., Concord, Mass.
Geo Space, Houston, Tex.
Gulton Inds., Servonic/Instr. Div., Costa Mesa, Cal.
H H Controls Co., Inc., Arlington, Mass.
Honeywell, Denver, Colo.
Kaman Sciences Corp., Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Knowles Elctrns., Inc., Franklin Park, Ill.
Larson Aero Dev., Concord, Calif.
Linden Labs., Inc., State College, Pa.
Metrix Instr. Co., Houston, Tex.
PCB Piezotronics, Inc., Depew, N.Y.
Robertshaw Controls Co., Richmond, Va.
Shure Bros., Inc., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Statham Instrs., Inc., Oxnard, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Geotech, Dallas, Tex.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Vibra-Metrics, Inc., E. Haven, Conn.
Zonic Tech. Labs., Cincinnati, Ohio

Transducers Volt, Watt, Current, Var, Power Factor, Frequency

American Aerospace Controls Inc., Farmingdale, N.Y. ..... Vol 2•328-332
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Scientific Columbus, Columbus, Ohio Vol 2•1180
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Acromag, Inc., Wixom, Mich.
Active Control Instrumentation, E. Northport, NY
Bristol Div, Waterbury, Conn
Cross Electronics Inc., Warrendale, Pa.
Dranetz Engrg. Labs., So. Plainfield, N.J.
EWC, Inc., Kenilworth, N.J.
Flight Sys., Inc., Mechanicsburg, Pa.
General Elec., W. Lynn, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Honeywell, Ft. Washington, Pa.
Kratos, Pasadena, Cal
Omega Engrg., Inc., Stamford, Conn.
RFL Inds., Comms. Div., Boonton, N.J.
Recorder Systems Div., E. Greenwich, R.I.
Westinghouse Elec. Corp., Computer & Instr. Div., Pittsburgh, Pa.
Westinghouse Elec. Corp., Newark, N.J.
Weston Instruments, Inc., Newark, N.J.

Transformers, Audio

ADC Prods., Minneapolis, Minn. Vol 3•1244,1245
Douglas Randall Div., Pawcatuck, Conn. Vol 3•1252
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ACDC Elctrns., Oceanside, Cal.
Aladdin Elctrns., Nashville, Tenn.
Allied Elctrns., Chicago, Ill.
Altec Div., Anaheim, Calif.
American Magnetics Corp., Carterville, Ill.
Bell Industries, Compton, Cal.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
CML-Macarr, Inc., Edison, N.J.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Coil Craft Inc., Bronxville, N.Y.
Custom Coil & Transformer Co., Zanesville, Ohio
Davis J.W. & Co., Dallas, Texas
Dietz Design, Inc., Belton, Mo.
Dynaco, Inc., Philadelphia, Pa.
Electrocom Inds., So. Bend, Indiana
Energy Systems, Palo Alto, Cal.
EWC, Inc., Kenilworth, N.J.
Ferrodyne Corp., Venice, Calif.
Geo Space, Houston, Tex.
Gotham Audio Corp., New York, N.Y.
Grand Transformers, Grand Haven, Mich.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Harder, Donald C. Co., Inc., San Diego, Calif.
Hipotronics, Inc., Brewster, N.Y.
Huntington Elctrns. Corp., Van Nuys, Cal.
JB Elctrn. Transformers, Inc., Chicago, Ill.
Jensen Sound Labs., Schiller Park, Ill.
K.G.S. Elctrns., Pasadena, Cal.
Lambda Elctrns., Melville, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Magnetic Circuit Elements, Monterey, Cal.
Magnetico, Inc., E. Northport, N.Y.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Merrimack Magnetics, Lowell, Mass.
Neshaminy Transformer, Furlong, Pa.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Phoenix Transformer Co., Phoenix, Ariz.
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Engrg., Inc., San Diego, Cal.
Queensboro Transformer & Mach., College Pt., N.Y.
Raytheon Co., Waltham, Mass.
RFL Inds., Comms. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Sennheiser Elctrn. Corp., New York, NY
Shigoto Inds., Ltd., New York, N.Y.
Signal Transformer, Bklyn., N.Y.
Staco, Inc., Dayton, Ohio
Stancor, Chicago, Ill.
Sterling Transformer Corp., Brooklyn, N.Y.
Torwico Elctrns., Inc., Lakewood, N.J.
Triad-Utrad Div., Huntington, Ind.
Zaring Inds., Inc., Westfield, Ind.

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ACDC Elctrns., Oceanside, Cal.
Acme Elec. Corp., Cuba, N.Y.
ADC Prods., Minneapolis, Minn.
Allied Elctrns., Chicago, Ill.
Allis-Chalmers, Milwaukee, Wisc.
Altec Div., Anaheim, Calif.
American Magnetics Corp., Carterville, Ill.
Anzac Elctrns., Waltham, Mass.
Arnold Magnetics, Culver City, Cal.
Astro-Metrix, Burbank, Cal.
Basler Elec. Co., Highland, Ill.
Bell Industries, Compton, Cal.
B.H. Inds., Los Angeles, Cal.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Carson Mfg. Co., Indianapolis, Ind.
CML-Macarr, Inc., Edison, N.J.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Coil Specialty Co., Boalsburg, Pa.
Collins Radio Co., Dallas, Tex.
Component Specialties, Temple City, Cal.
Custom Coil & Transformer Co., Zanesville, Ohio
Del Electronics Corp., Mt. Vernon, N.Y.
Dietz Design, Inc., Belton, Mo.
Elgin Elctrns. Inc., Waterford, Pa.
Energy Systems, Palo Alto, Cal.
EWC, Inc., Kenilworth, N.J.
Ferrodyne Corp., Venice, Calif.
Freed Transformer Co., Bklyn., N.Y.
Gates Elctrn. Co., Bronx, N.Y.
General Radio Co., Concord, Mass.
Geo Space, Houston, Tex.
Grand Transformers, Grand Haven, Mich.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hisonic, Inc., Olathe, Kans.
Hughey & Phillips, Inc., Burbank, Cal.
Huntington Elctrns. Corp., Van Nuys, Cal.
JB Elctrn. Transformers, Inc., Chicago, Ill.
Jefferson Elec., Bellwood, Ill.
K.G.S. Elctrns., Pasadena, Cal.
Lambda Elctrns., Melville, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Magnetic Circuit Elements, Monterey, Cal.
Merrimack Magnetics, Lowell, Mass.
Microtran Co. Inc., Valley Stream, N.Y.
North Electric Co., Galion, Ohio
NWL Transformers, Trenton, N.J.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Ohmite Mfg. Co., Skokie, Ill.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
Perkin-Elmer Corp., Electronic Prods. Dept., Norwalk, Conn.
Peschel Instrs., Cape Coral, Fla.
Phoenix Transformer Co., Phoenix, Ariz.
Pico Elctrns Inc., Mount Vernon, N.Y.
Polygon Inds. Ltd., Toronto 16, Ont., Canada
Polyphase Instr. Co., Bridgeport, Pa.
Queensboro Transformer & Mach., College Pt., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Stancor, Chicago, Ill.
Sterling Transformer Corp., Brooklyn, N.Y.
Telrex Labs., Asbury Park, N.J.
Terado Corp., St. Paul, Minn.
Todd Systems, Yonkers, N.Y.
Topaz Electronics, San Diego, Cal.
Torotel, Inc., Grandview, Mo.
Torwico Elctrns., Inc., Lakewood, N.J.
Triad-Utrad Div., Huntington, Ind.
Westinghouse Elec., Buffalo, N. Y.
Westinghouse Elec., Greenville, Pa.
Zaring Inds., Inc., Westfield, Ind.

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Microtran Co. Inc., Valley Stream, N.Y. Vol 3•1262; Vol 4•562*
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ADC Prods., Minneapolis, Minn.
American Magnetics Corp., Carterville, Ill.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Component Specialties, Temple City, Cal.
EWC, Inc., Kenilworth, N.J.
Freed Transformer Co., Bklyn., N.Y.
Geo Space, Houston, Tex.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hisonic, Inc., Olathe, Kans.
James Elctrns., Inc., Chicago, Ill.
Lambda Elctrns., Melville, N.Y.
Magnetico, Inc., E. Northport, N.Y.
Neshaminy Transformer, Furlong, Pa.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Pico Elctrns Inc., Mount Vernon, N.Y.
Pulse Engrg., Inc., San Diego, Cal.
Raytheon Co., Waltham, Mass.
Solid State Elctrns. Corp., Sepulveda, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
Stevens-Arnold, Inc., So. Boston, Mass.
Torwico Elctrns., Inc., Lakewood, N.J.
Triad-Utrad Div., Huntington, Ind.
Zaring Inds., Inc., Westfield, Ind.

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ADC Prods., Minneapolis, Minn.
Allied Elctrns., Chicago, Ill.
American Magnetics Corp., Carterville, Ill.
Astro-Metrix, Burbank, Cal.
Bell Industries, Compton, Cal.
Biometrics Instrument Corp., Garland, Tex.
Bogen Div., Paramus, N.J.
Carson Mfg. Co., Indianapolis, Ind.
CML-Macarr, Inc., Edison, N.J.
Coil Co. of Amer., Northvale, N.J.
Constant Voltage Co., Chicago, Ill.
Control Data Corp., Minneapolis, Minn.
Davis J.W. & Co., Dallas, Texas
Del Electronics Corp., Mt. Vernon, N.Y.
Elgin Elctrns. Inc., Waterford, Pa.
Ferrodyne Corp., Venice, Calif.
Geo Space, Houston, Tex.
Hipotronics, Inc., Brewster, N.Y.
Huntington Elctrns. Corp., Van Nuys, Cal.
Kepco, Inc., Flushing, N.Y.
K.G.S. Elctrns., Pasadena, Cal.
Lambda Elctrns., Melville, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Magnetic Circuit Elements, Monterey, Cal.
Maxwell Labs., Inc., San Diego, Calif.
Merrimack Magnetics, Lowell, Mass.
Microtran Co. Inc., Valley Stream, N.Y.
North Electric Co., Galion, Ohio
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Phoenix Transformer Co., Phoenix, Ariz.
Polyphase Instr. Co., Bridgeport, Pa.
Power-Matic, Inc., San Diego, Cal.
Queensboro Transformer & Mach., College Pt., N.Y.
Ratelco, Inc., Seattle, Wash.
Shigoto Inds., Ltd., New York, N.Y.
Sola Elec. Div., Elk Grove Village, Ill.
Standard Power, Inc., Santa Ana, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
TDC, Div. Freq. Technology Inc., Littleton, Mass.
Tele-Dynamics/Wanlass, Fort Washington, Pa.
Triad-Utrad Div., Huntington, Ind.
TRW/UTC Transformers, New York, N.Y.
Utah Elctrns., Huntington, Ind.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.

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Aladdin Elctrns., Nashville, Tenn.
Alpha Components Corp., El Segundo, Cal.
American Magnetics Corp., Carterville, Ill.
Amp Inc., Harrisburg, Pa.
Astro-Metrix, Burbank, Cal.
Automatic Coil, New Hyde Pk., N.Y.
Avtel Corp., Covina, Cal.
Basler Elec. Co., Highland, Ill.
Bertan Assocs., Inc., Hicksville, N.Y.
B.H. Inds., Los Angeles, Cal.
Biometrics Instrument Corp., Garland, Tex.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Compumod, Inc., Haverhill, Mass.
Constant Voltage Co., Chicago, Ill.
Corcom Inc., Chicago, Ill.
Dale Elctrns., Inc., Yankton, S.D.
Del Electronics Corp., Mt. Vernon, N.Y.
Deltec Corp., San Diego, Cal.
Dietz Design, Inc., Belton, Mo.
El-Rad Mfg. Co., Chicago, Ill.
Electrocom Inds., So. Bend, Indiana
Electronic Resch. Assocs., Moonachie, N.J.
Elgin Elctrns. Inc., Waterford, Pa.
Energy Systems, Palo Alto, Cal.
EWC, Inc., Kenilworth, N.J.
Ferrodyne Corp., Venice, Calif.
Geo Space, Houston, Tex.
Grand Transformers, Grand Haven, Mich.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Huntington Elctrns. Corp., Van Nuys, Cal.
JB Elctrn. Transformers, Inc., Chicago, Ill.
K.G.S. Elctrns., Pasadena, Cal.
Lambda Elctrns., Melville, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Magnetic Circuit Elements, Monterey, Cal.
Magnetico, Inc., E. Northport, N.Y.
Merrimack Magnetics, Lowell, Mass.
National Power Prods. Inc., Haverhill, Mass.
North Electric Co., Galion, Ohio
Novatronics, Inc., Pompano Beach, Fla.

Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Omnitec Corp., Nytronics Filter Div., Phoenix, Ariz.
PCA Elctrns., Inc., Sepulveda, Calif.
Phoenix Transformer Co., Phoenix, Ariz.
Pico Elctrns Inc., Mount Vernon, N.Y.
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Engrg., Inc., San Diego, Cal.
Raytheon Co., Waltham, Mass.
Spectran Elctrns., Pompano Beach, Fla.
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Stancor, Chicago, Ill.
Stanford Applied Engrg., Santa Clara, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
TDK Elctrns. Corp., Long Island City, N.Y.
Tele-Dynamics/Wanlass, Fort Washington, Pa.
Torotel, Inc., Grandview, Mo.
Torwico Elctrns., Inc., Lakewood, N.J.
Triad-Utrad Div., Huntington, Ind.
TRW/UTC Transformers, New York, N.Y.
Ward Leonard Elec. Co., Mt. Vernon, N.Y.
Zaring Inds., Inc., Westfield, Ind.

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Arnold Magnetics, Culver City, Cal.
Astrosystems, Inc., Lake Success, N.Y.
Basler Elec. Co., Highland, Ill.
B.H. Inds., Los Angeles, Cal.
Coast Coil Co., Los Angeles, Calif.
Coil Co. of Amer., Northvale, N.J.
Collins, G.L. Corp., Long Beach, Calif.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Lambda Elctrns., Melville, N.Y.
Magnetico, Inc., E. Northport, N.Y.
Microtran Co. Inc., Valley Stream, N.Y.
North Atlantic Inds., Plainview, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Phoenix Transformer Co., Phoenix, Ariz.
Pico Elctrns Inc., Mount Vernon, N.Y.
Polyphase Instr. Co., Bridgeport, Pa.
Singer Instrumentation, Los Angeles Oper., Los Angeles, Cal.
Solid State Elctrns. Corp., Sepulveda, Cal.
Torwico Elctrns., Inc., Lakewood, N.J.

Transformers, Differential

ADC Prods., Minneapolis, Minn.
Altec Div., Anaheim, Calif.
American Magnetics Corp., Carterville, Ill.
Ametek/Instrs. & Controls, Feasterville, Pa.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bicron Elctrns. Co., Canaan, Conn.
Bourns, Inc., Instr. Div., Riverside, Calif.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Coil Co. of Amer., Northvale, N.J.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Columbia Resch. Labs., Woodlyn, Pa.
Del Electronics Corp., Mt. Vernon, N.Y.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Lambda Elctrns., Melville, N.Y.
Magnetico, Inc., E. Northport, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Pickering & Co., Plainview, N.Y.
Pico Elctrns Inc., Mount Vernon, N.Y.
Polyphase Instr. Co., Bridgeport, Pa.
Torotron, Mt. Vernon, N.Y.
Torwico Elctrns., Inc., Lakewood, N.J.
TRW/UTC Transformers, New York, N.Y.
Zaring Inds., Inc., Westfield, Ind.

Transformers, Discriminator

ADC Prods., Minneapolis, Minn.
American Magnetics Corp., Carterville, Ill.
American Trans-Coil Corp., Richmond Hill, N.Y.
Automatic Coil, New Hyde Pk., N.Y.
Bell Industries, Compton, Cal.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Coil Co. of Amer., Northvale, N.J.
Coil Specialty Co., Boalsburg, Pa.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Collins Radio Co., Dallas, Tex.
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Bourns Pacific Magnetic Corp., Romoland, Calif.
Clippard Instr., Inc., Cincinnati, Ohio
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Shigoto Inds., Ltd., New York, N.Y.
Signal Transformer, Bklyn., N.Y.
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Bourns Pacific Magnetic Corp., Romoland, Calif.
CML-Macarr, Inc., Edison, N.J.
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Coil Co. of Amer., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
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Elgin Elctrns. Inc., Waterford, Pa.
Energy Systems, Palo Alto, Cal.
EWC, Inc., Kenilworth, N.J.
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Elgin Elctrns. Inc., Waterford, Pa.
Energy Systems, Palo Alto, Cal.
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Freed Transformer Co., Bklyn., N.Y.
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Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
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Beckman Instrs., Cedar Grove, N.J.
Bertan Assocs., Inc., Hicksville, N.Y.
Bicron Elctrns. Co., Canaan, Conn.
Bourns Pacific Magnetic Corp., Romoland, Calif.
CML-Macarr, Inc., Edison, N.J.
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Energy Systems, Palo Alto, Cal.
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Freed Transformer Co., Bklyn., N.Y.
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Grand Transformers, Grand Haven, Mich.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Harder, Donald C. Co., Inc., San Diego, Calif.
Hipotronics, Inc., Brewster, N.Y.
Jefferson Elec., Bellwood, Ill.
K.G.S. Elctrns., Pasadena, Cal.
Kilovolt Corp., Hackensack, N.J.
Lambda Elctrns., Melville, N.Y.
Mag-Con, Inc., New Brighton, Minn.
Magnetic Circuit Elements, Monterey, Cal.
Magnetico, Inc., E. Northport, N.Y.
Maxwell Labs., Inc., San Diego, Calif.
Megavolt, Inc., New York, N.Y.
Microtran Co. Inc., Valley Stream, N.Y.
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Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
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TDC, Div. Freq. Technology Inc., Littleton, Mass.
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Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Cambridge Thermionic, Cambridge, Mass
CML-Macarr, Inc., Edison, N.J.
Coast Coil Co., Los Angeles, Calif.
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Coil Craft Inc., Bronxville, N.Y.
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Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Dale Elctrns., Inc., Yankton, S.D.
Delevan Div., Coil Prods., E. Aurora, N.Y.
Dietz Design, Inc., Belton, Mo.
El-Rad Mfg. Co., Chicago, Ill.
General Instr. Corp., Automatic Mfg. Div., Chicopee, Mass.
Lambda Elctrns., Melville, N.Y.
Magnetico, Inc., E. Northport, N.Y.
Mini-Circuits Lab., Brooklyn, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Oeco Corp., Portland, Ore.
Piconics Inc., Tyngsboro, Mass.
Polyphase Instr. Co., Bridgeport, Pa.
Relcom (Div. Watkins-Johnson), Palo Alto, Calif.
Shigoto Inds., Ltd., New York, N.Y.
Syscon Int'l., Inc., So. Bend, Ind.
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Basler Elec. Co., Highland, Ill.
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Bicron Elctrns. Co., Canaan, Conn.
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Magnetic Circuit Elements, Monterey, Cal.
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Bell Industries, Compton, Cal.
B.H. Inds., Los Angeles, Cal.
Bicron Elctrns. Co., Canaan, Conn.
Bourns Pacific Magnetic Corp., Romoland, Calif.
CML-Macarr, Inc., Edison, N.J.
Coast Coil Co., Los Angeles, Calif.
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Component Specialties, Temple City, Cal.
Custom Coil & Transformer Co., Zanesville, Ohio
Dale Elctrns., Inc., Yankton, S.D.
Del Electronics Corp., Mt. Vernon, N.Y.
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Elcor Prods. Welex Elctrns., Silver Spring, Md.
Electrical Instr. Svc., Inc., Mt. Vernon, N.Y.
Elgin Elctrns. Inc., Waterford, Pa.
Esterline Angus Div., Indianapolis, Ind.
EWC, Inc., Kenilworth, N.J.
Ferrodyne Corp., Venice, Calif.
Freed Transformer Co., Bklyn., N.Y.
General Elec., W. Lynn, Mass.
Geo Space, Houston, Tex.
Grand Transformers, Grand Haven, Mich.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hammond Mfg. Co. (U.S.) Inc., Buffalo, N.Y.
Hipotronics, Inc., Brewster, N.Y.
Hoyt Elec. Instr. Works, Belmont, Mass.
Huntington Elctrns. Corp., Van Nuys, Cal.
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Bulova Watch Co., Freq. Control Prods., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
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Coil Craft Inc., Bronxville, N.Y.
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CML-Macarr, Inc., Edison, N.J.
Electrocom Inds., So. Bend, Indiana
Electrocube, San Gabriel, Cal
Geo Space, Houston, Tex.
Grand Transformers, Grand Haven, Mich.
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Microwave Semiconductor Corp., Somerset, N.J.
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National Semiconductor, Santa Clara, Cal.
Nucleonic Prods., Canoga Pk, Cal.
Power Physics Corp., Eatontown, N.J.
Raytheon, Mt. View, Calif.
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Solitron Devices, Inc., Riviera Bch., Fla.
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Teledyne Crystalonics, Cambridge, Mass.
Teledyne Semiconductor, Mountain View, Cal.
Texas Instruments, Dallas, Tex.
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Calabro Unitrack, Upper Darby, Pa.
Craig Sys. Corp., Lawrence, Mass.
Lewis G. B. Co, Watertown, Wisc
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M M Elctrn. Enclosures, Hicksville, N.Y.
Perfection Mica Co., Bensenville, Ill.
Skydyne A Brooks & Perkins Co., Port Jervis, N.Y.
TA Mfg. Corp., Los Angeles, Cal.
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Dialight Corp., Brooklyn, N.Y.
Nat'l. Wire & Cable, Los Angeles, Cal.
NES, Inc., Itasca, Ill.
Singer - Tele-Signal, Woodbury, N.Y.
Superior Elec., Bristol, Conn.
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Bristol Div, Waterbury, Conn
Cardion Elctrns., Woodbury, N.Y.
Codex Corp., Newton, Mass.
Continental Data Sys., Dayton, Ohio
Cubic Corp., San Diego, Cal.
Data-Control Systems, Danbury, Conn.
Demex, Inc., Kansas City, Mo.
Design Elements, Columbus, Ohio
Digitronics Corp., Albertson, N.Y.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
GTE Automatic Elec., Northlake, Ill.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hadron Inc., Westbury, N.Y.
Hathaway Instruments, Inc., Denver, Colo.
Hi-G, Windsor Locks, Conn.
Honeywell, Ft. Washington, Pa.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Integrated Systems, Inc., Norcross, Ga.
International Communications Corp., A Milgo Co., Miami, Fla.
Lear Siegler, Inc., Santa Monica, Calif.
Marconi Elctrns. Inc., Elmsford, N.Y.
McDonnell Douglas Electronics Co., St. Charles, Mo.
Memodyne Corp., Newton Upper Falls, Ma.
Metra Instruments, Inc., Mt. View, Cal.
NES, Inc., Itasca, Ill.
North Electric Co., Galion, Ohio
Optical Communications, Inc., Orlando, Fla.
RCA Service Co., Camden, N.J.
Remex, Santa Ana, Cal.
Resdel Engrg. Corp., Arcadia, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
Schneider Instr. Co., Cincinnati, Ohio
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.
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Pacific Communications, Santa Ana, Cal.
Thomson-CSF Inc., New York, N.Y.

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Autocon Inds., Inc., Minneapolis, Minn.
Beukers Labs., Inc., Hauppauge, N.Y.
BF Elctrns., Solana Beach, Calif.
Bogen Div., Paramus, N.J.
Brelonix, Inc., Seattle, Wash
Bristol Div, Waterbury, Conn
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Drake, R.L., Co., Miamisburg, Ohio
Dynalab Corp., Van Nuys, Cal.
Electro/Data, Inc., Garland, Tex.
Energy Systems, Palo Alto, Cal.
Farinon Electric, San Carlos, Calif.
GTE Lenkurt Inc., San Carlos, Calif.
Heath Co., Benton Harbor, Mich.
IEC Electronics Corp., E. Rochester, N.Y.
Intricate Circuit Corp., Port Chester, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Johnson E. F. Co., Waseca, Minn.
Linear Sys., Inc., Watsonville, Calif.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Melpar, Falls Church, Va.
Microwave Power Devices, Plainview, N. Y.
Mobil Elctrns., Inc., Anderson, Ind.
OPtimax Inc., Colmar, Pa.
Pace Div., Harbor City, Calif.
Pacific Communications, Santa Ana, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Regency Elctrns., Inc., Indianapolis, Ind.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Sierra Sys., Mountain View, Cal.
Special Microwave Devices Oper., Waltham, Mass.
Technical Mat'l., Mamaroneck, N.Y.
Telectro Sys. Corp., Corona, N.Y.

Transmitters, Fixed Station Comm.

American Elctrn. Labs., Inc., Lansdale, Pa.
Bendix Corp, Towson, Md.
Bogen Div., Paramus, N.J.
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Drake, R.L., Co., Miamisburg, Ohio
EG&G, Inc., Bedford, Mass.
Energy Systems, Palo Alto, Cal.
Farinon Electric, San Carlos, Calif.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Heath Co., Benton Harbor, Mich.
IEC Electronics Corp., E. Rochester, N.Y.
Intricate Circuit Corp., Port Chester, N.Y.
ITT Mackay Marine, Elizabeth, N.J.
Johnson E. F. Co., Waseca, Minn.
Linear Sys., Inc., Watsonville, Calif.
Marconi Elctrns. Inc., Elmsford, N.Y.
Microwave Power Devices, Plainview, N. Y.
Mobil Elctrns., Inc., Anderson, Ind.
Pace Div., Harbor City, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Technical Mat'l., Mamaroneck, N.Y.
Thomson-CSF Inc., New York, N.Y.

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Aircom, Inc., Union, N.H.
American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Microwave, Westwood, Mass.
Arra Inc., Bay Shore, N.Y.
Avantek, Inc., Santa Clara, Cal.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
Cubic Corp., San Diego, Cal.
Dynalab Corp., Van Nuys, Cal.
Energy Systems, Palo Alto, Cal.
Environmental Communications Inc., Santa Ana, Cal.
Farinon Electric, San Carlos, Calif.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
Greenray Inds., Inc., Mechanicsburg, Pa.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Melpar, Falls Church, Va.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Premier Microwave, Port Chester, N.Y.
Raytheon Data Systems Co., Norwood, Mass.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
RHG Elctrns. Lab., Deer Park, N.Y.
Rodelco, Deer Park, N.Y.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Teledyne Mec., Palo Alto, Cal.
Thomson-CSF Inc., New York, N.Y.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian Assoc., Solid State East Div., Micro-Link Prods., Beverly, Mass
Watkins Johnson Co., Palo Alto, Cal.
Westinghouse Elec. Corp., Defense & Public Sys, Pittsburgh, Pa.

Transmitters, Multiplex

Bramco Controls, Piqua, Ohio
Bristol Div, Waterbury, Conn
Collins Radio Co., Dallas, Tex.
Hathaway Instruments, Inc., Denver, Colo.
Pacific Communications, Santa Ana, Cal.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Thomson-CSF Inc., New York, N.Y.

Transmitters, Pulse Code Modulation

Bramco Controls, Piqua, Ohio
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Epsco, Inc., Westwood, Mass.
HB Engineering Corp., Beltsville, Md.
Marconi Elctrns. Inc., Elmsford, N.Y.
Pacific Communications, Santa Ana, Cal.
Phoenix Data Inc., Phoenix, Ariz.
RCA Govt. & Comm. Sys., Moorestown, N.J.
SCS Corporation-Microsystems, Ft. Lauderdale, Fla.

Transmitters, Pulse Phase Modulation

Cober Elctrns., Inc., Stamford, Conn.
Continental Elctrns. Mfg. Co., Dallas, Tex.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Raytheon Data Systems Co., Norwood, Mass.
Thomson-CSF Inc., New York, N.Y.

Transmitters, Pulse Time Modulation

Ailtech, City of Industry, Cal.
Autocon Inds., Inc., Minneapolis, Minn.
Bristol Div, Waterbury, Conn
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Continental Elctrns. Mfg. Co., Dallas, Tex.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Thomson-CSF Inc., New York, N.Y.
Vega Precision Labs., Vienna, Va.

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Arvin Sys., Inc., Dayton, Ohio
Bendix Corp, Towson, Md.
Brelonix, Inc., Seattle, Wash
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., Dallas, Tex.
Design Automation, Inc., Lexington, Mass.
Drake, R.L., Co., Miamisburg, Ohio
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Heath Co., Benton Harbor, Mich.
ITT Mackay Marine, Elizabeth, N.J.
Linear Sys., Inc., Watsonville, Calif.
Marconi Elctrns. Inc., Elmsford, N.Y.
Pace Div., Harbor City, Calif.
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RCA Govt. & Comm. Sys., Moorestown, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Technical Mat'l., Mamaroneck, N.Y.
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Arra Inc., Bay Shore, N.Y.
Autocon Inds., Inc., Minneapolis, Minn.
Beukers Labs., Inc., Hauppauge, N.Y.
BF Elctrns., Solana Beach, Calif.
Biocom, Inc., Culver City, Cal.
Bramco Controls, Piqua, Ohio
Bristol Div, Waterbury, Conn
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Conic Corp., San Diego, Calif.
Continental Data Sys., Dayton, Ohio
Continental Elctrns. Mfg. Co., Dallas, Tex.
Cubic Corp., San Diego, Cal.
Dataprobe, Inc., So. Hackensack, N.J.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Epsco, Inc., Westwood, Mass.
General Instr. Corp., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Hicksville, N.Y.
Hathaway Instruments, Inc., Denver, Colo.
Honeywell, Ft. Washington, Pa.
Integrated Systems, Inc., Norcross, Ga.
McDonnell Douglas Electronics Co., St. Charles, Mo.
OPtimax Inc., Colmar, Pa.
Pacific Communications, Santa Ana, Cal.
Phoenix Data Inc., Phoenix, Ariz.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Resdel Engrg. Corp., Arcadia, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
Schneider Instr. Co., Cincinnati, Ohio
Singer Co., Philadelphia, Pa.
Special Microwave Devices Oper., Waltham, Mass.
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Arra Inc., Bay Shore, N.Y.
CCA Elctrns. Corp., Gloucester, N.J.
Cober Elctrns., Inc., Stamford, Conn.
Energy Systems, Palo Alto, Cal.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Marconi Elctrns. Inc., Elmsford, N.Y.
Microwave Power Devices, Plainview, N. Y.
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AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
Arra Inc., Bay Shore, N.Y.
Bendix Corp., Ft. Lauderdale, Fla.
Bendix Corp, Towson, Md.
CCA Elctrns. Corp., Gloucester, N.J.
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Dynalab Corp., Van Nuys, Cal.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
IEC Electronics Corp., E. Rochester, N.Y.
Intricate Circuit Corp., Port Chester, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Melpar, Falls Church, Va.
Microwave Power Devices, Plainview, N. Y.
OPtimax Inc., Colmar, Pa.
Pace Div., Harbor City, Calif.
Pacific Communications, Santa Ana, Cal.
Pearce-Simpson, Miami, Fla.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Regency Elctrns., Inc., Indianapolis, Ind.
Thomson-CSF Inc., New York, N.Y.

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Dynalab Corp., Van Nuys, Cal.
Intricate Circuit Corp., Port Chester, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
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A.R.F. Products, Inc., Boulder, Colo.
Bendix Corp., Ft. Lauderdale, Fla.
Bendix Corp, Towson, Md.
Bramco Controls, Piqua, Ohio
Cincinnati Elctrns. Corp., Cincinnati, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Cubic Corp., San Diego, Cal.
Epsco, Inc., Westwood, Mass.
ESC Elctrns. Corp., Palisades Pk., N.J.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
McDonnell Douglas Electronics Co., St. Charles, Mo.
RCA Elctrns. Comps., Harrison, N.J.
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Waterbury Pressed Metal Co., Waterbury, Conn.

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ITT Electron Tube, Easton, Pa.
Litton Inds., San Carlos, Calif.
Raytheon Co., Burlington, Mass.
Raytheon Co., Waltham, Mass.
Sperry Elctrn. Tube, Gainesville, Fla.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Varian Assocs., Palo Alto, Cal.
Varian, Solid State West Division, Palo Alto, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Watkins Johnson Co., Palo Alto, Cal.

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General Electrodynamics Corp., Garland, Tex.
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Oceanside, Calif.
ITT Electron Tube, Easton, Pa.
Litton Inds., San Carlos, Calif.
Rauland, Melrose Pk., Ill.
RCA Elctrns. Comps., Harrison, N.J.
Thomas Elctrns., Inc., Wayne, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Instrument Use

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Calvert Elctrns., Inc., New York, N.Y.
Coleman Instr. Div., Oak Brook, Ill.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
General Atronics, Phila., Pa.
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Oceanside, Calif.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
RCA Elctrns. Comps., Harrison, N.J.
Tektronix, Inc., Beaverton, Ore.
Thomas Elctrns., Inc., Wayne, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Multiple Gun

General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 2•614
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Amperex Elctronic Corp., Slatersville, R.I.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
General Atronics, Phila., Pa.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Oceanside, Calif.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Rank Precision Inds., Des Plaines, Ill.
Raytheon Co., Quincy, Mass.
Thomas Elctrns., Inc., Wayne, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Projection

General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 2•614
Amperex Elctronic Corp., Slatersville, R.I.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
General Atronics, Phila., Pa.
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Oceanside, Calif.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Rank Precision Inds., Des Plaines, Ill.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Thomas Elctrns., Inc., Wayne, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Scan Conversion

General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 2•614
Raytheon Co., Quincy, Mass. Vol 2•1191
DuMont Electron Tubes, Clifton, N.J.
General Electrodynamics Corp., Garland, Tex.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Shaped-Beam

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Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
General Atronics, Phila., Pa.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Oceanside, Calif.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Rank Precision Inds., Des Plaines, Ill.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode Ray, TV Picture—See Tubes, Cathode-Ray Data Storage TV Picture

Tubes, Ceramic (Electron)

General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 2•614
Amperex Electronic Corp., Hicksville, N.Y.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
Elctrn. Enterprises, Newark, N.J.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Machlett Labs., Inc., Stamford, Conn.
Murata Mfg. Co. Ltd., Kyoto, Japan
Rank Precision Inds., Des Plaines, Ill.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Counting

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1183
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 2•614
Amperex Electronic Corp., Hicksville, N.Y.
Burroughs Corp., Plainfield, N.J.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Pinlites, Fairfield, N.J.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.

Tubes, Diode, Temperature Limited

Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Signalite, Neptune, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Electrometer

Amperex Electronic Corp., Hicksville, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Int'l. Elctrns., Melville, N.Y.
Raytheon Co., Quincy, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.

Tubes, Electron Multiplier

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1183
Hamamatsu Corp. (E), Middlesex, N. J. Vol 2•1185
Amperex Electronic Corp., Hicksville, N.Y.
Bendix Corp., Sturbridge, Mass.
Calvert Elctrns., Inc., New York, N.Y.
Coleman Instr. Div., Oak Brook, Ill.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Murata Mfg. Co. Ltd., Kyoto, Japan
RCA Elctrns. Comps., Harrison, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Uthe Technology Int'l., Sunnyvale, Cal.
Wagner Elec. Corp., Livingston, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Flash

Amersil, Inc., Hillside, N.J.
Dutrex Inds., Inc., New York, N.Y.
EG & G, Inc., Salem, Mass.
General Radio Co., Concord, Mass.
Heimann GmbH, Mt. Vernon, N.Y.
Illumination Inds., Inc., Sunnyvale, Cal.
Int'l. Elctrns., Melville, N.Y.
Kemlite Labs., Inc., Chicago, Ill.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
U.S. Scientific Instrs., Watertown, Mass.
Xenon Corp., Medford, Mass.

Tubes, Forward Wave

Dutrex Inds., Inc., New York, N.Y.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Raytheon Co., Waltham, Mass.
Sperry Elctrn. Tube, Gainesville, Fla.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.

Tubes, Gas

Semtech Corp., Newbury Pk., Cal. Vol 2•936
Amperex Electronic Corp., Hicksville, N.Y.
Black Light Corp. Amer., San Gabriel, Cal.
Burroughs Corp., Plainfield, N.J.
Cetron Elctrn. Corp., Geneva, Ill.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
Elctrn. Enterprises, Newark, N.J.
Electrons Co., Fairfield, N.J.
GTE Sylvania Inc., Seneca Falls, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Kemlite Labs., Inc., Chicago, Ill.
National Elctrns., Geneva, Ill.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Varian Assocs., Palo Alto, Cal.

Tubes, Ignitron

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1183
Advanced Kinetics, Costa Mesa, Calif.
Amperex Electronic Corp., Hicksville, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y.
Illumination Inds., Inc., Sunnyvale, Cal.
Int'l. Elctrns., Melville, N.Y.
International Rectifier, El Segundo, Cal.
National Elctrns., Geneva, Ill.
Raytheon Co., Burlington, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Triac Elctrn. Sys., Forest Hills, N. Y.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Image Converter

General Elec. Co., Elctrn. Comps. Sls. Dept., Schenectady, N.Y. ..... Vol 2•614
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Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Machlett Labs., Inc., Stamford, Conn.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varo, Garland, Tex.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Indicator—See Tubes, Readout

Tubes, Industrial Power

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1182,1183
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Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
Elctrn. Enterprises, Newark, N.J.
Electrons Co., Fairfield, N.J.
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Machlett Labs., Inc., Stamford, Conn.
National Elctrns., Geneva, Ill.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Triac Elctrn. Sys., Forest Hills, N. Y.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Klystron

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Varian, Solid State West Division, Palo Alto, Cal. ..... Vol 4•441*
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Raytheon Co., Burlington, Mass.
Raytheon Co., Waltham, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.

Varian Assocs., Eastern Tube Div., Beverly, Mass.
Varian Palo Alto Tube Div., Palo Alto, Cal.

Tubes, Laser

Amersil, Inc., Hillside, N.J.
Dutrex Inds., Inc., New York, N.Y.
EG & G, Inc., Salem, Mass.
Int'l. Elctrns., Melville, N.Y.
Kemlite Labs., Inc., Chicago, Ill.
Optics Technology, Palo Alto, Calif.
Raytheon Co., Waltham, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Spectra-Physics, Inc., Mountain View, Calif.
Thermal Amer. Fused Quartz, Montville, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.

Tubes, Magnetron

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1183
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Amperex Electronic Corp., Hicksville, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bowmar/TIC, Inc., Newbury Park, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Raytheon Co., Burlington, Mass.
Raytheon Co., Waltham, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Eastern Tube Div., Beverly, Mass.
Varian Palo Alto Tube Div., Palo Alto, Cal.
VTM Microwaves, Inc., Boulder, Colo.

Tubes, Microwave

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1182,1183
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Amperex Electronic Corp., Hicksville, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Calvert Elctrns., Inc., New York, N.Y.
Co-Operative Inds., Inc., Chester, N.J.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Elctrn. Enterprises, Newark, N.J.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Litton Inds., San Carlos, Calif.
Machlett Labs., Inc., Stamford, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Raytheon Co., Burlington, Mass.
Raytheon Co., Waltham, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Teledyne Mec., Palo Alto, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Eastern Tube Div., Beverly, Mass.
Varian Assocs., Travel Wave Tube Div., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Varian, Solid State West Division, Palo Alto, Cal.
VTM Microwaves, Inc., Boulder, Colo.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Watkins Johnson Co., Palo Alto, Cal.

Tubes, Noise Source

Elgenco, Inc., Santa Monica, Cal. Vol 1•441
Dutrex Inds., Inc., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
Int'l. Elctrns., Melville, N.Y.
Signalite, Neptune, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Eastern Tube Div., Beverly, Mass.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Waveline, Inc., W. Caldwell, N.J.

Tubes, Photomultiplier

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1183
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Hamamatsu Corp. (E), Middlesex, N. J. Vol 2•1185,1186
Amperex Electronic Corp., Hicksville, N.Y.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bendix Corp., Sturbridge, Mass.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Gamma Sci., San Diego, Cal.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Rank Precision Inds., Des Plaines, Ill.
RCA Elctrns. Comps., Harrison, N.J.
SSR Instrs. Co., Santa Monica, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.

Tubes Read Out (CRT, Cold-Cathode, Vacuum Fluorescent, Incandescent, Etc.)

Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y. ..... Vol 2•1187
Raytheon Co., Quincy, Mass. Vol 2•1191
Wagner Elec. Corp., Livingston, N.J. Vol 2•539
Alco Elctrn. Prods., North Andover, Mass.
Amperex Elctronic Corp., Slatersville, R.I.
Amperex Electronic Corp., Hicksville, N.Y.
Amperex Elctrn., Slatersville, R.I.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Burroughs Corp., Plainfield, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Major Data Corp., Costa Mesa, Cal.
National Elctrns., Geneva, Ill.
Pinlites, Fairfield, N.J.
Raytheon Co., Burlington, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
TEC, Inc., Tucson, Ariz.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Receiving

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1182,1183
Allied Elctrns., Chicago, Ill.
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Components Corp., Farmingdale, N. Y.
Int'l. Elctrns., Melville, N.Y.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian, Solid State West Division, Palo Alto, Cal.
Watkins Johnson Co., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Rectifying, Gas-Filled

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1182,1183
Amperex Electronic Corp., Hicksville, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
Elctrn. Enterprises, Newark, N.J.
Electrons Co., Fairfield, N.J.
Gordos Corp., Bloomfield, N.J.
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Elctrns., Melville, N.Y.
National Elctrns., Geneva, Ill.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Wagner Elec. Corp., Livingston, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Rectifying, Vacuum

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1182,1183
Semtech Corp., Newbury Pk., Cal. Vol 2•936
Allied Elctrns., Chicago, Ill.
Amperex Electronic Corp., Hicksville, N.Y.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
Coleman Instr. Div., Oak Brook, Ill.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
Elctrn. Enterprises, Newark, N.J.
Gordos Corp., Bloomfield, N.J.
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Elctrns., Melville, N.Y.
International Rectifier, El Segundo, Cal.
Machlett Labs., Inc., Stamford, Conn.
Raytheon Co., Burlington, Mass.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Palo Alto Tube Div., Palo Alto, Cal.
Victoreen Instr., Cleveland, Ohio
Westinghouse Elec., Elmira, N.Y.

Tubes, Strobe—See Lights, Stroboscopic

Tubes, Switching

Amperex Elctronic Corp., Slatersville, R.I. ..... Vol 2•1183
Victoreen Instr., Cleveland, Ohio Vol 2•1193
Amperex Electronic Corp., Hicksville, N.Y.
Burroughs Corp., Plainfield, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
EG & G, Inc., Salem, Mass.
Eimac, San Carlos, Calif.
Elctrn. Enterprises, Newark, N.J.
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Elctrns., Melville, N.Y.
Machlett Labs., Inc., Stamford, Conn.
RCA Elctrns. Comps., Harrison, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.
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Tubes, Tv Camera Pickup

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American Time Products, Woodside, N.Y.
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Behlman Div., California Instrs., San Diego, Cal
CALEX (California Elctrn. Mfg. Co.), Alamo, Calif.
California Instrs. Co., San Diego, Cal.
Constant Voltage Co., Chicago, Ill.
Electronic Dev. Corp., Boston, Mass.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Fogg System Co., Denver, Col.
Keithley Instrs., Inc., Cleveland, Ohio
Kepco, Inc., Flushing, N.Y.
McKee-Pedersen Instrs., Danville, Calif.
NH Research, Inc., Santa Ana, Calif.
Optimation, Inc., Chatsworth, Cal.
Pioneer/Instrumentation, Cleveland, Ohio
Spellman High Voltage Elctrns. Corp., Bronx, N.Y.
Systron-Donner Corp., Concord, Cal.
Tektronix, Inc., Beaverton, Ore.
Todd Products Corp., Farmingdale, N.Y.
Western Reserve Elctrns., Twinsburg, Ohio
Zi-Tech Div., Palo Alto, Cal.

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Americon Microwave Inds., Inc., Waltham, Mass.
Andrew Corp., Orland Pk., Ill.
CES Elctrns., Brooklyn, N.Y.
E & M Laboratories, Inc., Westlake Village, Cal.
General Microwave Corp., Farmingdale, N.Y.
Marconi Elctrns. Inc., Elmsford, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Nurad, Inc., Baltimore, Md.
OMNI Spectra, Farmington, Mich.
Phelps Dodge Comm., North Haven, Conn.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Systron-Donner Microwave Div., Van Nuys, Cal.
Transco Prods., Inc., Venice, Cal.
UTE Microwave, Asbury Park, N.J.
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Andrew Corp., Orland Pk., Ill.
Co-Operative Inds., Inc., Chester, N.J.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Gabriel Elctrns. Inc., Scarborough, Me.
Marconi Elctrns. Inc., Elmsford, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Microwave Development Labs., Inc., Needham Hgts., Mass.
RF Systems, Inc., Cohasset, Mass.
Servometer Corp., Clifton, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
Uniform Tubes, Collegeville, Pa.

Wave-Absorbing Materials, Electromagnetic

TDK Electronics Co., Ltd., Chiyoda-ku, Tokyo 101, Japan
Zippertubing Co., Los Angeles, Calif.

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Welding Equipment & Access. (Excluding Equip. for Semiconductor Devices)

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Mallory Metallurgical, Indianapolis, Ind.
Nelson Stud Welding Co., Lorain, Ohio
Taylor-Winfield Corp., Warren, Ohio
3M Co., St. Paul, Minn.
Westinghouse Elec., Sykesville, Md.

Welding Equip., Semiconductor Devices

Associate General Labs., Inc., Brookfield, Ill.
Ewald Instrs. Corp., Kent, Conn.
Freudenberg, B., Inc., New York, N.Y.
GTI Corp. (E), Pittsburgh, Pa.
Hadron Inc., Westbury, N.Y.
Hamilton Standard, Windsor Locks, Conn.
Hughes Aircraft Co., Welding Equip./Ind'l. Prods. Div., Oceanside, Calif.
Kahle Engrg. Co., Union City, N.J.
Leico Inds., Inc., New York, N.Y.
National Elctrns., Geneva, Ill.
Sonobond Corp., West Chester, Pa.
Taylor-Winfield Corp., Warren, Ohio
Tekform Prods. Co., Anaheim, Cal.

Union Carbide, San Diego, Cal.
Uthe Technology Int'l., Sunnyvale, Cal.
Varian Assocs., Vacuum Div., Palo Alto, Cal.

Whiteprint Machines

Keuffel & Esser Co., Morristown, N.J.
Teledyne Rotolite, Stirling, N.J.

Windows, Waveguide

Aircom, Inc., Union, N.H.
Airtron, Morris Plains, N.J.
Alberox Corp., New Bedford, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amersil, Inc., Hillside, N.J.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Latronics Corp., Latrobe, Pa.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Plessey Ceramic Div., Frenchtown, N.J.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
Rogers Corp., Rogers, Conn.
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Consolidated Wire & Assoc. Corps., Chicago, Ill.
Copperweld Bimetallics, Glassport, Pa.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dearborn Wire & Cable Co., Rosemont, Ill.
GC Electronics, Rockford, Ill.
Hackensack Cable Corp., Hackensack, N.J.
IE Mfg. Co., Chicago, Ill.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Rohn Mfg., Peoria, Ill.
South River Metal Prods. Co., South River, N.J.
Standard Wire & Cable, Los Angeles, Cal.
Times Wire & Cable, Wallingford, Conn.
TRW/Holyoke Wire & Cable, Holyoke, Mass.

Wire, Asbestos Insulated

Alpha Wire Corp., Elizabeth, N.J.
Anaconda Wire and Cable Co., New York, N.Y.
Cerro Wire & Cable Co., New Haven, Conn.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
Dearborn Wire & Cable Co., Rosemont, Ill.
General Elec., Bridgeport, Conn
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Revere Elctrn. Div., Wallingford, Conn.
Standard Wire & Cable, Los Angeles, Cal.
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Consolidated Wire & Assoc. Corps., Chicago, Ill.
Essex Int'l., Inc., Fort Wayne, Ind.
Hatfield Wire & Cable Div., Linden, N.J.
Hudson Wire Co, Ossining, N Y
Leico Inds., Inc., New York, N.Y.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Materials for Elctrns., Inc., Jamaica, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Molecu-Wire Corp., Farmingdale, N.J.
Nesor Alloy Corp., W. Caldwell, N.J.
Permaluster, Inc., Burbank, Calif.
Reynolds Metals Co., Richmond, Va.
South River Metal Prods. Co., South River, N.J.
United Mineral & Chem. Corp., New York, N.Y.
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Consolidated Wire & Assoc. Corps., Chicago, Ill.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
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Manhattan Elec. Cable Corp., Brooklyn, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
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Okonite Co., Ramsey, N.J.
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Pace Wire & Cable Corp., Oceanside, N.Y.
Philips Elmet Corp., Lewiston, Me.
Standard Wire & Cable, Los Angeles, Cal.
United Mineral & Chem. Corp., New York, N.Y.
Victor Wire & Cable, L.A., Cal.
Viking Wire Co., Inc., Danbury, Conn.
Wire Research Corp., Chatsworth, Cal.

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Hamilton Technology, Inc., Lancaster, Pa.
Hudson Wire Co, Ossining, N Y
Kawecki Berylco Inds., Inc., New York, N.Y.
Leico Inds., Inc., New York, N.Y.
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GTE Sylvania Inc., Newark, N.J.
Hamilton Technology, Inc., Lancaster, Pa.
Hoskins Mfg. Co., Detroit, Mich.
Materials Resch. Corp., Orangeburg, N.Y.
Molecu-Wire Corp., Farmingdale, N.J.
Nesor Alloy Corp., W. Caldwell, N.J.
Omega Engrg., Inc., Stamford, Conn.
Wire Research Corp., Chatsworth, Cal.

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Gte Sylvania Inc., Belmont, Cal.
Hamilton Technology, Inc., Lancaster, Pa.
Handy & Harman, New York, N.Y.
Kawecki Berylco Inds., Inc., New York, N.Y.
Leico Inds., Inc., New York, N.Y.
Materials for Elctrns., Inc., Jamaica, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Molecu-Wire Corp., Farmingdale, N.J.
Omega Engrg., Inc., Stamford, Conn.
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Handy & Harman, New York, N.Y.
Leico Inds., Inc., New York, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Wire Research Corp., Chatsworth, Cal.

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Associated Engrg. & Mfg. Corp., Upper Montclair, N. J.
Bram Metallurgical-Chem. Co., Phila., Pa.
Cohn, Sigmund, Mt. Vernon, N.Y.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
GTE Sylvania, Inc., Towanda, Pa.
Hamilton Technology, Inc., Lancaster, Pa.
Leico Inds., Inc., New York, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Omega Engrg., Inc., Stamford, Conn.
Philips Elmet Corp., Lewiston, Me.
United Mineral & Chem. Corp., New York, N.Y.
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Bram Metallurgical-Chem. Co., Phila., Pa.
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Co-Operative Inds., Inc., Chester, N.J.
Cohn, Sigmund, Mt. Vernon, N.Y.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dearborn Wire & Cable Co., Rosemont, Ill.
Gavitt Wire & Cable Div., Brookfield, Mass.
Hudson Wire Co, Ossining, N Y
Kates Scientific Instrs., Inc., Watertown, Mass.
Laser Technology, Inc., N. Hollywood, Calif.
Metex Corp., Edison, N.J.
Nat'l-Standard Co., Niles, Mich.
Nesor Alloy Corp., W. Caldwell, N.J.
Standard Wire & Cable, Los Angeles, Cal.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
Victor Wire & Cable, L.A., Cal.
Wire Research Corp., Chatsworth, Cal.
Wireflex Inc., Calumet City, Ill.
Zippertubing Co., Los Angeles, Calif.

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Ametek/Instrs. & Controls, Feasterville, Pa.
ARI Inds., Inc., Franklin Pk., Ill.
Conax Corp., Buffalo, N.Y.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
Molecu-Wire Corp., Farmingdale, N.J.
Omega Engrg., Inc., Stamford, Conn.
Permaluster, Inc., Burbank, Calif.
Tensolite, Tarrytown, N.Y.
Wire Research Corp., Chatsworth, Cal.

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Belden Corp. Elctrn. Div., Richmond, Ind.
Copperweld Bimetallics, Glassport, Pa.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dearborn Wire & Cable Co., Rosemont, Ill.
GTE Sylvania Inc., Warren, Pa.
Handy & Harman, New York, N.Y.
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Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Texas Instruments, Attleboro, Mass.
Wire Research Corp., Chatsworth, Cal.

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Nat'l-Standard Co., Niles, Mich.
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Cerro Wire & Cable Co., New Haven, Conn.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
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Essex Int'l., Inc., Fort Wayne, Ind.
GTE Sylvania Inc., Newark, N.J.
ITT Surprenant Div., Clinton, Mass.
Leico Inds., Inc., New York, N.Y.
Molecu-Wire Corp., Farmingdale, N.J.
Omega Engrg., Inc., Stamford, Conn.
Phelps Dodge Magnet Wire Co., Ft. Wayne, Ind.
Prestolite Wire Div., Eltra Co., Port Huron, Mich.
Revere Elctrn. Div., Wallingford, Conn.
Standard Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
Victor Wire & Cable, L.A., Cal.
Wire Research Corp., Chatsworth, Cal.
Wireflex Inc., Calumet City, Ill.

Wire, Guy

Birnbach Co., Inc., Freeport, N.Y.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
Copperweld Bimetallics, Glassport, Pa.
Hackensack Cable Corp., Hackensack, N.J.
IE Mfg. Co., Chicago, Ill.
Lance Inds., Sylmar, Calif.
Molecu-Wire Corp., Farmingdale, N.J.
Nat'l-Standard Co., Niles, Mich.
Rohn Mfg., Peoria, Ill.

Saxton Prods., Congers, N.Y.
Sitco Antennas, Portland, Ore.
South River Metal Prods. Co., South River, N.J.
Tensolite, Tarrytown, N.Y.
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Birnbach Co., Inc., Freeport, N.Y.
Bram Metallurgical-Chem. Co., Phila., Pa.
Brand-Rex Co., Willimantic, Conn.
Cerro Wire & Cable Co., New Haven, Conn.
Cimco Wire & Cable, Allendale, N.J.
Cities Svc. Co., Chester, N.Y.
Cleveland Refractory Metals Div., Solon, Ohio
Cohn, Sigmund, Mt. Vernon, N.Y.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
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Gore, W.L. & Assocs., Inc., Newark, Del.
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GTE Sylvania Inc., Warren, Pa.
Hoskins Mfg. Co., Detroit, Mich.
Hudson Wire Co, Ossining, N Y
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Judd Wire Div., Burlington, Mass.
Leico Inds., Inc., New York, N.Y.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Malco, A Microdot Co., Inc., Chicago, Ill.
Manhattan Elec. Cable Corp., Brooklyn, N.Y.
Molecu-Wire Corp., Farmingdale, N.J.
Nat'l-Standard Co., Niles, Mich.
Nat'l. Wire & Cable, Los Angeles, Cal.
Omega Engrg., Inc., Stamford, Conn.
Pace Wire & Cable Corp., Oceanside, N.Y.
Permaluster, Inc., Burbank, Calif.
Phelps Dodge Magnet Wire Co., Ft. Wayne, Ind.
Phoenix Wire, Inc., S. Hero, Vt.
Prestolite Wire Div., Eltra Co., Port Huron, Mich.
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Standard Wire & Cable, Los Angeles, Cal.
Storm Products Co., Los Angeles, Ca.
Teledyne Western Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
Times Wire & Cable, Wallingford, Conn.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
Victor Wire & Cable, L.A., Cal.
Viking Wire Co., Inc., Danbury, Conn.
Wire Research Corp., Chatsworth, Cal.
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Dielectric Sciences, Burlington, Mass
General Elec., Bridgeport, Conn
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Hatfield Wire & Cable Div., Linden, N.J.
Hudson Wire Co, Ossining, N Y
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Judd Wire Div., Burlington, Mass.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Malco, A Microdot Co., Inc., Chicago, Ill.
Manhattan Elec. Cable Corp., Brooklyn, N.Y.
Nat'l. Wire & Cable, Los Angeles, Cal.
Okonite Co., Ramsey, N.J.
Prestolite Wire Div., Eltra Co., Port Huron, Mich.
Reynolds Metals Co., Richmond, Va.
Rowe Inds., Div., Toledo, Ohio
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Storm Products Co., Los Angeles, Ca.
Teledyne Western Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
Times Wire & Cable, Wallingford, Conn.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
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Cerro Wire & Cable Co., New Haven, Conn.
Cities Svc. Co., Chester, N.Y.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Essex Int'l, Inc., Sycamore, Ill.
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General Elec., Bridgeport, Conn
Gore, W.L. & Assocs., Inc., Newark, Del.
Hudson Wire Co, Ossining, N Y
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Jonard Inds. Corp., Bronx, N.Y.
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Nat'l. Wire & Cable, Los Angeles, Cal.
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Phoenix Wire, Inc., S. Hero, Vt.
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Revere Elctrn. Div., Wallingford, Conn.
Sag Harbor Inds., Inc., Sag Harbor, N.Y.
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Spectra-Strip Corp., Garden Grove, Cal.
Standard Wire & Cable, Los Angeles, Cal.
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Cities Svc. Co., Chester, N.Y.
Columbia Eletrn. Cables, New Bedford, Mass.
Copperweld Bimetallics, Glassport, Pa.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
GC Electronics, Rockford, Ill.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
General Elec., Bridgeport, Conn
GTE Sylvania Inc., Warren, Pa.
Judd Wire Div., Burlington, Mass.
Lance Inds., Sylmar, Calif.
Pace Wire & Cable Corp., Oceanside, N.Y.
Prestolite Wire Div., Eltra Co., Port Huron, Mich.
Rohn Mfg., Peoria, Ill.
Standard Wire & Cable, Los Angeles, Cal.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
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Asco Wire & Cable Co., Bridgeport, Conn.
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Hudson Wire Co, Ossining, N Y
Philips Elmet Corp., Lewiston, Me.
Slepian, Arthur & Co., Bridgeport, Conn.
Standard Wire & Cable, Los Angeles, Cal.
Victor Wire & Cable, L.A., Cal.
Wire Research Corp., Chatsworth, Cal.

Wire, Magnet

Anaconda Wire and Cable Co., New York, N.Y.
Asco Wire & Cable Co., Bridgeport, Conn.
Belden Corp. Elctrn. Div., Richmond, Ind.
Birnbach Co., Inc., Freeport, N.Y.
Bram Metallurgical-Chem. Co., Phila., Pa.
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Coil Winders Div. Caddell-Burns, Mineola, N. Y.
Columbia Superconductor & Cryogenics Co., Allentown, Pa.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dearborn Wire & Cable Co., Rosemont, Ill.
Essex Int'l., Inc., Fort Wayne, Ind.
Hudson Wire Co, Ossining, N Y
Molecu-Wire Corp., Farmingdale, N.J.
Permaluster, Inc., Burbank, Calif.
Phelps Dodge Magnet Wire Co., Ft. Wayne, Ind.
Philips Elmet Corp., Lewiston, Me.
Phoenix Wire, Inc., S. Hero, Vt.
Reynolds Metals Co., Richmond, Va.
Shigoto Inds., Ltd., New York, N.Y.
Slepian, Arthur & Co., Bridgeport, Conn.
Standard Wire & Cable, Los Angeles, Cal.
Victor Wire & Cable, L.A., Cal.
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ARI Inds., Inc., Franklin Pk., Ill.
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Gore, W.L. & Assocs., Inc., Newark, Del.
Hudson Wire Co, Ossining, N Y
ITT Surprenant Div., Clinton, Mass.
Judd Wire Div., Burlington, Mass.
Molecu-Wire Corp., Farmingdale, N.J.
Permaluster, Inc., Burbank, Calif.
Standard Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
Times Wire & Cable, Wallingford, Conn.
Victor Wire & Cable, L.A., Cal.

Wire, Resistance

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Hoskins Mfg. Co., Detroit, Mich.
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Wire Research Corp., Chatsworth, Cal.
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Wire, Resistance Thermometer

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Leico Inds., Inc., New York, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
Molecu-Wire Corp., Farmingdale, N.J.
Omega Engrg., Inc., Stamford, Conn.
Wire Research Corp., Chatsworth, Cal.
Wireflex Inc., Calumet City, Ill.

Wire, Ribbon

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Columbia Eletrn. Cables, New Bedford, Mass.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dearborn Wire & Cable Co., Rosemont, Ill.
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Gavitt Wire & Cable Div., Brookfield, Mass.
Gore, W.L. & Assocs., Inc., Newark, Del.
GTE Sylvania, Inc., Towanda, Pa.

GTE Sylvania Inc., Newark, N.J.
GTE Sylvania Inc., Warren, Pa.
Hoskins Mfg. Co., Detroit, Mich.
Hudson Wire Co, Ossining, N Y
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Leico Inds., Inc., New York, N.Y.
Manhattan Elec. Cable Corp., Brooklyn, N.Y.
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Permaluster, Inc., Burbank, Calif.
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Standard Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
Wire Research Corp., Chatsworth, Cal.
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Fansteel Inc., N Chicago, Ill.
General Elec. Co., Lamp Parts & Equip. Sales Oper., Cleveland, Ohio
GTE Sylvania Inc., Newark, N.J.
GTE Sylvania Inc., Warren, Pa.
Henes Mfg. Co., Phoenix, Ariz.
Leico Inds., Inc., New York, N.Y.
Molecu-Wire Corp., Farmingdale, N.J.
Nat'l-Standard Co., Niles, Mich.
Nesor Alloy Corp., W. Caldwell, N.J.
Revere Elctrn. Div., Wallingford, Conn.
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Nat'l. Wire & Cable, Los Angeles, Cal.
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Norelcom Inds., Inc., Farmingdale, N.Y.
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Permaluster, Inc., Burbank, Calif.
Prestolite Wire Div., Eltra Co., Port Huron, Mich.
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Standard Wire & Cable, Los Angeles, Cal.
Teledyne Western Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
Texas Instruments, Attleboro, Mass.
Times Wire & Cable, Wallingford, Conn.
Victor Wire & Cable, L.A., Cal.
Whitmor Wire & Cable, No. Hollywood, Cal.
Wire Research Corp., Chatsworth, Cal.
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Leico Inds., Inc., New York, N.Y.
Materials Resch. Corp., Orangeburg, N.Y.
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Chemplast, Inc., Wayne, N.J.
Cohn, Sigmund, Mt. Vernon, N.Y.
Columbia Eletrn. Cables, New Bedford, Mass.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Gore, W.L. & Assocs., Inc., Newark, Del.
ITT Surprenant Div., Clinton, Mass.
Leico Inds., Inc., New York, N.Y.
Malco, A Microdot Co., Inc., Chicago, Ill.
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Molecu-Wire Corp., Farmingdale, N.J.
Nat'l. Wire & Cable, Los Angeles, Cal.
Norelcom Inds., Inc., Farmingdale, N.Y.
Omega Engrg., Inc., Stamford, Conn.
Phoenix Wire, Inc., S. Hero, Vt.
Revere Elctrn. Div., Wallingford, Conn.
Standard Wire & Cable, Los Angeles, Cal.
Storm Products Co., Los Angeles, Ca.
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Daburn Elctrns. & Cable Corp., Bronx, N.Y.
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Essex Int'l, Inc., Sycamore, Ill.
ITT Surprenant Div., Clinton, Mass.
Judd Wire Div., Burlington, Mass.
Lynn Elctrns. Corp., Feasterville, Pa.
Manhattan Elec. Cable Corp., Brooklyn, N.Y.
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Cohn, Sigmund, Mt. Vernon, N.Y.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
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Honeywell, Ft. Washington, Pa.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Corp., No. Wales, Pa.
Leico Inds., Inc., New York, N.Y.
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Standard Wire & Cable, Los Angeles, Cal.
Tensolite, Tarrytown, N.Y.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
Victor Wire & Cable, L.A., Cal.
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Cimco Wire & Cable, Allendale, N.J.
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Gavitt Wire & Cable Div., Brookfield, Mass.
Gore, W.L. & Assocs., Inc., Newark, Del.
Hatfield Wire & Cable Div., Linden, N.J.
Lynn Elctrns. Corp., Feasterville, Pa.
Malco, A Microdot Co., Inc., Chicago, Ill.
Mupac Corp., Brockton, Mass.
Saxton Prods., Congers, N.Y.
Standard Wire & Cable, Los Angeles, Cal.
Storm Products Co., Los Angeles, Ca.
Superior Cable Div., Hickory, N.C.
3M Co. Electro Prods. Div., St. Paul, Minn.
Times Wire & Cable, Wallingford, Conn.
Wireflex Inc., Calumet City, Ill.
Woven Elctrns., Mauldin, S. C.

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Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Eaton Corp., Engired. Fasteners Div., Cleveland, Ohio
Electrovert, Mt. Vernon, N.Y.
Gardner-Denver Co., Quincy, Ill.
Grayhill Inc., LaGrange, Ill.
Hanscom, H.F. Co., Inc., Providence, R.I.
ITT Holub Inds., Sycamore, Ill.
K. C. C. Shokai Ltd., Nada-ku, Kobe 657, Japan
Mann, Henry Inc., Feasterville, Pa.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Richco Plastic Co., Chicago, Ill.
Saxton Prods., Congers, N.Y.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Thomas & Betts Co., Elizabeth, N.J.
3M Co. Electro Prods. Div., St. Paul, Minn.
TRW/Holyoke Wire & Cable, Holyoke, Mass.
Waldom Elctrns., Inc., Chicago, Ill.
Weckesser Co., Inc., Chicago, Ill.
Zeus Ind'l. Prods., Raritan, N.J.
Zippertubing Co., Los Angeles, Calif.

Wire Cutters, Automatic

Eraser Co., Syracuse, N.Y.
Eubanks Engrg., Monrovia, Calif.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Molex Inc., Lisle, Ill.
Techni-Tool, Inc., Philadelphia, Pa.
Tech. Devices Co., Culver City, Calif.
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Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Clauss Cutlery Co., Fremont, Ohio
Communications Technology Corp., Los Angeles, Cal.
Engineering & Elctrn. Devices, Inc., Los Angeles, Calif.
Erikson Specialized Tool Co., Pico-Rivera, Cal.
ETC, Div. ITT, Cleveland, Ohio
GC Electronics, Rockford, Ill.
General Hardware Mfg. Co., New York, N.Y.
Henes Mfg. Co., Phoenix, Ariz.
Hollis Engrg., Inc., Nashua, N.H.
Hunter Tools, El Monte, Calif
Ideal Industries, Inc., Sycamore, Ill.
ITT Holub Inds., Sycamore, Ill.
Klein, Mathias & Sons, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Manger Elec. Co., Inc., Stamford, Conn.
Mann, Henry Inc., Feasterville, Pa.
Norelcom Inds., Inc., Farmingdale, N.Y.
Porter, H.K., Inc., Somerville, Mass.
Techni-Tool, Inc., Philadelphia, Pa.
Thomas & Betts Co., Elizabeth, N.J.
Utica Tool Co., Inc., Orangeburg, S.C.
Vigor Co., New York, N.Y.
Waldom Elctrns., Inc., Chicago, Ill.
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Excel Specialty Corp., Chicago, Ill.
GC Electronics, Rockford, Ill.
Ideal Industries, Inc., Sycamore, Ill.
K. C. C. Shokai Ltd., Nada-ku, Kobe 657, Japan
Manger Elec. Co., Inc., Stamford, Conn.
Mann, Henry Inc., Feasterville, Pa.
Markel, L. Frank & Sons, Norristown, Pa.
Nat'l. Band & Tag, Newport, Ky.
Norelcom Inds., Inc., Farmingdale, N.Y.
Plymouth Rubber Co., Inc., Canton, Mass.
Sjoberg, C. & Son, Inc., Cranston, R.I.
Storm Products Co., Los Angeles, Ca.
Thomas & Betts Co., Elizabeth, N.J.
Zippertubing Co., Los Angeles, Calif.

Wire-Marking Machines, Automatic

Ackerman Gould Co., Inc., Oceanside, N.Y.
Artos Engrg. Co., New Berlin, Wisc.
Brady, W.H. Co., Milwaukee, Wisc.
Conrac Corp., Westminister, Cal.
Kingsley Mach. Co., Hollywood, Calif.
Matthews, Jas & Co., Pittsburgh, Pa.

Wire-Marking Machines, Hand Operated

Ackerman Gould Co., Inc., Oceanside, N.Y.
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Kahle Engrg. Co., Union City, N.J.
Laser Technology, Inc., N. Hollywood, Calif.
Mann, Henry Inc., Feasterville, Pa.
Molex Inc., Lisle, Ill.
Nat'l. Wire & Cable, Los Angeles, Cal.
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Cal-Metex Corp., Inglewood, Cal.
Cities Svc. Co., Chester, N.Y.
Co-Operative Inds., Inc., Chester, N.J.
Consolidated Wire & Assoc. Corps., Chicago, Ill.
Copperweld Bimetallics, Glassport, Pa.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Estes Engrg. Co., Gardena, Calif.
Manger Elec. Co., Inc., Stamford, Conn.
Metex Corp., Edison, N.J.
Nat'l. Wire & Cable, Los Angeles, Cal.
Norelcom Inds., Inc., Farmingdale, N.Y.
Standard Wire & Cable, Los Angeles, Cal.
Storm Products Co., Los Angeles, Ca.
Texas Instruments, Attleboro, Mass.
3M Co., St. Paul, Minn.
3M Co., Dielectric Materials & Sys. Div., St. Paul, Minn.
Times Wire & Cable, Wallingford, Conn.
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Wire Research Corp., Chatsworth, Cal.
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Burndy Corp., Norwalk, Conn.
Carpenter Mfg. Co., Inc., Manlius, N.Y.
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Eubanks Engrg., Monrovia, Calif.
Ewald Instrs. Corp., Kent, Conn.
Gardner-Denver Co., Quincy, Ill.
High Speed Hammer Co., Inc., Rochester, N.Y.
MacDonald & Co., Glendale, Calif.
Mann, Henry Inc., Feasterville, Pa.
Molex Inc., Lisle, Ill.
Omega Engrg., Inc., Stamford, Conn.
Taylor-Winfield Corp., Warren, Ohio
Techni-Tool, Inc., Philadelphia, Pa.
Tech. Devices Co., Culver City, Calif.
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American Elec. Heater, Detroit, Mich.
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Carpenter Mfg. Co., Inc., Manlius, N.Y.
Channellock, Inc., Meadville, Pa.
Clauss Cutlery Co., Fremont, Ohio
Communications Technology Corp., Los Angeles, Cal.
Engineering & Elctrn. Devices, Inc., Los Angeles, Calif.
Eraser Co., Syracuse, N.Y.
ETC, Div. ITT, Cleveland, Ohio
Ewald Instrs. Corp., Kent, Conn.
Gagne Assocs., Inc., Binghamton, N.Y.
Gardner-Denver Co., Quincy, Ill.
General Hardware Mfg. Co., New York, N.Y.
Greenlee Tool Co., Rockford, Ill.
Hunter Tools, El Monte, Calif
Ideal Industries, Inc., Sycamore, Ill.
ITT Holub Inds., Sycamore, Ill.
Jonard Inds. Corp., Bronx, N.Y.
Klein, Mathias & Sons, Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Manhattan Elec. Cable Corp., Brooklyn, N.Y.
Mann, Henry Inc., Feasterville, Pa.
Stevens, Geo. Mfg. Co., Inc., Chicago, Ill.
Techni-Tool, Inc., Philadelphia, Pa.
Teledyne Kinetics, Solana Beach, Cal.
Telvac Instr. Co., Van Nuys, Cal.
Thomas & Betts Co., Elizabeth, N.J.
Utica Tool Co., Inc., Orangeburg, S.C.
Waldom Elctrns., Inc., Chicago, Ill.
Western Elctrn. Prods. Co., San Clemente, Cal.
Xcelite, Inc., Orchard Park, N.Y.

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American Elec. Heater, Detroit, Mich.
Eraser Co., Syracuse, N.Y.
Hunter Tools, El Monte, Calif
Ideal Industries, Inc., Sycamore, Ill.
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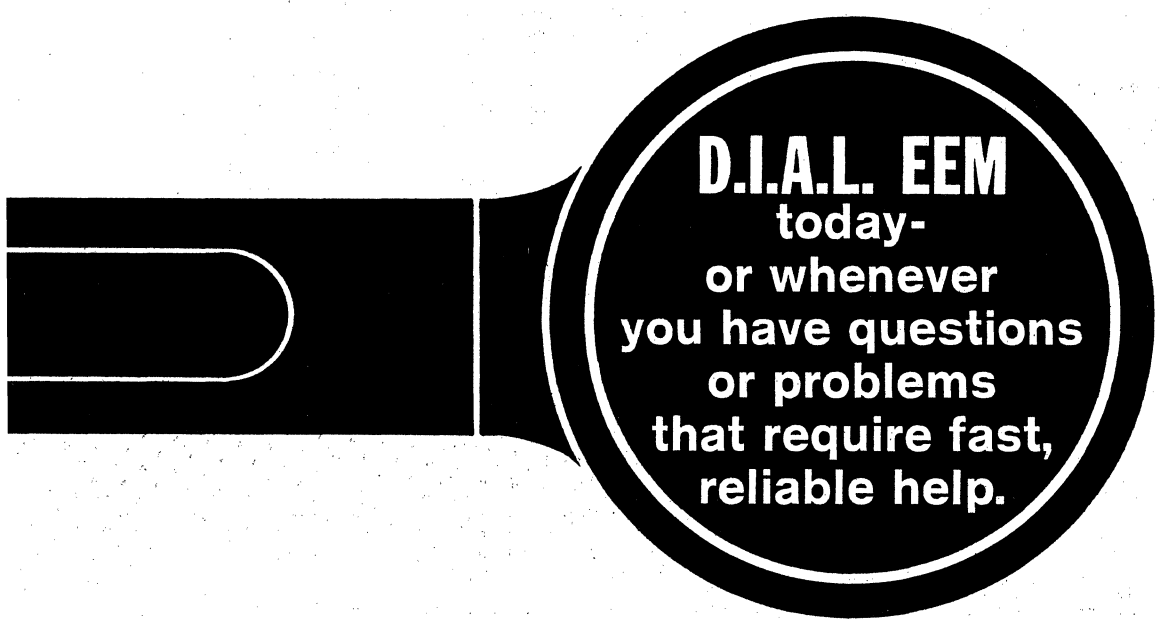

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Vol.1•319	1900	Communications Equipment (Facsimile, Telephone, Television)
Vol.1•321	2000	Computing, Data Handling Equipment & Accessories
Vol.1•382	2550	Environmental Test Equipment
Vol.1•386	2900	Instruments, Measuring & Test
Vol.1•536	3000	Instruments, Graphic Recording
Vol.1•544	3400	Microwave, Laser & Radar (Systems & Subsystems)
Vol.1•571	4000	Power Supplies, Converters, Inverters, Batteries, etc.
Vol.1•934	4100	Production Machinery & Automation Equipment
Vol.1•935	4300	Recording Equipment (Non-Audio Types)
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Waldom Electronics .....Vol.2•1151; Vol.3•964-971,1072,1073; Vol.4•383*
Wall-Lenk .....Vol.3•1243
Wanlass (see Tele-Dynamics)
Waveline .....Vol.2•629
Wavetek .....Vol.1•531-533
Wesco Electrical Co., Inc. .....Vol.3•515
Whitmor Wire & Cable .....Vol.3•1418
Weinschel Engineering .....Vol.1•534
Westinghouse Electric .....Vol.2•976-982; Vol.4•534-540*
Wild Rover Corp. .....Vol.2•1152,1153
Wilmore Electronics .....Vol.1•932,933
Winchester Electronics ....Vol.3•973-975; Vol.4•385*
Wiremold Co. .....Vol.3•976,977

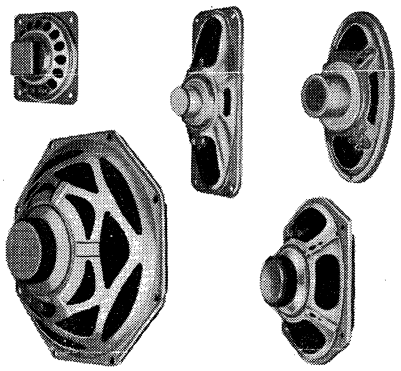
Z

Zero Mfg. Co. .....Vol.3•341

* Volume 4, 1973

Amperex INDUSTRIAL AND HIGH FIDELITY Speakers

STANDARD SPEAKER SERIES



Amperex standard speakers offer a wide diversity in characteristics, size, and price for all kinds of radio and television sets, phonographs, tape recorders, sound columns, etc.

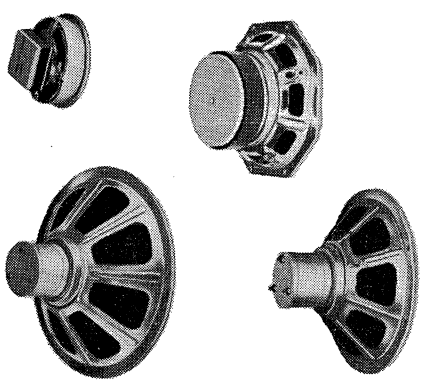
Most standard speakers have a flat magnet system of powerful Ferroxdure ceramic. For television sets and other applications where the leakage field should be kept as small as possible, there are Amperex loudspeakers with a Ticonal magnet in a pot system. Due to the use of Ticonal 750 these pot systems are very small.

NOTE: ALL STANDARD SPEAKERS AVAILABLE IN 4, 8, 15, AND 25 OHM IMPEDANCES.

*Ticonal Magnet in pot system
**Dual-Cone °Inverted Magnet

Size (inches)	Model No.	Magnet Weight (oz.)	Power Handling (watts)	Voice Coil Diameter (inches)	Total Depth (inches)	Resonant Frequency (Hertz)
ROUND GROUP						
2½	AD2070/Z	.70	1	9/16	4/5	360
3	AD3370/Y	.70	2	9/16	1 1/8	250
4	AD4470/Y	.70	2	9/16	1 1/6	200
4	AD4080/X	4.0	6	3/4	1 3/5	165
4	AD4080/Z	4.0	6	3/4	1 3/5	185
4	AD4090/X	1.0*	4	3/4	1 1/2	175
5	AD5080/Z	4.0	8	3/4	2	155
5	AD5080/X	4.0	12	3/4	2	140
5**	AD5080/M	4.0	8	3/4	2	130
6½	AD7080/X	4.0	12	3/4	2 1/2	110
6½**	AD7080/M	4.0	8	3/4	2 1/2	95
6½°	AD7091/M	1.5*	6	3/4	1 4/5	95
8	AD8080/X	4.0	12	3/4	2 3/4	95
8**	AD8080/M	4.0	12	3/4	2 3/4	75
OVAL GROUP						
3 x 5	AD3590/X	1.0*	4	9/16	1 3/5	200
3 x 8	AD3880/X	4.0	4	3/4	2	120
3 x 8	AD3890/X	1.0*	4	3/4	2 1/8	120
4 x 6	AD4680/Z	4.0	6	3/4	1 4/5	155
4 x 6	AD4680/X	4.0	12	3/4	1 4/5	140
4 x 6**	AD4680/M	4.0	8	3/4	1 4/5	125
4 x 6	AD4690/X	1.0*	12	3/4	2	140
4 x 6**	AD4690/M	1.0*	8	3/4	2	135
5 x 7	AD5780/X	4.0	6	3/4	2 1/4	115
5 x 7**	AD5780/M	4.0	8	3/4	2 1/4	100
5 x 7	AD5790/X	1.5*	12	3/4	2 1/2	115
6 x 9	AD6980/X	4.0	12	3/4	2 3/4	85
6 x 9	AD6980/M	4.0	12	3/4	2 3/4	72

HIGH QUALITY SPEAKER SERIES



The high-quality speakers have been specially designed for use in Hi-Fi equipment, where a high power-handling capacity, a very wide frequency-range and a negligible distortion level are required. Examples of application: acoustic boxes, bass-reflex boxes, juke boxes, Hi-Fi enclosures with or without cross-over network and stereo columns.

*Ticonal Magnet

Size (inches)	Model No.	Magnet Weight (oz.)	Power Handling (watts)	Voice Coil Diameter (inches)	Total Depth (inches)	Resonant Frequency (Hertz)
TWEETERS						
1" Dome	AD0160/T	10.0	20*	1	1	1000
2¼	AD2071/T	.70	10	9/16	1-1/8	800
* Cross-over frequency 1500 Hz. Power handling capacity is 40 watts if cross-over frequency is 4000 Hz.						
WOOFERS						
(All woofers have rigid paper cone with highly flexible butyl-rubber suspension.)						
5	AD5060/W	10.0	10	1	2-1/4	50
6½	AD7065/W	14.4	20	1	2-3/5	28
8	AD8065/W	14.4	20	1	3-2/5	28
10	AD1056/W	20*	40	1-1/2	6	24
12	AD1256/W	20*	40	2	6-3/4	15
FULL RANGE						
5	AD5060/M	10	8	1	2-1/4	85
6½	AD7061/M	10	10	1	2-3/5	55
8	AD8065/M	14.4	15	1-1/2	3-2/5	60
8½	AD9710/M	10*	15	1-1/2	4-3/4	50
10	AD1065/M	14.4	15	1-1/2	4	50
12	AD1265/M	14.4	15	1	4-3/4	50
12	AD1256/M	20*	30	1-1/2	6-3/4	50
12	AD1256/HP	20*	50	2	6-3/4	60

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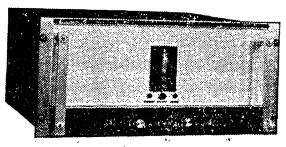
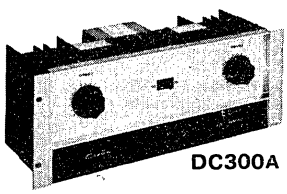
WIDEBAND POWER AMPLIFIERS



M600

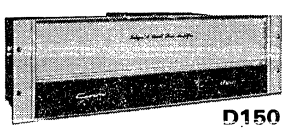
M2000 MONAURAL AMPLIFIER (not pictured)
Power Bandwidth: ±1db DC-20,000Hz at 2,000 watts RMS per channel into 8 ohms **Other Specifications:** similar to model M600 **Weight:** 200 lbs **Dimensions:** 19"w x 19"h x 17½"d **Price:** $2900 rack mount

M600 MONAURAL AMPLIFIER
Power Bandwidth: +1 -0db, DC-20,000Hz at 600 watts RMS per channel into 8 ohms **IM Distortion:** under 0.05% from 0.01 watt to 600 watts **Frequency Response:** ±0.1db DC-20,000Hz at 1 watt **Phase Response:** +0° -15° DC-20,000Hz **Hum and Noise:** 110db below full output **Damping Factor:** greater than 200 from 0-1,000Hz **Slewing Rate:** 16v per micro-second **Output Indicator:** calibrated peak output with 4 ranges **Inputs:** wide choice of input configurations using plug-in modules **Weight:** 100 lbs **Dimensions:** 19"w x 19"d x 8¾"h **Price:** $1500 rack mount



DC300A

DC300A DUAL-CHANNEL AMPLIFIER
Power Bandwidth: ±1db -0db, DC-20,000Hz at 150 watts per channel into 8 ohms **IM Distortion:** under 0.05%, 0.01 watt to 150 watts **Frequency Response:** ±0.1db, DC-20,000Hz at 1 watt **Phase Response:** +0° -15° DC-20,000Hz **Hum and Noise:** 110db below 150 watts output **Damping Factor:** greater than 200, 0-1,000Hz **Slewing Rate:** 8v per micro-second **DC Drift:** under 3mv to 55°C **Weight:** 45 lbs **Dimensions:** 19"w x 9¾"d x 7"h **Price:** $685 rack mount

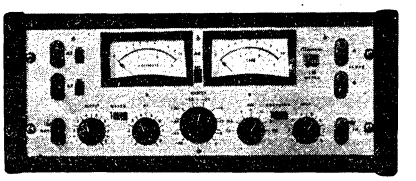


D150

D150 DUAL-CHANNEL AMPLIFIER
Power Bandwidth: ±1db, 5-20,000Hz at 75 watts RMS per channel into 8 ohms **IM Distortion:** under 0.05% from 0.01 watt to 75 watts **Frequency Response:** ±0.1db, 20-20,000Hz at 1 watt **Phase Response:** ±15°, 20-20,000Hz **Hum and Noise:** 110db below 75 watts output **Damping Factor:** greater than 200 from 0-1,000Hz **Weight:** 22 lbs **Dimensions:** 17"w x 9"d x 5¼"h **Price:** basic unit $399, 19" rack mount hardware and front panel $30

D60

D60 DUAL-CHANNEL AMPLIFIER
Power Bandwidth: ±1db, 5-30,000Hz at 30 watts RMS per channel into 8 ohms **IM Distortion:** under 0.05%, from 0.01 watt to 30 watts **Frequency Response:** ±0.1db 20-20,000Hz at 1 watt **Phase Response:** ±15° 20-20,000Hz **Hum and Noise:** 106db below 30 watts output **Damping Factor:** greater than 200 from 0-1,000Hz **Weight:** 10 lbs **Dimensions:** 17"w x 8¾"d x 1¾"h **Price:** $229 rack mount



IMA

AUDIO INTERMODULATION DISTORTION ANALYZER
Residual IM: guaranteed under 0.005%, and within 5% of full scale **Circuitry:** FET solid state **IM Ranges:** 0.1, 0.3, 1, 3, 10, 30, 100% full scale on separate IM meter **Sensitivity:** 17mv sensitivity for testing low-level devices; metered, variable LF/HF ratio; internal oscillators 60Hz and 7KHz; provision for external oscillators from 10-150Hz (LF) and 2.5K-20KHz (HF) ranges; constant output impedance **Plotting:** master "tracking" attenuator, acting on input and output, permits rapid IM plots of the test device--over a 45db output range in 5db steps **Price:** $570 rack mount, $595 in cabinet, as shown

All specifications reflect minimum performance levels under long-term use. Crown amplifiers are completely stable with internal protection for all loads. All dual-channel amplifiers can be modified for monaural operation with increased power output. Rugged industrial-grade construction warranteed three years for parts, labor and shipping. Custom modifications available for quantity OEM purchases. Prices subject to change without notice.

PROFESSIONAL 1/4-IN MAGNETIC TAPE RECORDERS

All models handle ¼-inch tape and reels 5" to 10½", all 19" rack mount.

Standard speeds 15 - 15/16 ips with 1 to 4 channels.

Patented electro-magnetic brakes never need adjustment.

True straight-line threading with easy-edit design.

Individual erase, record and play heads for 1, 2 or 4 tracks.

Six years proven solid state circuitry - etched circuit modules.

Extremely low noise electronics; modular transport construction.

Design lifetime of 10 years working 18 hours per day, with 3 factory overhauls

Strict quality control with individual proof-of-performance records - entirely American made.

Over 40 standard models $545-$3700; custom modifications for OEM use; complete series of players and decks available.

TAPE TRANSPORT STYLES

700 Rugged, high-quality simple unit with only 9 moving parts; automatic stop in "play" mode.

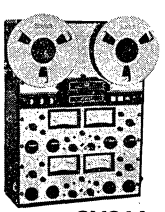
800 Basic 700 construction plus computer logic control which never breaks tape; IC logic levels for remote control and function readout; ideal for systems integration; 10 moving parts; photocell tape sensor, edit switch, cue lever; automatic replay accessory.

ELECTRONICS STYLES

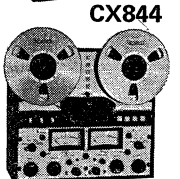
Varying features and degrees of flexibility to match user requirements. Contact sales dept. for complete descriptions on recorders and players.

Typical Performance Characteristics

Speed	Response-Hz	S/N	Wow
15 ips	±2db 50-30K	60db	0.06%
7 1/2	±2db 30-25K	60db	0.09%
3 3/4	±2db 50-15K	55db	0.18%
1 7/8	±3db 50-10K	45db	0.35%
15/16	±3db 50-5K	45db	0.50%



CX844



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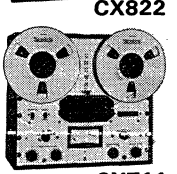

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CTS OF PADUCAH PADUCAH, KENTUCKY

LOUDSPEAKERS

CTS of Paducah, Inc., Paducah, Kentucky, specializes in the design and manufacture of loudspeakers to individual customer specifications and requirements. Production facilities characterized by a high degree of automation and vertical integration insure uniform high quality and capacity to handle large customer requirements at competitive prices. Complete design and production engineering staffs, well-known for pioneering many state-of-the-art advances, review each specification to suggest optimum performance/application criteria.

In addition to supplying custom design loudspeakers for original equipment manufacturers, **CTS has designed a line of speakers especially for the distributor, jobber and individual customer market. This line of speakers is carried in stock at Paducah for immediate delivery.**

CTS of Paducah, Inc., has achieved an enviable record of growth and progress servicing the needs of the loudspeaker market during the past decade. Eager to expand the level and scope of this service, we invite your inquiries.

HI-FIDELITY STEREO SPEAKERS AVAILABLE IN SINGLE-PACK CARTONS

MODEL	NOMINAL CONE DIAMETER	MAGNET WEIGHT (Oz.)	MAGNET TYPE	VOICE COIL DIAMETER	APPLICATION	SPEAKER RESONANCE (Hz.)	RESPONSE RANGE (Hz.)	POWER RATING MAXIMUM CONTINUOUS WATTS	MAXIMUM DEPTH
2T2*	1¾"	2.4	Ferrite	9/16"	Tweeter	N/A	2000-20,000	2	1⅛"
2T8*	1¾"	7.5	Ferrite	¾"	Tweeter	N/A	2000-20,000	10	1⅜"
3T2	3"	2.4	Ferrite	9/16"	Tweeter	N/A	1500-20,000	2	1½"
4½M5X	4½"	4.8	Ferrite	¾"	Mid-range	N/A	300- 5,000	5	3⅛"
6W10C	6"	10.0	Ferrite	1"	Woofer	40-55	50- 3,000	10	2¾"
8W7P	8"	6.8	Alnico V	1½"	Woofer	30-45	30- 3,000	25	3⅞"
8W9R	8"	8.5	Alnico V	1½"	Woofer	25-40	25- 3,000	25	4"
10W14P	10"	14.0	Alnico V	2"	Woofer	25-35	30- 2,000	50	5¼"
10W18C	10"	18.0	Ferrite	1½"	Woofer	20-35	20- 2,500	25	5⅜"
12W19P	12"	19.0	Alnico V	2"	Woofer	15-25	20- 2,000	50	6⅝"

HI-FIDELITY STEREO SPEAKERS AVAILABLE IN BULK-PACKED CARTONS

MODEL	NOMINAL CONE DIAMETER	MAGNET WEIGHT (Oz.)	MAGNET TYPE	VOICE COIL DIAMETER	APPLICATION	SPEAKER RESONANCE (Hz.)	RESPONSE RANGE (Hz.)	POWER RATING MAXIMUM CONTINUOUS WATTS	MAXIMUM DEPTH
2T3*	1¾"	3.0	Ferrite	¾"	Tweeter	N/A	2000-20,000	7	1¼"
3T2BP	3"	2.4	Ferrite	9/16"	Tweeter	N/A	1500-20,000	2	1½"
4½SR10-B	4½"	10.0	Ferrite	1"	Full Range	60-90	60-15,000	10	2¼"
6W3C	6"	2.5	Alnico V	1"	Woofer	45 MAX	50- 3,000	10	3⅛"
6W10R	6"	10.0	Ferrite	1"	Woofer	35 MAX	40- 4,000	10	2⅞"
8W7C	8"	6.8	Alnico V	1½"	Woofer	30-45	30- 3,000	25	2⅞"
8W9C	8"	8.5	Alnico V	1½"	Woofer	30-45	30- 2,500	25	4"
8FR6	8"	6.0	Ferrite	¾"	Full Range	85-105	60-17,000	5	3⅛"
8FR10	8"	10.0	Ferrite	1"	Full Range	80-100	40-19,000	10	3¼"
10W9C	10"	8.5	Alnico V	1½"	Woofer	20-35	20- 2,500	25	5⅛"
10W9P	10"	8.5	Alnico V	1½"	Woofer	20-35	20- 3,000	25	5⅛"
10W14C	10"	14.0	Alnico V	2"	Woofer	20-35	20- 2,500	50	5¼"
12W9P	12"	8.5	Alnico V	1½"	Woofer	20-35	20- 2,500	25	6¼"
12W14C	12"	14.0	Alnico V	2"	Woofer	20-35	20- 2,500	50	6½"
12W32C	12"	32.0	Ferrite	1½"	Woofer	20-35	20- 2,500	25	5¾"

* Phenolic Ring Suspension Tweeter Mounted in 3½" Housing.

KEY: Concerning woofers, last letter of model number (P, C or R) indicates suspension material.

P = Polyurethane
C = Treated Cloth
R = Butyl Rubber

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CTS OF PADUCAH PADUCAH, KENTUCKY

LOUDSPEAKERS

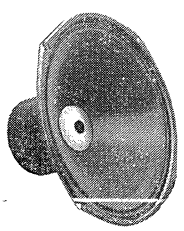
MUSICAL INSTRUMENT SPEAKERS AVAILABLE IN SINGLE-PACK CARTONS

MODEL	NOMINAL CONE DIAMETER	CERAMIC MAGNET WEIGHT (Oz.)	VOICE COIL DIAMETER	APPLICATION	RESONANCE SPEAKER (Hz.)	RESPONSE RANGE (Hz.)	NOMINAL SENSITIVITY LEVEL (Decibels)	POWER RATING MAXIMUM CONTINUOUS WATTS	MAXIMUM DEPTH
10E18L	10″	18.0	1½″	Lead guitar-Organ	80-100	80-7,000	97	60	4¾″
10E18B	10″	18.0	1½″	Bass guitar	50-70	50-4,500	97	60	4¾″
10G54L	10″	54.0	2″	Lead guitar-Organ	60-80	60-7,000	100	100	4⅞″
10G54B	10″	54.0	2″	Bass guitar	40-60	40-4,000	100	100	4⅞″
12C10L	12″	10.0	1″	Lead guitar-Organ	75-95	70-7,000	100	25	6″
12E18L	12″	18.0	1½″	Lead guitar-Organ	80-100	80-7,000	100	60	6½″
12E18B	12″	18.0	1½″	Bass guitar	45-65	50-4,000	98	60	6½″
12G54L	12″	54.0	2″	Lead guitar-Organ	70-90	70-7,000	102	100	6″
12G54B	12″	54.0	2″	Bass guitar	30-50	30-4,000	100	100	6″
15E28L	15″	28.0	1½″	Lead guitar-Organ	70-90	70-8,000	102	60	7⅝″
15E28B	15″	28.0	1½″	Bass guitar	35-55	30-4,000	98	60	7⅝″
15G54L	15″	54.0	2″	Lead guitar-Organ	70-90	80-8,000	107	100	6¾″
15G54B	15″	54.0	2″	Bass guitar	30-50	30-4,000	100	100	6¾″
18G54B	18″	54.0	2″	Bass guitar	30-50	20-3,000	100	100	7⅞″
18K96B	18″	96.0	3″	Bass guitar	35-45	20-3,500	103	125	8″

AUTOMOTIVE AND EXTENSION SPEAKERS AVAILABLE IN SINGLE-PACK CARTONS

MODEL	NOMINAL CONE DIAMETER	MAGNET WEIGHT (Oz.)	MAGNET TYPE	VOICE COIL DIAMETER	APPLICATION	SPEAKER RESONANCE (Hz.)	RESPONSE RANGE (Hz.)	POWER RATING MAXIMUM CONTINUOUS WATTS	MAXIMUM DEPTH
4½FR10*	4½″	10.0	Ferrite	1″	Full Range	60-90	60-15,000	10	2¼″
5¼FR14	5¼″	14.0	Ferrite	1″	Full Range	70-90	70-18,000	10	3½″
69FR8	6 x 9″	7.5	Ferrite	1″	Full Range	40-65	50-20,000	10	3¼″
69FR14	6 x 9″	14.0	Ferrite	1″	Full Range	40-65	40-18,000	10	3½″
8FR2	8″	2.4	Ferrite	9/16″	Full Range	100-120	100-15,000	2	2⅞″
8FR14	8″	14.0	Ferrite	1⅛″	Full Range	70-100	70-20,000	15	3⅜″
8CA10	Coax 8″ / 3″	10.0	Ferrite	1″	Full Range	55-75	55-20,000	20	3¾″
10FR10*	10″	10.0	Ferrite	1″	Full Range	65-85	65-18,000	15	4″

* Bulk packed.



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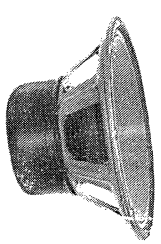

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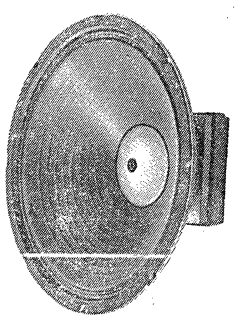

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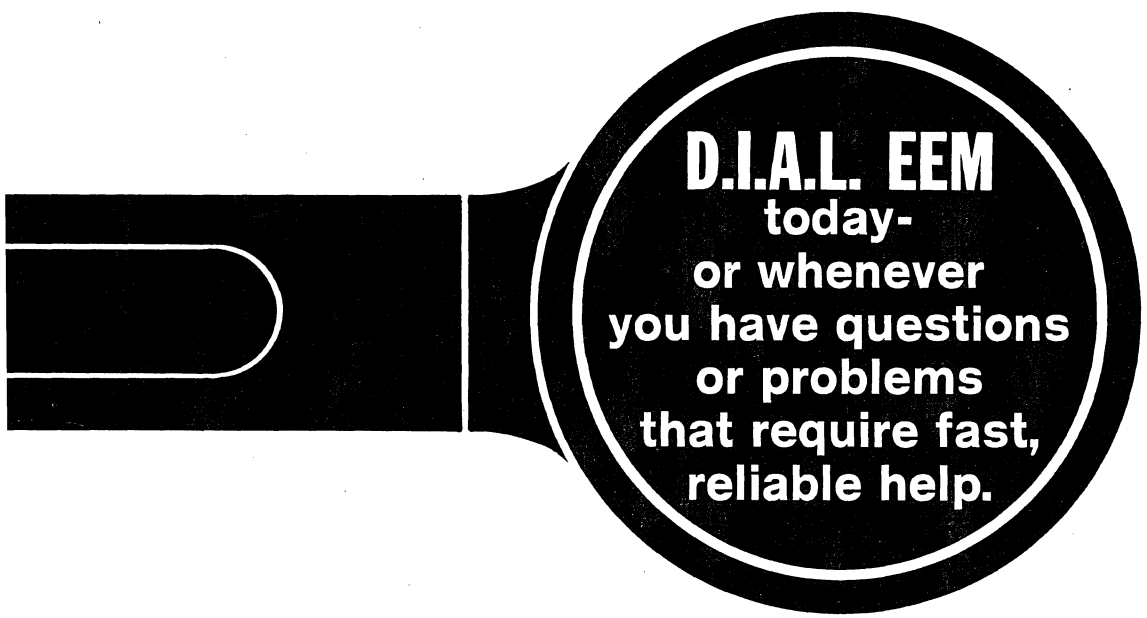

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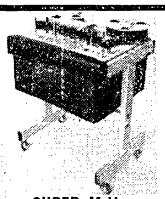
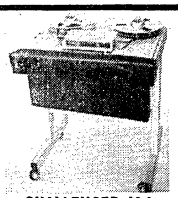
MAGNETIC TAPE TRANSPORTS



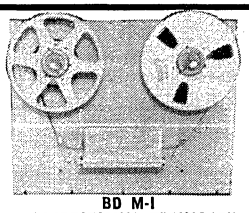
SUPER M-II
STUDIO RECORDER FOR 2″ AND 1″ TAPE

OPTIONS —
- 2″ and 1″ Tape
- 24, 16, 12 and 8 Tracks
- 10½″ and 14″ Reels
- Speed up to 240 IPS
- Remote Control
- Interchangeable Head Mount



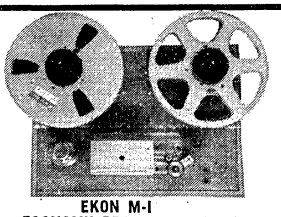
CHALLENGER M-I
STUDIO RECORDER FOR 1″ AND SMALLER TAPE

OPTIONS —
- 1″, ½″, ¼″ and 150 MIL Tape
- 8, 4, 2 and 1 Tracks
- 10½″ Reels
- Speed up to 30 IPS
- Remote Control
- Interchangeable Head Mount



BD M-I
BI-DIRECTIONAL TRANSPORT FOR LOGGING OR QC

OPTIONS —
- ½″, ¼″ and 150 MIL Tape
- 8, 4, 2 and 1 Tracks
- 10½″ and 14″ Reels
- Speed up to 30 IPS
- Interchangeable Head Mount



EKON M-I
ECONOMY PROFESSIONAL TRANSPORT

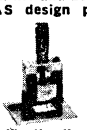
OPTIONS —
- ½″, ¼″ and 150 MIL Tape
- 8, 4, 2 and 1 Tracks
- 10½″ Reels
- Speed up to 30 IPS
- Interchangeable Head Mount

New from IEM — A Complete Line of Tape Transport and Head Assemblies for Every Application.

RECORDING ASSEMBLIES

Professional recording assemblies represent the state of the art for precision magnetic components. They encompass most of the standard and special recording formats and electronics. They can be incorporated for upgrading most existing professional equipment. They are also available as OEM equipment for systems manufacturers. All parts are precision ground for accuracy and permanent alignment. • Guide surfaces are of tungsten carbide for maximum life and accuracy. • IEM unique MEGA-BIAS design permits head change in seconds with positive azimuth and zenith lock-in.

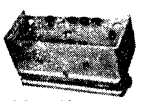
16 Track Head System



Calibration Head

Turret Head Assembly

Cam Head System



Head Assembly with Bias

OEM EQUIPMENT

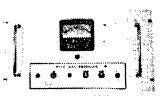
Complete facilities for both engineering and fabrication makes IEM an ideal partner in your special short run requirements. Below are a few items developed with both customer and company sponsored programs.

OEM Recorder Line

Common Capstan Cartridge Tester

7/8″ x 3½″ x 5″ Recorder

Cartridge Loader



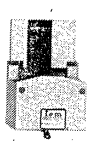
Bias Amplifier

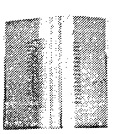
MAGNETIC HEADS

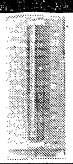
PRECISION MAGNETIC HEADS

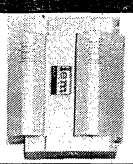
IEM HAS DESIGNED AND BUILT THOUSANDS OF DISTINCT HEAD TYPES. IF NONE OF THESE FIT YOUR NEED, IEM CAN DESIGN TO YOUR SPECIFIC REQUIREMENTS.

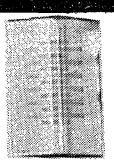
DIGITAL COMPUTER AUDIO IRIG ANALOG FERRITE VIDEO HI-SPEED DUPLICATION

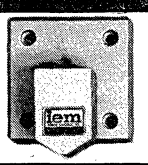


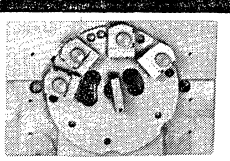












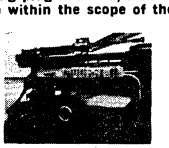
FLUX RESPONSIVE SYSTEMS

The flux sensitive system represents an efficient method of sensing static magnetic information, making data output independent of tape speed.
The system is flexible, simple, and economical, the accuracy being mainly a function of the drive element. All circuitry is solid state utilizing plug in board, thus reducing maintenance and trouble shooting to within the scope of the average user.

Angular Resolver

Linear Resolver

Low Frequency Playback Amplifier



Magnetic Machine Control

USES
- POSITION CONTROL
- QUANTITATIVE MEASUREMENT
- LINEAR RESOLVERS
- ANGULAR RESOLVERS
- LOW FREQUENCY PLAYBACK TO DC

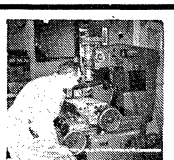
RECONDITIONING REFURBISHING SERVICES

iem offers complete service for refurbishing, including cleaning, relapping, replacement of guides and inspection. Standard audio types — all formats. Duplicator types — slave and master assemblies. Video tape recorder audio heads. Complete conversion service for various tape formats.

FACILITIES • CAPABILITIES

IEM, since 1958, with exceptional personnel stability plus ultra modern, total facilities, has become one of the most dependable suppliers of mass produced and special magnetic heads as well as OEM recording systems.

SEND FOR BULLETINS



Jig Bore Oriented Shop

Complete Machine Shop

Computer Controlled Production

NBS Traceable Testing

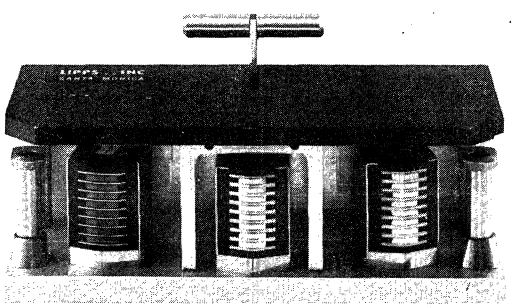
Microscope Equipment Lines

Micro Inch Measuring Lab

LIPPS..INC MAGNETIC RECORDING HEADS

PROFESSIONAL AUDIO RECORDING HEADS

Illustrated above are only a few of the heads which we produce. Contact us direct for more information and data.



PRE-ALIGNED HEAD ASSEMBLIES

LIPPS . . INC
offers a variety of precision-made head assemblies, complete and ready to mount on your transport. Renew your existing equipment for finer reproduction quality, or update older equipment to accommodate the newer multi-channel recording techniques.

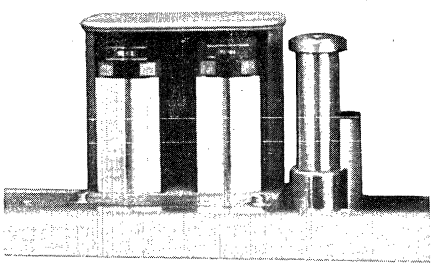
REFURBISHMENT · RELAPPING REPLACEMENT SERVICE

AUDIO · ANALOG · DIGITAL INSTRUMENTATION

Enjoy maximum usage for a fraction of the original cost. Utilize our reconditioning service to obtain maximum use of existing heads.

We will be pleased to furnish prices for special assemblies, including ANALOG and DIGITAL, on request.

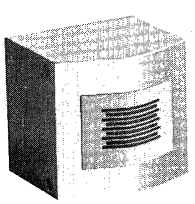
LIPPS . . INC. manufactures a complete line of monaural, stereo and multichannel heads for replacement of original heads in name-brand recorders. Our heads are guaranteed to equal or exceed the requirements of original equipment.



LIPPS . . INC. maintains a complete relapping and replacement service for Ampex and RCA Video Tape Recorder Audio Heads.

Most assemblies are serviced in three to five working days.

EXTENDED LIFE HEAD
Ferrite Core

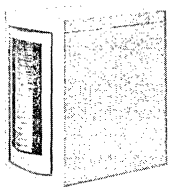


LIPPS..INC
magnetic recording heads
1630 euclid street
santa monica · calif. 90404
(213) 393-0449 · 871-0777

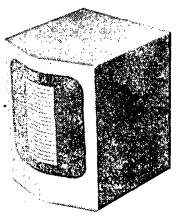
OVER 25 YEARS OF EXCELLENCE IN MAGNETIC HEADS

SPECIALIZED PRECISION MAGNETIC RECORDING HEADS

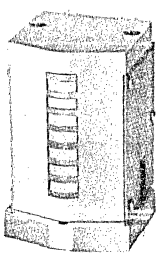
LOGGING • IRIG



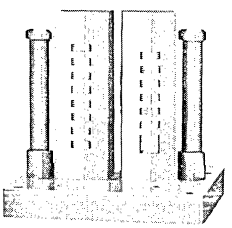
42 TRACK IRIG, 1"



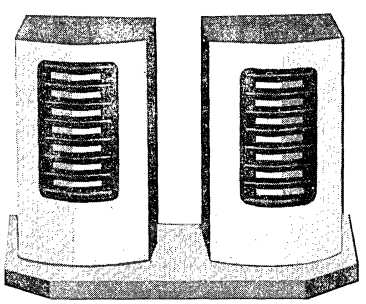
20 TRACK DIGITAL, ½"



INDUSTRIAL or ENVIRONMENTAL



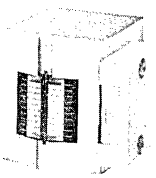
61 CHANNEL ASSEMBLY



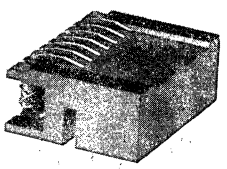
7 or 14 CHANNEL IRIG

When you require more channels on narrower tape widths, single head stacks or special assemblies can be designed and produced utilizing our more than 25 years of head manufacturing experience with tight toleranced multi-channel programs.

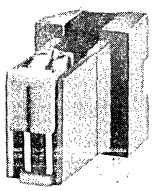
COMMERCIAL DIGITAL SERIES MAGNETIC RECORDING HEADS



7 & 9-CHANNEL IBM COMPATIBLE TAPE HEAD



8-CHANNEL FLYING DISC RECORDING HEAD ASSEMBLY



FLYING DRUM RECORDING HEAD

LIPPS . . INC. is the oldest independent head manufacturer in the United States. We are a production-oriented facility with engineering and development capabilities that enable us to produce metal surfaced and ferrite heads. LIPPS . . INC. produces a complete line of high quality recording heads, mainly for Original Equipment Manufacturers.

Successful performance with Original Equipment Manufacturers has come about as the result of a flexible and strong capacity to produce to customer specifications at competitive prices. Close cooperation between your engineering department and our production staff is our basic policy as an independent manufacturer. Our unique methods have always enabled us to furnish top quality, precision products to our customers at prices more attractive than our competitors. Our techniques are of proprietary design and, therefore, are controlled and protected by in-house processes, some of which are:

Photolab . . . chemical milling . . . hydrogen annealing . . . transfer molding . . . vacuum depositing . . . complete capability to machine, profile, slice and polish ferrite and ceramic materials . . . complete in-house machine shop.

We are manufacturers of custom heads designed for individual requirements. Your specifications will receive immediate attention when sent to us for quotation, and our engineering staff is always available to assist in any way.

We look forward to having the opportunity to manufacture a product built to your exacting requirements at a competitive price.

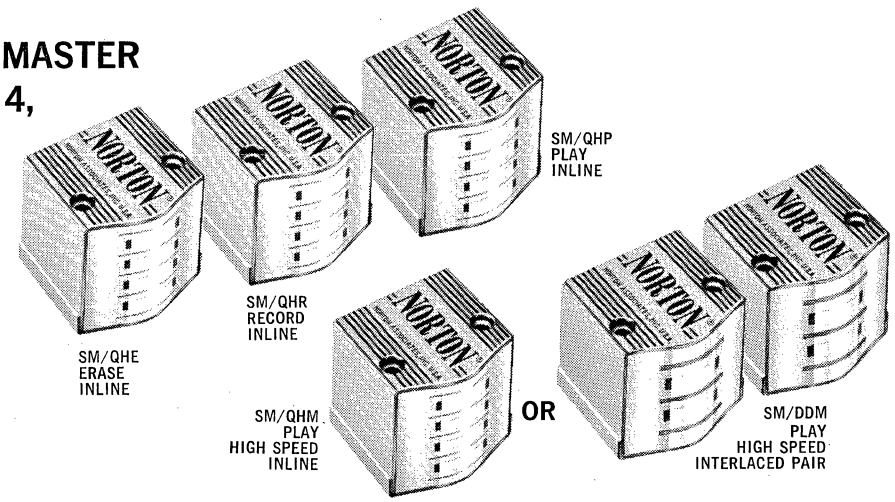
Robert J. Cross
Vice President and General Manager

NORTON® MAGNETIC HEADS
For Duplication, Motion Picture Film, Business Machines

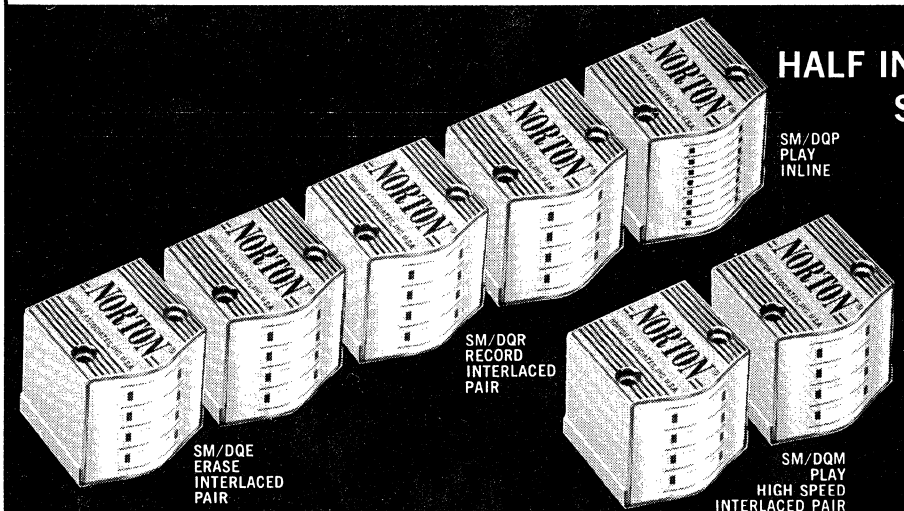
HALF INCH STUDIO MASTER STANDARD STEREO 4,

A standard four track inline Master series for new equipment or replacement. The high speed play is available as an interlaced pair SM/DDM or an inline unit SM/QHM.

Available in impedances and mountings to fit most recorders: singly, in sets and installed by us in your head assembly.

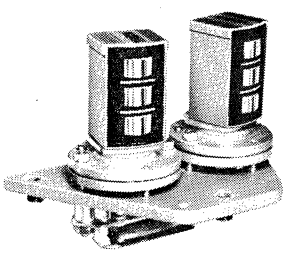


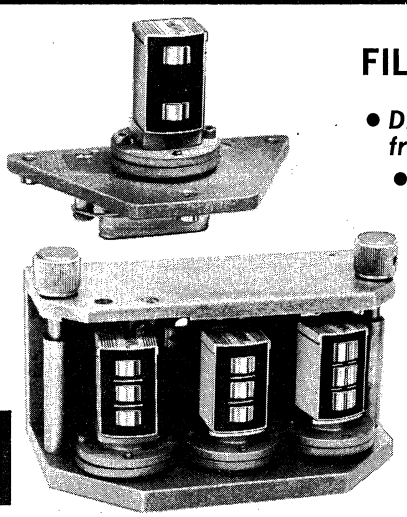
HALF INCH STUDIO MASTER STANDARD STEREO 8



This standard 8 track half inch master series uses a 4 by 4 interlaced format. The low speed play is offered as an inline unit SM/DQP. High speed play requires the interlaced pair SM/DQM.

Available in impedances and mountings to fit most recorders: singly, in sets and installed by us in your head assembly.





Some professional applications are illustrated here. For our complete catalog write or call...

FILM HEADS IN ALL FORMATS

- ***Direct factory replacement film heads from OEM stock***
- ***Your equipment need not become obsolete***
- ***Tested and aligned for immediate plug-in use***
- ***Off the shelf factory prices***

Send us your worn head assembly for replacement with new top quality NORTON film heads.

Have extra head assemblies available. NORTON can also supply complete new units to match your present equipment and requirements.

NORTON **ASSOCIATES, INC.**
10 Di Tomas Court, Copiague, New York 11726 • (516) 842-4666

ELECTRET CONDENSER MICROPHONES

ELECTRET CONDENSER MICROPHONE EMU-522 (UNI-DIRECTIONAL)

This microphone is suited to Hi-Fi recording, and other audiophile applications. Performance is of a level found in the professional condenser microphones of broadcast stations. The pickup pattern is unidirectional, with good pickup from the front but high rejection from the sides and back. This means a lower ambient noise level and resistance to system feedback in public address applications. Performance is outstanding.

• Main Specifications:

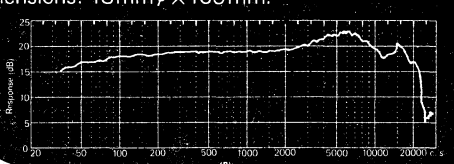
• Frequency range: Refer to the Figure (A) • Output impedance: 2KΩ ±30% (1KHz) • Sensitivity: −68dB ±3dB/μ Bar at 1KHz 0dB = 1V/μ Bar • Signal-to-noise ratio: More than 50dB • Battery life: UM-3D battery; More than 3,000 hours (continuous) • Dimensions: 17.6mmφ × 226.5mm.

ELECTRET CONDENSER MICROPHONE EM-518 (NON-DIRECTIONAL)

Performance is of a level found in the professional condenser microphones of broadcast stations. This microphone is suited to public address, Hi-Fi recording, and other audiophile applications. Handling of the microphone holder is simple, as 5/16" threads are used. Any stand with this thread size is acceptable.

• Main Specifications:

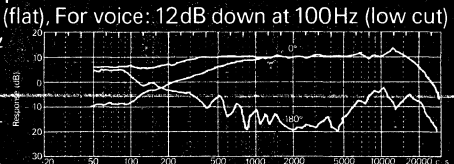
• Frequency range: Refer to the Figure (B) • Output impedance: 2KΩ • Sensitivity: −65dB ±3dB • Signal-to-noise ratio: 40dB • Continuous operating time: UM-3D battery; More than 3,000 hours • Dimensions: 18mmφ × 169mm.



ELECTRET CONDENSER MICROPHONE EMU-521 (UNI-DIRECTIONAL)

This is high-performance condenser microphone. Slim and smart but has rugged construction. The electret unit employed is of the highest quality, giving top performance and providing service suited to stereo recording. A response switch is equipped, with positions for music and voice. The music position gives flat response and is suited to music recording. At the voice position, unnecessary lows are cut, giving clear voice output.

• Main Specifications: • Frequency range: 20~18,000Hz (flat), For voice: 12dB down at 100Hz (low cut) • Output impedance: 600Ω • Sensitivity: −69dB ±2.5 (1μ bar, 1KHz) • Signal-to-noise ratio: More than 50dB • Battery: UM-3 (1.5V) • Battery service: 1,500 hours (continuous) • Cable: 6m with Cannon plug (3P) • Finish: Wrinkled nickel • Dimensions: 22mmφ × 205mm • Weight: 420g (including cable).



• *For more information, write to:*

PRIMO COMPANY LTD.

CHICAGO ILLINOIS OFFICE: 111 EAST WACKER DRIVE, SUITE 2207, CHICAGO ILLINOIS 60601
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TEL: (0422) 43-3121~7 CABLE: "PRIMO MUSASHINO MITAKA" TELEX: 2822-326 PRIMO J

• *Main Products:* *Microphones Headphones*

TRIMM INC.

A SELECTED LISTING FROM OVER 2500 TRIMM-MANUFACTURED COMPONENTS.

P.O. Box 489 • 400 West Lake St. • Libertyville, Ill. 60048 • (312) 362-3700

HEADSETS : COMMERCIAL , AMATEUR , MILITARY , EDUCATIONAL

Broad variety of types, backed by more than 50 years of continuous production. Listed are the most used double monaural and stereo headsets, plus single earphones. Many additional types and related accessories such as earcushions, multiple jack junction boxes, repair parts, etc. are listed in catalog 560 p. 1-10. Also see below for clarifying information regarding ohmage, cord terminations, etc.

ACME – 24, 25, and 27 SERIES

A superior very low cost headset. Recommended for educational toys, novice electronic experimenters,crystal sets, radiation detectors, institutional systems where initial cost is a must consideration, etc.

Receiver units - single coil, magnetic type. No. 24 and 25 double headsets. No. 27 single earphone, Cord 4½ ft. No.24 uses extruded vinyl covered double wire headband (left). No. 25 and No. 27 use a single steel band (right).

REX – 30 and 31 SERIES

Particularly recommended for low cost teaching systems, electronic organs, institutional radio and TV systems.

Very light weight bi-polar magnetic type headset. Non-warping bakelite cap and shell.No. 30 uses braided tinsel cord. No. 31 grey colored vinyl jacketted cord. Both have extruded plastic covered wire headband.(Left figure.)

DEPENDABLE – 70 SERIES

The original TRIMM headset, manufactured continuously since 1922. Provides maximum sensitivity. Recommended for low cost educational systems, electronic organs, radio amateurs, crystal sets, numerous industrial instruments centralized institutional systems, etc. Has considerably improved bass response compared to lower cost headsets.

Receiver unit bi-polar design with forged magnets. Cap and shell of non-warping bakelite. Vinyl covering over double wire headband. Many special variations for particular applications.

FEATHERWEIGHT––100, 101, 102, 104, 106, and 107

The first really lightweight headset with high sensitivity, first introduced in 1929, continuously improved. Long a favorite of amateurs, additionally recommended for industrial instruments, electronic organs, broadcast stations

Weight, double headset, 5 oz. Receiver unit of bi-polar design. Cap and shell of non-warping thermosetting resin. No. 100, 101, and 106 have adjustable metal band type headband. No. 102, 104, and 107 a vinyl covered wire type headband.No. 101, and 102 use an over-the-head cord, others, Y-shaped cord. Single forms of these headsets for group hearing applications listed at right.

"L" HEADSET – 50 and 56 SERIES

Highest quality TRIMM magnetic headset. Recommended for broadcast monitoring, teaching systems, etc.

No. 50 has Y-shaped cord, No. 56 an over-the-head type cord. All come equipped eith telephone quality plugs.

ACME

24-03	24-9-03
24-2K	24-9-2K
24-4K	24-9-4K
	24-14-08
25-03	25-9-03
25-2K	25-9-2K
25-4K	25-9-4K
27-03	27-9-03
27-1K	27-9-1K
27-2K	27-9-2K

REX

30-03	30-9-03
30-06	30-9-06
30-2K	30-9-2K

DEPENDABLE

70-08	70-9-08
70-06	70-9-06
70-2K	70-9-2K
70-4K	70-9-4K
	70-14-08

"L" – MONAURAL

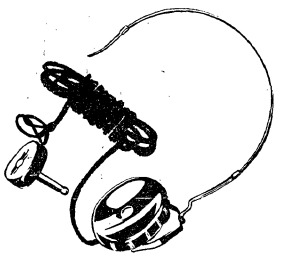
50-06	56-06
50-08	56-08
50-16	56-16
50-2M	56-2M
50-5M	56-5M
50-12M	56-12M

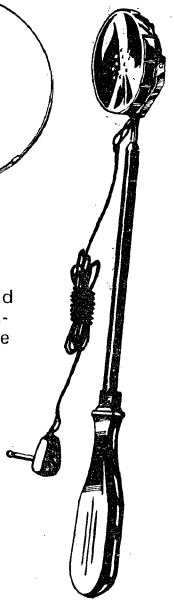
"L" – STEREO

50-14-08	56-14-08
50-14-16	56-14-16
50-14-6M	56-14-6M
50-15-08	56-15-08
50-15-16	56-15-16
50-15-6M	56-15-6M

COMMERCIAL

156	600 ohms
157	17000 ohms





SINGLE EARPHONES

Types for group hearing aid and other specialized listening applications usually use the FEATHERWEIGHT series receiver unit and either a lorgnette handle or a headband with a cushion on end opposite earphone. Cord 6 ft. long. Supplied with a TRIMM No. 512 plug.

Headband	Lorgnette Handle
114-08	124-08
114-3	124-3
114-1K	124-1K
114-2K	124-2K

FEATHERWEIGHT

100-06	100-9-06	104-06	104-9-06
100-08	100-9-08	104-08	104-9-08
100-2K	100-9-2K	104-2K	104-9-2K
100-4K	100-9-4K	104-4K	104-9-4K
106-24M	106-9-24M	107-24M	107-9-24M
101-06	101-9-06	102-06	102-9-06
101-08	101-9-08	102-08	102-9-08
101-2K	101-9-2K	102-2K	102-9-2K
101-4K	101-9-4K	102-4K	102-9-4K
104-14-03		104-14-08	
104-14-2K		104-15-08	

OTHER ACCESSORIES

CONTROL BOXES

A wide assortment of outlet boxes with volume controls and standard jacks, suitable for use in group hearing aids are listed in catalog 560 p. 6. Additionally, for teaching and centralized radio and TV systems a variety of boxes with and without volume controls, selector switches, and multiple jacks are available.

Stereo and hi-fi multi-channel switching and outlet boxes; attachments for radio and TV, as well as other applications–catalog 560 p.4-6.

EARCUSHIONS

Provides user with maximum comfort, also are used to exclude outside unwanted ambient noises. Types to fit all TRIMM headsets, and those of many others. See catalog 560 p. 2.

PLUGS – JACKS – ADAPTERS

Audio types to fit all headsets, tape recorders stereo and hi-fi systems. Produced by TRIMM in the U.S.A. See catalog 560 p. 10.

COMMERCIAL – 156 and 157 SERIES

A ruggedized variation of the FEATHERWEIGHT type. Developed principally for marine, aircraft, and other commercial applications. Although listed in only two forms, available in many special variations. Both have telephone type plug (501-00), and use nylon braided, but rubber insulated, waterproof, heavy duty cord. Plastic covered headband.

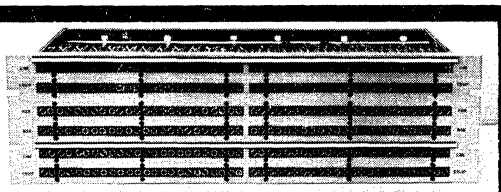
NOTES

OHMAGE – Final one or two digit suffix incode number of most headsets indicates ohmage as follows:

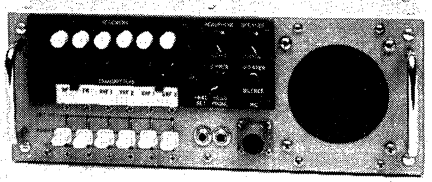
-3	300 ohms	-16	16 Ohms	-24M	24000 ohms
-03	3-4 ohms	-2M	2000 ohms	-1K	1000 ohms d.c.
-06	600 ohms	-5M	5000 ohms	-2K	2000 ohms d.c.
-08	8 ohms	-12M	12000 ohms	-4K	4000 ohms d;c;

Ohmage is usually impedance at 1000 hz. except those having "K" in suffix which by tradition is the d.c. resistance. Impedance is usual 4-7 time this.

CORD TERMINATION – MONAURAL-When "-9-" appears in code number, a standard ¼-inch dia. 2-circuit plug is attached to cord. A few older numbers such as 50, 56, 156, 157 have plug without "-9-" in code number. Other than these few exceptions those without "-9-" are equipped with a standard pin tip terminal. Stereo– All models can be equipped with stereo cords; althoughnot listed. Those with "-14" in code number use a single ¼-inch dia. 3-circuit plug. Those with "-15-" have two 2-circuit plugs intended to go to separate jacks for each channel.

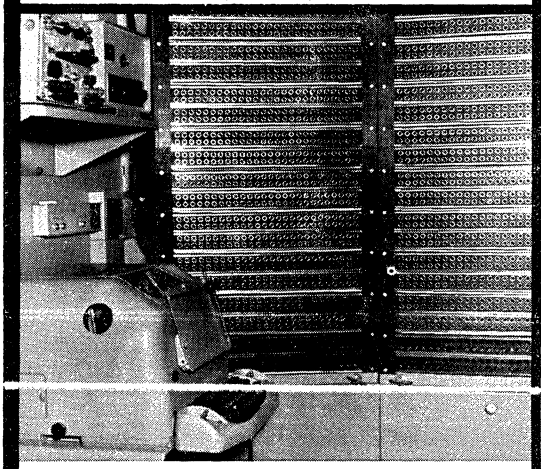


Audio and VF Patch Panels • Bantam and standard jack models • Shelf and custom designed models • Completely wired to rear terminal block • Available in 2 to 6 row construction.

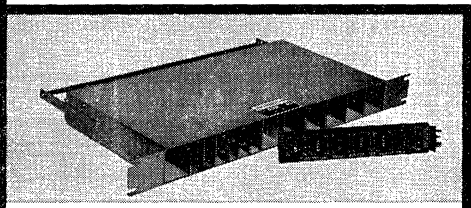


Air Traffic Control Tower Systems • Complete solid state Airport Tower units • FAA, Navy and Air Force approved • Models for 12 VDC, 24 VDC and 48 VDC power • Amplifiers for Tx and Rx circuits.

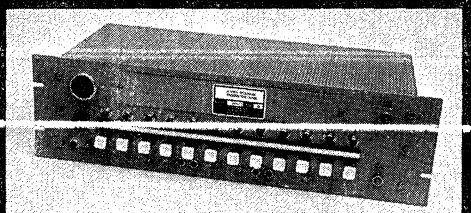
Mobile Air Traffic Control System AN/MRC-131 • Completely self contained • Provides 1 HF, 2 VHF, 2 UHF, 1 FM channels • Three operator positions • Powered from motor alternator, 12 V DC battery, and 110/230 VAC rectifier charger • All frequencies in HF, VHF and UHF Air/Ground bands.



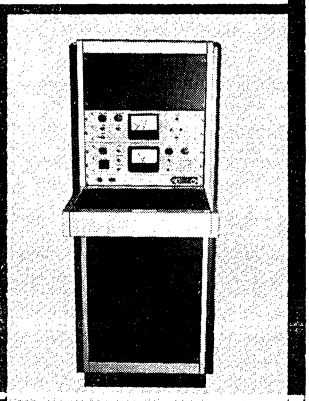
Technical Control Communications Center AN/TSC-76 • Audio, VF, HF, DC and Wideband Patch Systems • Telephone and Video Patch Cords • All types military shelter systems • Completely self contained Microwave Tech Control Centers.



Strappable Audio Pad AP-1232 • 12 pads per MMS shelf • Each pad strappable 0 to 31.5 db. • 600 ohm input-output • Plug in construction • Variable and other impedance models.

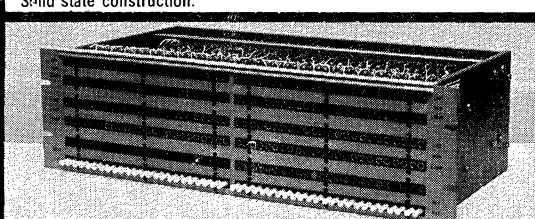


Voice Orderwire Unit TTP-12 • Provides selection 12 channels • Supplied with telephone handset • Adjustable Tx and Rx levels • A must for microwave users.

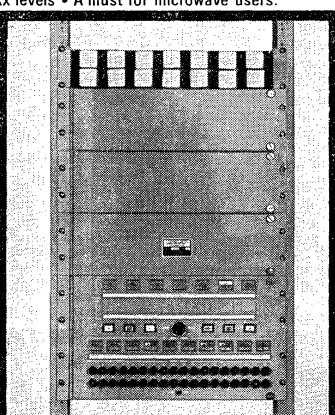


Magnet Charger Model 3 LV • High power for industrial users • 11000 watt seconds peak energy • Automatic 10 operations per minute • Available with Monitor Unit • Variable charging voltage 0-500 volts • Model 1 LV also available.

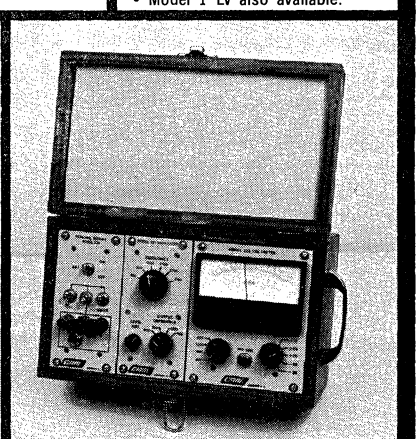
Local Alarm Panel LAP-12 • Model of 12, 24 and 36 points • Red lamp and audible alarm • 110 VAC, 48 VDC and 24 VDC optional power • Solid state construction.



D.C. Patch Panels • Bantam and standard jack models • Shelf and custom designed models • Activity lamp on all models • 24, 26 and 48 channels Tx and Rx.



Supervisory Control, Alarm Systems • Custom designed to your requirements • Up to 256 points control and alarm • Excellent security Double Scan with Parity • Computer control and logging available • Single master-multiple remotes • Fully solid state IC construction.



Telephone Line Test Set • Measures signal and noise levels +13 to −60 dbm • Handles 600, 900, 1200. 20 K impedances • Provides self contained test tones • Invaluable tool for leased line users • Internal battery and AC power.

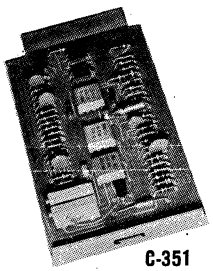
GRM CORPORATION
Triangle Industrial Center
P.O. Box 337, Medford, N.J.
Phone (609) 267-7950
CORPORATION An Inductotherm Company

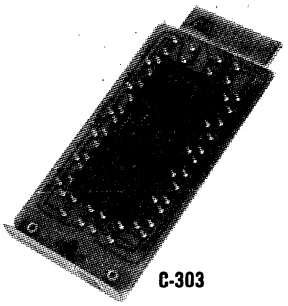
We invite your inquiries for all items used in Technical Control, Microwave, Air Traffic Control and Voice Switching Systems. Leaders in control and switching technology.

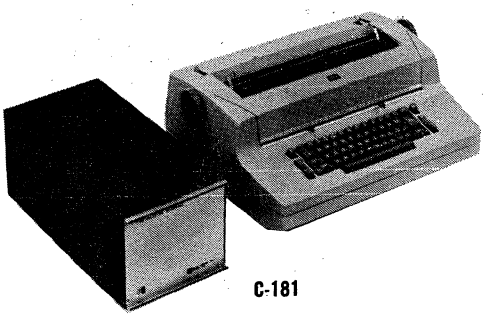
RE-EL CIRCUITS INC.

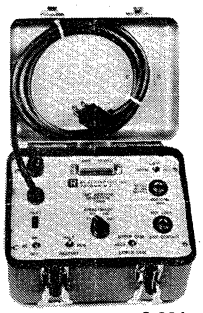
520 VICTOR STREET, SADDLE BROOK, NEW JERSEY / TELEPHONE (201) 843-3738

PRODUCTS FOR COMMUNICATION


C-351


C-303


C-181


C-391

INTERFACE

IBM SELECTRIC* INTERFACE C-181

The C-181 Selectric* Interface is a completely solid state device which performs all the necessary code translation, level interface and control functions necessary to interconnect either an IBM Model 731 or 735 "Correspondence" coded Input/Output writer to a computer I/O bus or simular data input/output device.

COMMUNICATIONS MULTIPLEXER FOR PDP-11 COMPUTER

1069 — 32 CHANNEL MULTIPLEXER

Multiplexer provides full character transfer directly in and out of core (DMA). Allows intermix of synchronous and asynchronous channel cards. Four different data rates standard, 8 optional. Variable codes and stop bits accommodated. Isolated line drivers and receivers for neutral, polar (CCITT) or RS232C lines. Ability to perform "Telex" signalization. Two vectors provide line status and buffer status indications. Dual port option allows use in systems having redundant DEC, PDP-11 computer.

PASSIVE NETWORKS

C-303 — DUAL ATTENUATOR

The C-303 dual attenuator contains two independent adjustable 600 ohm pads. The adjustment is via soldered straps and is in increments of .25 DB to 31.75 DB.

CONDITIONERS

C-311 — LINE AMPLIFIER

The C-311 is a voice frequency Line Amplifier designed for use in high grade data communication circuits. Its excellent amplitude and delay distortion characteristics, low harmonic distortion, low noise output and 32 DB gain are necessary for operation of reliable data transmission.

C-312 — 1 WATT POWER AMPLIFIER

The C-312 is a voice frequency power amplifier which delivers one (1) watt into an 8 ohm speaker load. The unit is ideal for line monitoring applications. Gain adjustments are made by either an internal 20 turn potentiometer or with an external "volume" control potentiometer.

C-314 — SUMMING AMPLIFIER

The C-314 Summing Amplifier contains three (3) balanced and isolated inputs and one (1) balanced isolated output.

C-315 — DISTRIBUTION AMPLIFIER

The C-315 Distribution Amplifier contains one balanced isolated input and three balanced isolated outputs.

SIGNALLING

C-324 — TOUCH TONE® RECEIVER

Converts Touch Tone frequencies (CCITT optionally) to 1 of 12 or BCD coded levels.

C-325 — BINARY (BCD) TO DIAL PULSE CONVERTER

Translates parallel BCD coded digits into Rotary Dial pulse output. On card buffer allows up to 15 digits to be loaded in as little as 30 microseconds. Indication of completion and time out function included.

CONTROL/SUPERVISION

C-341 — ORDER WIRE

The C-341 Order Wire is designed to allow voice access to a V.F. circuit. The C-341 provides talk battery to the mouthpiece of a handset or headset (not supplied). The C-341 is isolated from the line via transformers and presents a high impedance load to the line it bridges. Talk/listen directions are controlled by relays provided on the unit.

ALARMS

C-351 — SIGNAL FAULT ALARM

The C-351 Signal Fault Alarm is a low cost Data-Telegraph monitoring unit designed for Signal speeds up to 200 bauds. The C-351 gives alarm outputs for pre-set signal distortion and open line.

C-353 — DUAL CARRIER DETECT

The C-353 is a dual level detector designed to detect equipment failures. The C-353 operates on the voice frequency range. The high impedance detectors are bridged across the input and output of a unit and will give an alarm output upon failure of the equipment in between.

C-354 — HI/LOW CARRIER DETECT

The C-354 hi/low detector is designed to present an output alarm when a voice frequency level falls above or below a pre-set level spread. Ideal for use in maintaining proper operating parameters of voice frequency systems.

INTERFACE

C-362 — EIA TO TTY CONVERTER WITH 2/4 WIRE HYBRID

The C-362 is a EIA to TTY converter. This unit converts standard EIA levels to 20 or 60 MA keyed teletype signals. Two way conversion i.e., EIA to TTY and TTY to EIA is provided along with a hybrid strapping option allowing 2 to 4 wire conversion.

SUB-SYSTEMS

C-411 — REGENERATIVE SELECTOR MAGNET DRIVER

C-411 is a combination unit containing a signal regenerator as well as a selector magnet driver. It can accept a distorted input signal, reconstruct a distortionless signal which in turn drives the selector magnet driver. The output of the selector magnet driver delivers an undistorted 60 MA keyed signal to the teleprinter. The complete unit can be mounted in the electrical service unit of a standard M-28 Teletype* or any other mounting desired. Plug-in replacement for existing drivers.

C-414 — CRYSTAL CONTROLLED REGENERATOR

C-414 takes a distorted input signal, reconstructs it and transmits this now distortion free signal. Timing is crystal controlled thereby virtually eliminating speed distortion of the regenerated signal.

TEST EQUIPMENT

C-391A — TEST MESSAGE GENERATOR BAUDOT $459.50

C-391B — TEST MESSAGE GENERATOR ASCII/BAUDOT $561.50

C-391C — TEST MESSAGE GENERATOR ASCII/SPEED TO 4800 $582.00

The C-391 Teletype Test Message Generator is a completely self-contained portable transmitter which supplies a low distortion Baudot coded test message for machine or line evaluation. Dual output circuits are supplied; a solid state, polarity insensitive neutral loop keyer, and a keyed 60 milliampere current regulated output. Standard models provide four switch selected speeds. Options include speeds, codes and output levels other than the standard combinations.

MISCELLANEOUS EQUIPMENT

C-440 — SELECTIVE CALLING UNIT

Solid state selective calling units for ASCII or Baudot codes, half or full duplex systems.

C-446 — HIGH SPEED LINE CONCENTRATOR

Remote line concentrator allows any of four high speed input data lines to selectively access any one of sixteen output data lines upon receipt of a two character sequence. Disconnect is by means of a third character. All solid state.

AVR-301 — ALTERNATE VOICE DATA TERMINAL

Compact package to allow connection of a four wire leased data line to either data terminals for data use or to a PBX (PABX) board for voice usage on a demand basis. All echo suppressors, signallirig gear, supervisory controls and maintenance functions provided in accordance with common carrier requirements.

AVR-400 SERIES — SPEECH PLUS TERMINAL

These terminals may be used independently or in conjunction with the AVR-300/500 Series to provide from one to four low speed (50 to 110 Band) data channels frequency multiplexed with a restricted bandwidth channel suitable for voice or medium speed data modems.

AVR-501 — ALTERNATE VOICE DATA TERMINAL

Similar to the AVR-301 but provides facilities for twelve voice/data channels, complete with monitoring and test facilities.

american astrionics
LOG VIDEO AMPLIFIERS

AC COUPLED LOGARITHMIC VIDEO AMPLIFIERS

AL SERIES (UNIPOLAR)
ABL SERIES (BIPOLAR)

Dynamic Range .....Up to 80 db
Video Bandwidth ....Up to 100 MHz
Log Linearity .....±1 db to ±1.5 db to a true log curve over temp. Special linearity optional
Tracking .....Multiple unit tracking to ±½ db
Small size—Mil temperature operation—low power.

DC COUPLED LOGARITHMIC VIDEO AMPLIFIERS

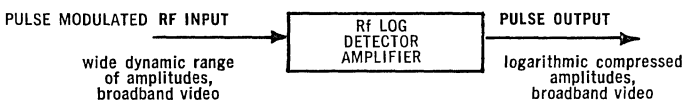
Available on Request:

- Special Temperature Compensation
- Log Linearity Matching to ±0.5 db
- Alignment with R.F. Detectors

Dynamic Range .....Up to 80 db
Video Bandwidth .....5 MHz
Log Linearity .....±1.5 db
Standard Temperature Drift .....0.05 db/°C (at medium and high input levels)
Duty Factor .....over 50%

AC COUPLED RF LOG DETECTOR AMPLIFIERS

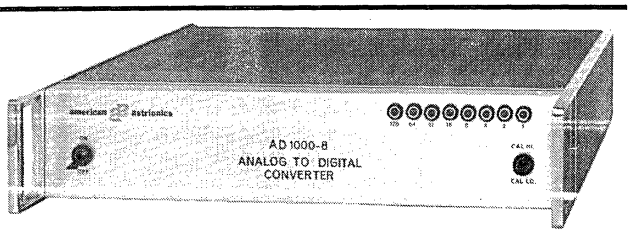
ADL SERIES



From Rf to log video in one small package

Input Rf Pass Bands .....Octave and Multi-Octave
Rf Dynamic Range .....Up to 50 db
Video Bandwidth .....Up to 70 MHz
Log Linearity .....±1.5 db over temp. Special linearity optional

HIGH SPEED A/D CONVERTERS

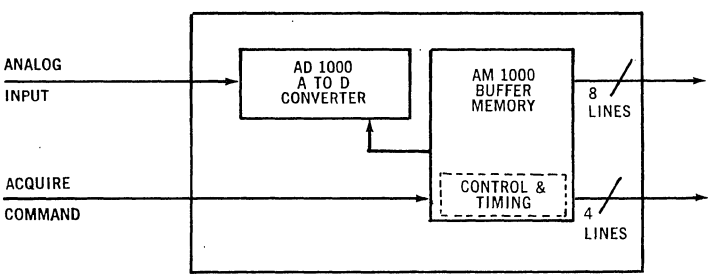


Model	Max. Sample Rate	Bits	Aperture Time	Max. Slew Rate mV/ns	Accuracy @ Analog F.S. Input* MHz	Accuracy Over Temp. °C	Accuracy % ±½ LSB	Price
AD 1000-6	10 MHz	6	100 ps	> 80	5	0-50	0.8	$5,100
AD 1000-7	10 MHz	7	100 ps	> 80	5	0-50	0.6	5,800
AD 1000-8	10 MHz	8	100 ps	> 80	5	0-50	0.4	5,950

Panel Height — 3½ inches
Price includes power supply
Input multiplexer available

*Remains operational with analog input signals of over 100 MHz.

HIGH SPEED DATA ACQUISITION SYSTEM



The Data Acquisition System consists of an AD 1000-6, 7, or 8 Analog-to-Digital Converter and an AM 1000-8 Buffer Memory of selected capacity. They are supplied as a factory interfaced combination.

AM 1000-8 BUFFER MEMORY

The American Astrionics AM 1000-8 High Speed Buffer Memory provides MOS-LSI storage for high word rate data — such as the output from the AD 1000 A/D converter. The memory accepts 8-bit words and stores them as a data block. The stored data is then recirculated at a slower rate, available for transfer to peripheral storage or processing.

SPECIFICATIONS

Input Word Rate .....10 MHz
Input Data Lines .....8 individual lines
Output Word Rate .....10 KHz; 20 KHz; 40 KHz; 80 KHz; or 160 KHz output rates are available as standard items. Other rates are optional.
Bits per Word .....8 bits
Temperature Range ....0 to 50°C
Interfaces .....All TTL

Contact factory for other combinations of speed/capacity.

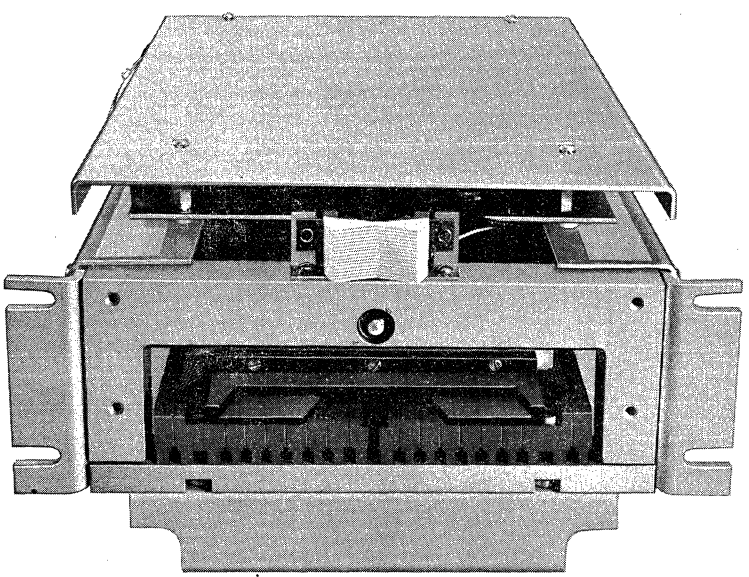
american astrionics
Division of **TECHNICOLOR,® INC.**
291 Kalmus Drive, Costa Mesa, Calif. 92626
Phone (714) 557-8480

Data entry. AMP fits the product

However you buy them—as complete, ready-to-use units or as individual components—our broad range of data entry products will give you the excellent performance and reliability for which AMP is noted. Typical applications include industrial control and automation, as well as information systems and remote data collection.

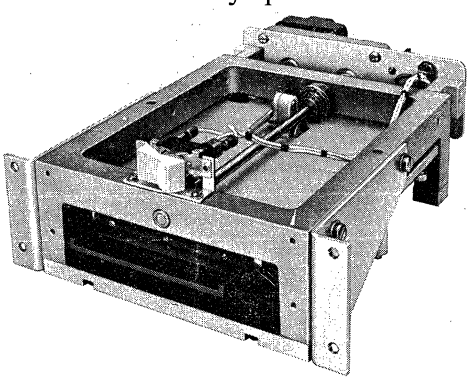
Card reader/scanner

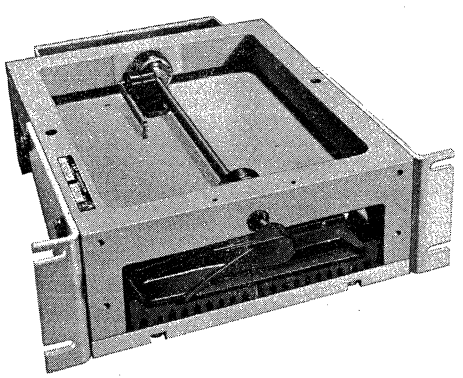
- Senses all 960 hole positions of standard, 80-column card.
- Provides character serial, bit parallel data up to 2000 CPS.
- Offers outputs which are compatible with DTL and TTL.
- Integrated circuitry and solid-state components assure high reliability.
- Equipped with diode-isolated card reader and electronic scanner.



Tab-card reader

- Reads standard punched tab cards.
- Compact design allows positioning in small panel space.
- Available in bussed-column, matrix and diode-isolated specials.
- Wipe and back-wipe contact operation has high inherent reliability.
- Available in 80-column and 22-column versions—motorized and manually operated.

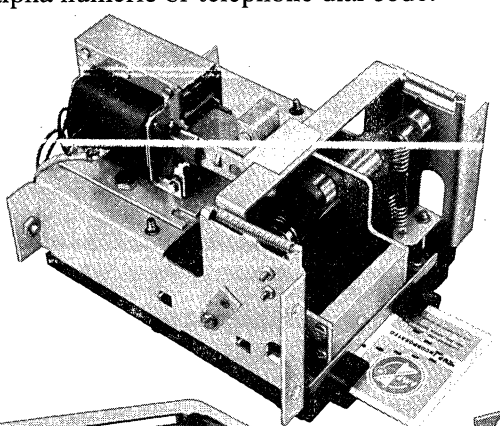


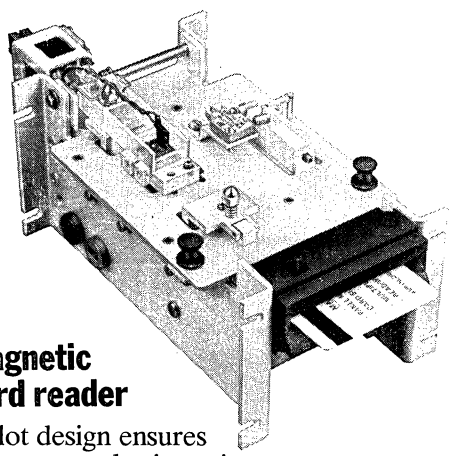


to your application.

Credit card reader

- Reads 15, 20 or 22-column cards.
- Solenoid powered or manually operated versions available.
- Cross matrix available for numeric data, matrix alpha numeric or telephone dial code.



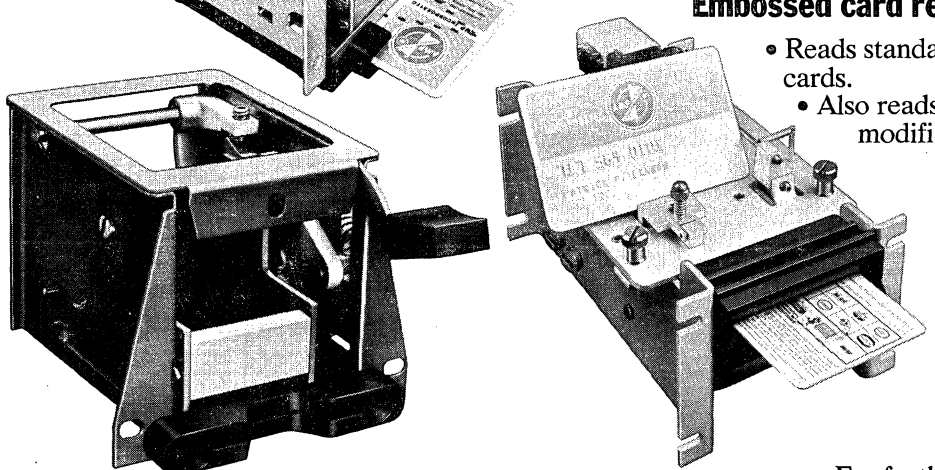


Magnetic card reader

- Slot design ensures proper card orientation.
- Aiken codes at 220 bits/inch provides as many as 650 bits across the card.
- Available with single- or double-read head.
- Supplied with or without enclosure.

Embossed card reader

- Reads standard ANSI-coded embossed cards.
- Also reads magnetic cards—with modification to reader mechanism.
- Slot design ensures proper card orientation.
- Output decoded to one-out-of-ten line format.
- High data output rate: approximately 24 CPS.



Matrix badge reader

- Reads 10 columns of a 15-column badge; 15 columns of a 20-column badge; and 17 columns of a 22-column badge.
- Small size and low cost adapt to limited space and budget.
- Cross matrix available for numeric data, matrix alpha numeric or telephone dial code.

For further information on data entry products call 717-367-1105 or write AMP Capitron Division, Elizabethtown, Pa. 17022.

AMP
INCORPORATED

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HOW TO USE eem

electronic engineers master

1973-74

Need directory information?

EEM contains four complete directories which provide the most up-to-date information available. These directories are listed and described at the right. They appear in all three volumes, with the exception of the Trade Mark Directory which appears only in Volume 1. Directory references to Volume 4 indicate the 1973 edition, which you received in January. That copy of Volume 4 should be retained to complete the 4-volume set.

Add Volume 4/1973 to your copies of Volumes 1, 2 and 3 to make a complete set of **EEM** for 1973-74.

Included in this volume are:

The Product Index and Directory

The Product Index and Directory (green section, page 9) lists more than 6,000 types of electronic products alphabetically, by product. Under each product heading is a complete, alphabetical listing of manufacturers who make that product. **Bold face** listings indicate which manufacturers have provided catalog data on that product in the white pages.

The Manufacturers and Sales Office Directory

The Manufacturers and Sales Office Directory (starts yellow section of each volume) lists more than 3,000 manufacturers of electronic components, materials, instruments, assemblies, systems, and key services. Provided are complete addresses, phone numbers, sales managers' names, names of application engineers, TWX numbers where applicable, selected distributors. **Bold face** listings indicate that manufacturers have provided catalog data in the white pages and that sales offices are listed.

The Distributor Directory

The Distributor Directory (yellow section, page 1594, with black edge marking) lists more than 1,000 electronic distributors and branch locations, alphabetically by distributor's name, geographically by state and city.

Need catalog information?

For complete catalog information on any product, refer to the Product Index and Directory (green section, page 9, all volumes) which provides a complete listing of all the manufacturers who supply a particular product. Those manufacturers listed in bold face with page and volume number references have provided catalog data on this product in the catalog section (white pages) where you can find the information you need. References to Volume 4 indicate the Volume 4 you received in January and which should be retained to complete your 4-volume set of EEM.

Need additional information in a hurry?

Two special telephone services are being maintained for EEM users to provide extra information you need. If you need to determine a local source of supply, just **D.I.A.L. EEM.** This toll-free service (**D**istributor **I**nformation **A**nd **L**istings), provides you with the name of a sales office or distributor in your area who can provide a needed product.
For up-to-the-minute listings of manufacturers who provide certain IC functions, **call the IC UPDATE HOTLINE.** Listings of IC functions are updated daily by manufacturers throughout the country. For information in a hurry, **just D.I.A.L. EEM** — call toll-free 800-645-9200 (in N. Y. State call collect (516) 294-0990). Or **call The IC UPDATE HOTLINE,** Dial toll-free 800-645-9201.

Need additional assistance?

Contact the EEM editorial staff, at United Technical Publications, Inc., 645 Stewart Avenue, Garden City, N. Y. 11530, or phone (516) 248-9700.

UNITED TECHNICAL PUBLICATIONS

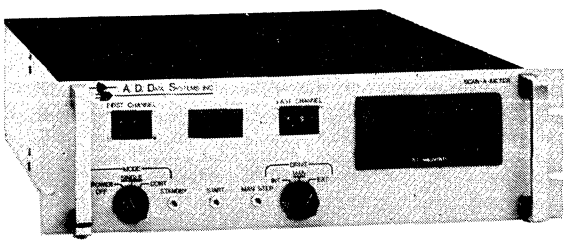
ANALOG DIGITAL DATA SYSTEMS, INC.

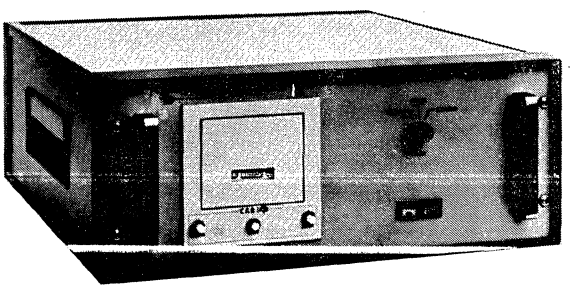
830 LINDEN AVENUE • ROCHESTER, N. Y. 14625 • PHONE 716 - 381-2370

DATA ACQUISITION SYSTEMS

DATALOGGING SYSTEMS FROM STOCK UNITS. ASSEMBLED TO CUSTOM REQUIREMENTS

The Dataloggers accept multiple analog signals, from physical transducers, such as thermocouples, strain gauges, and similar devices. These are scanned by a multiplexer and programmer, individually conditioned to the appropriate voltage level; digitized, converted to computer compatible format and recorded.





SERIES M

This datalogger is available with either 10, 100 or 1000 channel multiplexer capability, digitizing and recording in computer compatible magnetic tape. The tape format can be either straight binary or binary coded decimal, 7 or 9 tracks and 200, 556 or 800 b.p.i. The system speed can be from manual push button to 1000 characters/second asychronous or up to 5000 characters/second in the slew mode.

SERIES P

This datalogger is available as the above, but the output is recorded in computer compatible paper tape, such as ASC11. The system speed is 20 characters/second as standard and up to 130 characters/second as options.

SERIES T

This datalogger is available as the above, but with teletype output. The teletype gives both punched paper tape output in the ASC11 code and also a line printer. The teletype includes a keyboard for manual input data and can be used for computer input. Speed is controlled by the teletype at 10 characters/second.

SERIES K

This datalogger is available as above, but with output onto magnetic tape cassettes. The format is compatible with teletype and the cassettes can be read out onto teletype machine or over a datalink to a shared time computer.

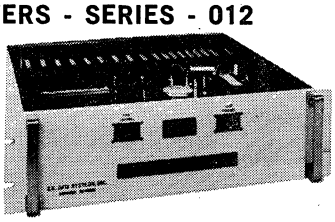
SERIES C

This datalogger is available as above, but controlled from a small computer, which can perform on line computation and read out onto all forms of output devices, such as magnetic tape, paper tape, and teletype. Memory is 4096 words and can be expanded as required.

DATALOGGER COMPONENTS

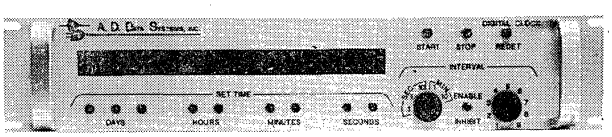
The full range of components used to build up the datalogger systems are available as individual products. Each designed for ease of interface with individual powers supplies, pin board programming and DTL or TTL compatible logic levels.

MULTIPLEXERS - SERIES - 012



Both reed relay scanners and FET multiplexers from 10 channels to 1000 channels are available as standard. Using a unique modular design, the multiplexers can be built up from a wide range of modules to give 1, 2, 3 or 4 wire switching. Features include low thermal switching, high common mode rejection, switched guard, flying capacitor filtering, and programming.

DIGITAL CLOCKS - SERIES - 015



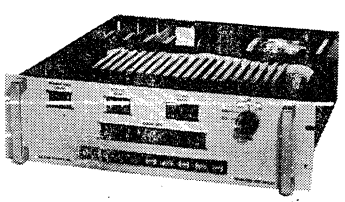
This clock has been designed not only as a visual display of time, but also to be easily integrated into the data handling systems. All inputs and outputs are buffered TTL or DTL compatible logic levels.

Model 015-016 — Days, Hours, Minutes and Seconds
Model 015-017 — Hours, Minutes and Seconds

SCANNER/A.D. CONVERTER COMBINATIONS

Model 022 — This combination of Scanner and A/D Converter has capacity for 10 channels of switching using reed relays up to 500 samples/second or solid state multiplexing up to 10 Kc. The A/D Converter has 3 digit plus sign resolution at 10 Kc.

UNIVERSAL CONTROLLER COUPLERS

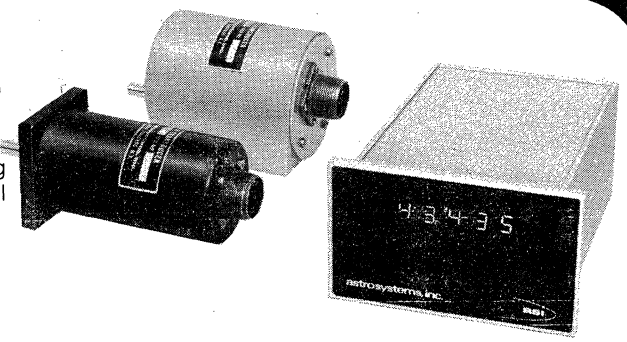


These units have been designed to control the overall system and also to serialize parallel data into computer compatible format. The Coupler has plug-in modules to drive output devices such as punched card, paper tape, magnetic tape, teletype and computers. It is also pin board programmable for control functions and computer format, and front panel controls for word length, record length, recycle point and cycle time.

encoders

Magnetic Absolute Encoders

Absolute encoders provide direct natural binary or BCD outputs and/or visual readouts. They feature high reliability, simple cabling and versatility. Complete line of single, multiturn and multichannel position measuring devices offered. All units are absolute with unique digital output for each encoder position
Request Data File 144.



Digital Output Encoders

Type	Code	Full Count	No. of Turns
Single Turn	Binary	10-12 Bits	1
	BCD	360, 1000, 2000, 3600	1
Multi-turn	Binary	16, 17 Bits	64
	BCD	10,000	10
		36,000	36
		100,000	100

Readout Encoders

Type	Readout Range	No. of Turns
Single Turn	0-999, 0-1999	1
	0-359, 0-3599	1
Multi-turn	0- 9999	10
	0-99999	100
	0-35999	36

Inductosyn Digital Readouts

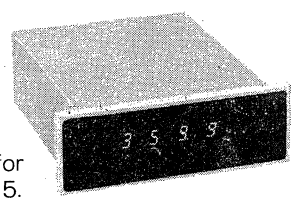
Resolutions and accuracies better than 5 seconds of arc are provided by IC Series Inductosyn type encoders. All solid state units provide high accuracy readout for applications such as antenna positioning and machine tool readout. Request Data File 144.

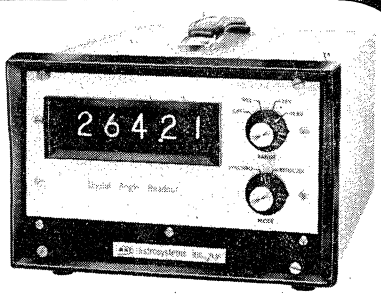
Part No.	Output Code	Counts per 360°	Rev. per Count	Transducer Diameter
IC5018S	Binary	2^{18}	1	12"
IC5118S	BCD	360,000	1	12"

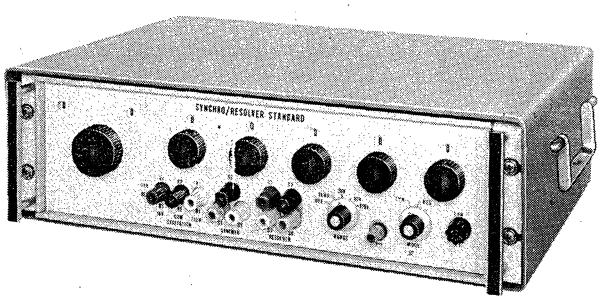
synchro instrumentation

Digital Angle Indicators

Completely electronic angle position indicators convert and display signals from all standard synchros and resolvers. Available in .01° or .1°, rack or panel mounted. BCD outputs available for driving off-line equipment. Request Data File 115.







Standards and Bridges

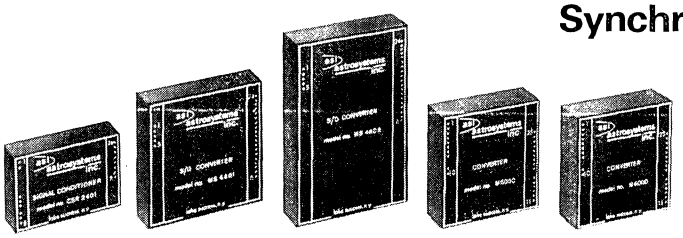
Standards, Bridges and Decade Ratio Transformers test and simulate synchros, resolvers and servo systems quickly and economically. All units are accurate to 2 arc seconds with resolution from 15° to .0001°. Request Data File 105.

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

astrosystems, inc.

6 Nevada Drive/Lake Success, New York 11040/516/328-1600
West Coast: 4301 West Commonwealth Avenue/Fullerton, California 92633/714/523-0820
Washington, D.C.: 1629 K Street, N.W./Suite 5031/Washington, D.C. 20006/202/296-4380

synchro/digital conversion



Synchro Conversion Modules

Miniature cost-effective synchro conversion modules for a wide range of applications such as position sensing, servo readout and data aquisition systems. Multi-speed, multiplexed as well as single channel systems. All inputs, including reference, are transformer isolated. Designed for PCB mounting. Request File 150.

Single Speed Modules

Series	Description
M1000	Synchro to DC, 0.1%
M1100	Synchro to DC, 0.03%
M4000	Synchro to Digital, 8 bits, Binary
M5000	Synchro to Digital, 10 bits, Binary

Series	Description
M5100	Synchro to Digital, 359 counts, BCD
M5200	Synchro to Digital, 999 counts, BCD
M6000	Synchro to Digital, 12 bits, Binary
M7000	Digital to Synchro, 12 bits, Binary

Dual Speed Modules

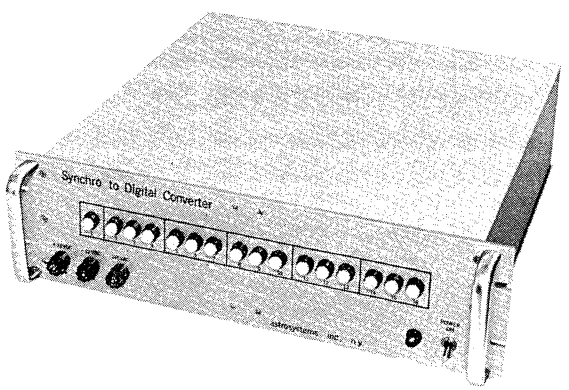
Series	Speed Ratio	Output
M4000M	1:8, 1:16, 1:32	11-13 bits, Binary
M5000M	1:8, 1:16, 1:32, 1:64	13-16 bits, Binary
M6000M	1:8, 1:16, 1:32, 1:64	15-18 bits, Binary
M51000M	1:36	.01° BCD

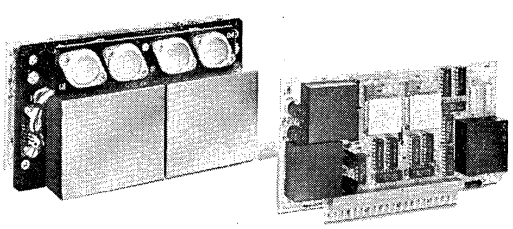
Multiplexed Modules

Series	Conversion Time	Output Code
M4000	2 milliseconds	8 bits, Binary
M5000	2 milliseconds	10 bits, Binary
	2 milliseconds	359 or 999 BCD
M6000	2 milliseconds	12 bits, Binary

High Accuracy Converters

A complete line of ruggedized Digital to Synchro and Synchro to Digital Converters with single speed accuracy to 10 seconds of arc and dual speed accuracies to 1 second of arc. Available in a complete range of voltages and frequencies. Rack or case mounted and ruggedized units to meet MIL-T-21200 (class III). Request Data File 102A.





High Power Digital to Synchro Converters

Single PCB packages to drive all types of torque receivers and/or control transformers. Accept 12 or 13 bit parallel binary information and convert to accurate 3 wire synchro or 4 wire resolver information. Request Data File 136.

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N.Y. STATE CALL COLLECT (516) 294-0990)

astrosystems, inc.

6 Nevada Drive/Lake Success, New York 11040/516/328-1600
West Coast: 4301 West Commonwealth Avenue/Fullerton, California 92633/714/523-0820
Washington, D.C.. 1629 K Street, N.W./Suite 5031/Washington, D.C. 20006/202/296-4380

Burr-Brown Data Conversion Products

■ *Burr-Brown Conversion Products are designed to function as a team while offering you a wide variety of systems options. Units incorporate the latest technology: integrated circuit current switches and amplifiers, thin film ladder networks and Burr-Brown quality design. Units are self-contained in low profile modules, but feature specifications formerly expected only from expensive rack-mounted instruments.*

■ *Conversion products are available in several package configurations. The low profile (0.4" high) modules are intended for printed circuit board mounting to allow high density systems packaging. As an option, the modules are available mounted on a printed circuit card complete with gain and offset potentiometers for card file mounting. They are also available in a Burr-Brown shielded enclosure for rack mounting.*

ANALOG-TO-DIGITAL CONVERTERS
ADC 40 and ADC 50—LOW DRIFT
Entirely self-contained, premium performance Analog to Digital Converters. Ideal for applications requiring low gain and offset drift and conversion speeds of 2.5 μsec/bit. 12, 10, 8 bits: Binary or BCD Codes
Low Temperature Coefficient
±7 ppm/°C max. Gain Drift—ADC40
±12 ppm/°C max. Gain Drift—ADC50
20 to 30 μsec Conversion Time
Guaranteed Monotonicity
Input Ranges:
(Pin Programmable)
+5V, +10V, ±2.5V, ±5V, ±10V
Low Profile Package—
2" X 4" X 0.4"
Price Range (1-9) $150.00 to $275.00

ADC 100—HIGH RESOLUTION
For applications requiring greater resolution and accuracy but where speed is not as important.
Codes
16 Bit Binary
4 Digit BCD
Sign Plus 4 Digit BCD Magnitude
Low Temperature Coefficient
±10 ppm max. Offset & Gain
Guaranteed Monotonicity
Input Ranges:
(Pin Programmable) +10V, ±10V
Conversion Speed:
30 msec—4 Digit BCD
Low Profile Package—
2" X 4" X 0.4"
Price Range (1-9) $225.00 to $250.00

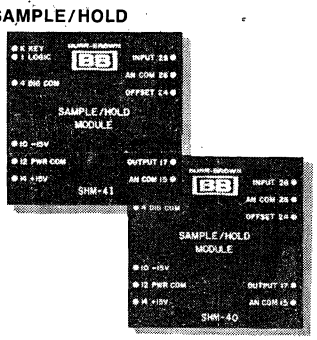
DIGITAL-TO-ANALOG CONVERTERS
DAC 40 and DAC 50—LOW DRIFT
12, 10, 8-Bits: Binary or BCD Codes
Low Temperature Coefficient
±7 ppm/°C max. Gain Drift—DAC40
±12 ppm/°C max. Gain Drift—DAC50
5μsec Settling Time
Guaranteed Monotonicity
Output Ranges (Pin Programmable)
+5V, +10V, ±2.5V, ±5V, ±10V
Low Profile Packages 0.4" High
2" X 2" No Storage Buffer
2" X 4" With Storage Buffer
Price Range (1-9) $90.00 to $175.00

DAC 45—HIGH RESOLUTION
Codes:
16 Bits Binary
4 Digit BCD
Linearity, .003%
Guaranteed Monotonicity (14 bits)
Output Ranges (Pin Programmable)
+10V, ±10V
Price (1-9) $325.00

DAC 60—HIGH SPEED
For applications where fast settling speed is important.
Codes:
12, 10 Bit Complementary Binary
40 nanosecond settling to ±0.05%
Output Ranges (Pin Programmable):
±2.5mA, +5mA
Low Profile Package: 2" X 2" X 0.4"
Price range (1-9) $105.00 to $125.00

DAC 85—LOW COST HYBRID MICROCIRCUIT
This hybrid DAC features high performance in a small hermetically sealed package.
12 Bit Binary or BCD Codes
5 μsec Settling Time
Pin Spacing is Dual-in-line Compatible
Total Linearity Error: ±0.0122% or ±0.0244%
Voltage or Current Output
Wide Operating Temperature Range: −25°C to 85°C
Price (1-9) from $64.00

SAMPLE/HOLD



SHM40—8 TO 10 BIT COMPATIBLE
4 μsec Acquisition Time to .02% of Final Value
2" X 2" X 0.4" low profile module
Price (1-9) $85.00
SHM41—12 BIT COMPATIBLE
4 μsec Acquisition Time to .005% of Final Value
2" X 2" X 0.4" low profile module
Price (1-9) $135.00
SHC23—LOW COST HYBRID IN A TO-8 PACKAGE
For applications requiring low cost and small size, the SHC23 offers ±0.01% accuracy, 60 μsec acquisition time and low droop of 0.1 mV/msec.
Price (1-9) SHC23 (0°C to +70°C)—$45.00
SHC23ET (−55°C to +125°C)—$85.00

ANALOG MILTIPLEXER
Complimenting Burr-Brown's Converter and Sample/Hold modules is the MPM-8S single-ended analog multiplexer. The MPM-8S accepts binary channel addressing and can be expanded in single or multiple tiers.
8 Channels
Decoder Included
Settles to 0.01% of final value in 7 μsec
Expandable to 256 channels in 8 channel increments
Price (1-9) $125.00

BURR-BROWN
RESEARCH CORPORATION
International Airport Industrial Park • Tucson, Arizona 85706
TEL: 602-294-1431 • TWX: 910-952-1111 • Cable: BBRCORP

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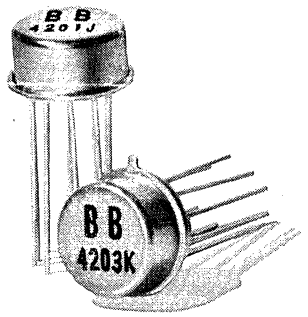
FOR BURR-BROWN ACTIVE FILTERS, CHIP RESISTORS, CHIP CAPACITORS AND HYBRID CIRCUITS SEE SECTION 3130

amplifiers / DAC-ADC / multipliers-dividers
analog functions/modular power supplies
active filters/data conversion products

Burr-Brown Analog Circuit Functions



■ *Burr-Brown offers a complete line of packaged analog circuit functions which can save valuable design time and provide high performance at low cost. Representative units are outlined below.*

MULTIPLIERS
MODEL 4200—HIGH ACCURACY 0.1%
A pulse modulation multiplier intended for applications which require the best possible accuracy.
±0.1% Accuracy
Ultra Low Non-Linearity
Low Drift
Price (1-9) $129.00

MODEL 4201J – USER TRIMMED IC
An integrated circuit multiplier is excellent for applications where a hermetic package is required.
±2.0% Accuracy With External Trim
TO-100 Package
Price (100-249) $15.00

MODEL 4203K—LASER ADJUSTED IC
An integrated circuit multiplier is laser adjusted by Burr-Brown to a 1% accuracy. Where IC multipliers are needed but where external trimming is not desired the 4203 is the best choice.
±1.0% Accuracy
TO-100 Package
Price (100-249) $26.00

MODEL 4202B—LOW DRIFT ±0.01%/°C
Where no external adjustment is desirable this small modular multiplier is ideal.
±0.01%/°C Accuracy Drift
±1.0% Accuracy Factory Adjusted
1.12" X 1.12" X 0.4" Package
Price (100-249) $33.00

DIVISION and SQUARE ROOT
Even the best multiplier/divider cannot match the performance of a circuit optimized for division or square root performance. Burr-Brown offers products specifically designed for these applications.

DIVIDER: MODEL 4290—
HIGH ACCURACY 0.1%
High Accuracy (0.5%). Trimmable to 0.1%
Wide Dynamic Range
10 mV≤D≤10 V
Low Accuracy Drift .01%/°C
Price (1-9) $75.00

SQUARE ROOTER: MODEL 4126—
HIGH ACCURACY 0.5%
±0.5% Accuracy
+3 mV to +10 V Input Range
Voltage or Current Input
Price (1-9) $49.00

LOGARITHMIC AMPLIFIERS
MODEL 4116—WIDE DYNAMIC RANGE
Logarithmic amplifiers give an output proportional to the logarithm or antilogarithm of the input signal. These units accept voltage inputs (80 dB range) or current input (120 dB range) signals and can be scaled for input and output range. Price (1-9) $95.00.

RMS to DC CONVERTERS—TRUE RMS CONVERSION
MODEL 4128
Accurate measurement of signals with high harmonic content requires use of a true RMS conversion technique rather than conventional averaging. Burr-Brown's Model 4128 computes true RMS value with accuracies of ±0.1% of full-scale ±0.1% of reading. It will accept complex waveforms including those with DC components. Price (1-9) $105.00

SPECIALIZED CIRCUIT FUNCTIONS
The complete line of Burr-Brown Analog Circuit Functions is too varied to describe here. Complete Product Data Sheets are available upon request for the following products: Sine/Cosine Function, Squaring Function, Precision Oscillator, Peak Detectors, and Voltage Comparators.

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RESEARCH CORPORATION
International Airport Industrial Park • Tucson, Arizona 85706
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FOR BURR-BROWN INSTRUMENTATION AMPLIFIERS, OP AMPS, AND POWER SUPPLIES SEE SECTION 1100
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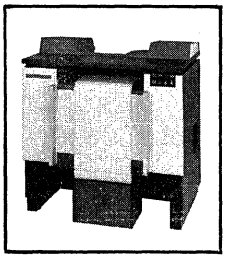
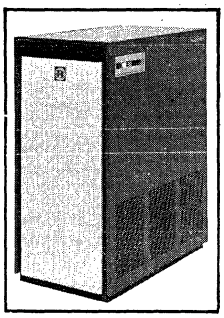
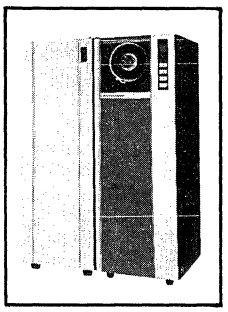
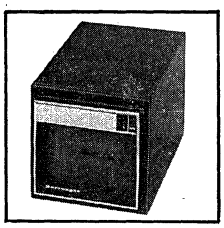
amplifiers / DAC-ADC / multipliers-dividers
analog functions/modular power supplies
active filters/data conversion products

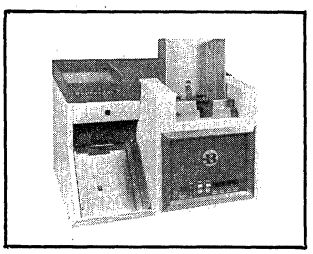
BURROUGHS COMPUTER SYSTEM COMPONENTS

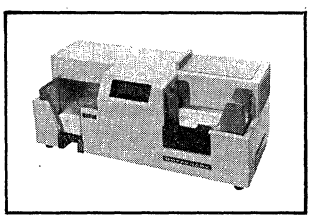












LINE PRINTER

New model combines medium-to-high speed with outstanding print quality and operating flexibility to establish a new high in cost/effectiveness for printers. Printing mechanism uses a train module which consists of a predetermined set of print characters riding on a circular track past the printing facility. This method assures superior print quality through exact horizontal and vertical print alignment. Print character selection is virtually unlimited through operator-changeable train modules of 16-, 48-, 64- and 96-character sets. Basic printing rate is 750 lines per minute with a 48-character set. Other printing rates are up to 1,200 lines per minute. A paper slew rate of 20 inches per second results in maximum throughput. Forms control flexibility is available through Burroughs Forms-Self-Align and optional 12-channel carriage tape. Column drop out detection is automatic. Other features include complete control panels on both the front and rear of the unit, and standard 120 or optional 132 print positions.
The unit cost of this new printer is low when compared to other printers of comparable abilities.

SYSTEMS MEMORY DISK FILES

High speed, magnetic disk files used for system software, users' programs and general data storage. They feature one fixed read/write head per track of information on the disk surface. One systems memory module has a capacity of 16-million bits with an average access time of 17 milliseconds. The average data transfer rate is 2.34 megabits per second. Other models are available with an average access time of 5 milliseconds. The units are self-contained with all power and electronics to provide a 6 or 8 bit buffered interface.

MAGNETIC TAPE TRANSPORTS

Several high speed, high precision subsystems are available. Models feature automatic tape threading and loading, easy tape handling, phase-encoded recording, modular expansion, and multiple simultaneous accessing when used in multiple processor environments. Bi-directional units operate at up to 250 inches per second. Packing density is up to 1,600 bits per inch, and transfer rates are up to 400,000 bytes per second. Other features include fast rewind and controlled environment tape chamber. Units are available with either NRZ or phase-encoded electronics or mechanism with only servo electronics.

CASSETTE TAPE SUBSYSTEM

For data and program storage. Reads/writes at 10 inches per second. Search is 30 inches per second and rewind is 60 inches per second. Dual-gap read/write head with automatic write verification enables read after write checking without tape backspacing and significantly reduces tape movement and wear. The unit features spindle controlled, multi-speed reel drive and photoelectrically controlled tape speed. Magnetic tape cassette has a capacity of 280 feet excluding a 20-inch clear leader at the beginning and end of the tape. Unit is available with 800 BPI NRZ or 1,600 FCI Phase Encode electronics. Other features include dual track recording and optional R (removal is prohibited) and WS (writing is enabled) status indicator lamps.

CARD READERS

Low cost, high performance reader operates at 800 cards per minute (demand rate) and can be adjusted to rates of 600 or 300 cpm. It reads standard 80-column cards photoelectrically, column by column. Reading is highly accurate with double strobe comparison for each column, and with light and dark checks for each card. An operator-changeable 51-column adapter is available for the unit.

Solid-state serial card reader operates under program control of the computer. It reads standard 80-column cards at 200 cards per minute. Other features include choice of EBCDIC or BCL code, and individual feed and stacking hoppers.

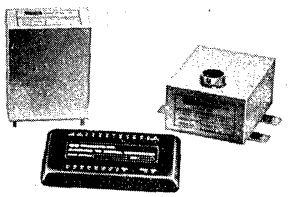
For more information on these and other Burroughs products, please contact:

Burroughs

OEM Sales, 460 Sierra Madre Villa,
Pasadena, California 91109
Call (213) 351-6551

SYNCHRO/RESOLVER DATA CONVERTERS

LOW COST/MODULAR/PC-MOUNTING



SERIES SD 200 SYNCHRO TO DIGITAL

SD 200 A

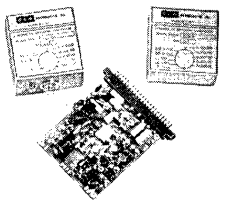
Input:
11.8/90 vrms L-L, 60 or 400 Hz. Ref.: 26/115 vrms
Output:
4 decade BCD or 13 bits parallel binary
Accuracy:
±6 minutes of arc.
Data Rate:
to 3600°/sec.
No adjustments–Drift free

from **$700.**
(quan. 1-9)

SD 200B

Input:
11.8/90 vrms L-L, 60 or 400 Hz. Ref.: 26/115 vrms
Output:
12 bits parallel binary
Accuracy:
±15 minutes of arc.
Data Rate:
to 1,000°/sec.
No adjustments–Drift free

from **$530.**
(quan. 1-9)



SERIES ST 200 SYNCHRO TO SINE-COSINE DC

ST 200

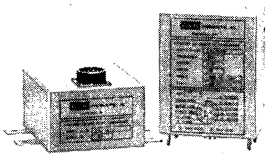
Input:
11.8/90 vrms L-L, 60 or 400 Hz. Ref.: 26/115 vrms
Output:
10 SINθ vdc; 10 COSθ vdc.
Accuracy:
±3 minutes of arc.
Dynamic Lag:
5 arc sec/rpm

from **$190.**
(quan. 1-9)

ST 200A (NON-VARIANT)

Input:
11.8/90 vrms L-L, 60 or 400 Hz. Ref.: 26/115 vrms
Output:
10 SINθ vdc; 10 COSθ vdc.
Accuracy:
±6 minutes of arc
Conformity:
±.15% Full scale
Regulation:
±.1% for a ±10% Line voltage variation

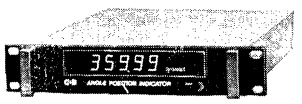
from **$390.**
(quan. 1-9)



SERIES SL 200 SYNCHRO TO LINEAR DC

Input:
11.8/90 vrms L-L, 60 or 400 Hz. Ref.: 26/115 vrms
Output:
—2.5 to +2.5 vdc linear with angles from —180° to +180° standard. Other scale factors also available.
Accuracy:
±6 minutes of arc
Dynamic Lag:
10 arc sec/rpm
No adjustments–Drift free

from **$650.**
(quan. 1-9)



SERIES SD 100 ANGLE POSITION INDICATOR

Input:
11.8/90 vrms L-L, 60 or 400 Hz. Ref.: 26/115 vrms
Output:
5 digit, large wide angle display and five decades of buffered BCD (rear connector)
Accuracy:
±3 minutes of arc.
Data Rate:
to 3600°/sec.
Display Test (rear connector)
1¾" high, half-rack
No drift, all solid state

from **$1450.**
(quan. 1-9)

ADDITIONAL PRODUCTS
- CUSTOM SYSTEMS • MULTIPLEX CONVERTERS • DIGITAL TO SYNCHRO
- SIN-COS DC TO SYNCHRO • LINEAR DC TO SIN-COS DC
- RECTANGULAR TO POLAR • POLAR TO RECTANGULAR

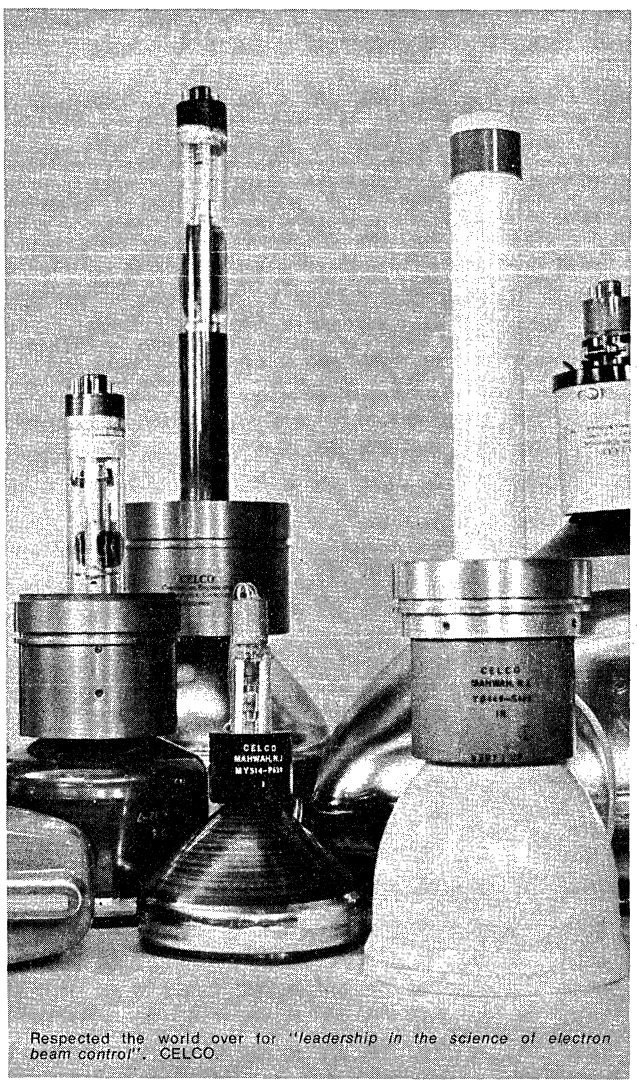
ALL UNITS
- Solid State • Light Weight • Metal Case (modules)—Hermetically Sealed • Factory Repairable
- Two Operating Temperature Options: 0 to +70°C or —55 to +85°C • MIL-E-5400
- Operate from ±15 VDC/+5 VDC • Transformer Isolated Inputs

Readily available variations of these converters include units with other voltage and frequency ranges and designed to specific mechanical and environmental requirements.

Write or phone for detailed specifications, applications assistance and evaluation units.

C&D PRODUCTS, INC.
37-12 58th Street, Woodside, New York, 11377 (212) 779-4303

Celco Yokes for CRT DISPLAYS



Respected the world over for *"leadership in the science of electron beam control"*. CELCO

CELCO makes YOKES. They make them good. In fact, CELCO has been making the best CRT deflection yokes and focus coils in the industry for the past twenty years.

CELCO makes yokes for precision displays when you must have the highest performance available.

And CELCO makes yokes for computer terminal displays when you need reliable repetitive scan yokes for commercial purposes, at low cost.

Not only does CELCO make good yokes, but they make sure you get the right yoke for your particular CRT display requirements.

Call CELCO on your present display problem. A CELCO yoke will solve it. (It might even be one of the standard CELCO yokes listed below:)

CELCO PRECISION DISPLAY YOKES:

DNA702	"superfastDYNAYOKE" (2 μsec recovery time to 0.1%)
HDN428	Low-Zero Approach
HDQ428	Mini-Spot, (CRT/Yoke matched)

CELCO COMPUTER TERMINAL DISPLAY YOKES:

PW	Position-Write Yokes
PWM	Position-Write, with Pincushion Correction
YA	Resonant Drive, Hi-Q

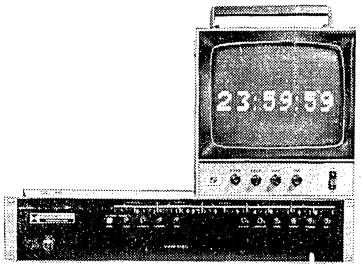
CONSTANTINE ENGINEERING LABORATORIES COMPANY

MAHWAH, N. J. 07430 TEL. 201-327-1123 TWX: 710-988-1018

UPLAND, CAL. 91786 TEL. 714-982-0215 TWX: 910-581-3401

Go ahead and call CELCO. All you've got to lose are your yoke problems.

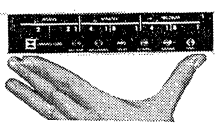
Celco



SERIES 40,000
VIDEO CLOCK

SERIES 70,000
LED CLOCK/CALENDAR

SERIES 5,000
TIME CODE READER

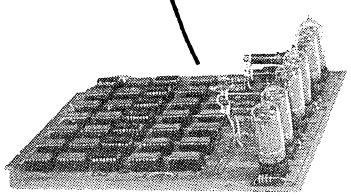


SERIES 30,000
DIGITAL CLOCK

CHRONO-LOG
CORPORATION

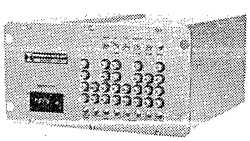
DIGITAL TIMING
EQUIPMENT

SERIES 8,000
TAPE SEARCH CONTROL



SERIES 50,000
OEM CLOCK CARDS

SERIES 4,000
TIME CODE GENERATOR



SERIES 26,000
TIME CODE GENERATOR

CHRONO-LOG CLOCK/CALENDARS:

Applications
Wherever a digital output of real or elapsed time is required such as data logging, data transmission, data processing, telemetry and digital printout systems, or for remote digital time displays.

Thousands of configurations available to meet specific system requirements at off-the-shelf prices. Options include:

- BCD, NIXIE or LED decimal front panel displays
- Outputs of Hours, Minutes and Seconds or other time ranges, with time resolution to 100 microseconds.
- Calendar ranges of Year, Day-of-Year, Month and Day, or Day-of-Week.
- Parallel and Serial BCD Digital Outputs, IC compatible, gated and buffered.
- Can be supplied with video character generator outputs to drive remote displays; minimum cost remotes with single line cabling.
- Various power supply inputs, with internal battery power for standby operation.
- A variety of external and internal time bases with various stabilities, as required.
- OEM Clock/Calendar cards available for building into systems.

For complete details request Bulletins 30,000, 40,000, 50,000, 60,000 and 70,000.

CHRONO-LOG TIME CODE EQUIPMENT:

Applications
For recording digital time codes on single channel of analog magnetic tape and for searching and playback of data in specified portions of the tape. Also used for transmission and display of time.

Time Code Generators—for IRIG, NASA, Vela or other time code formats. Both parallel outputs and serial modulated carrier outputs are provided. Ask for Bulletins 4,000 and 7,000.

Low Power Time Code Generators—for field and airborne systems. Operate up to 60 hours from internal standby batteries. Internal oscillator has stability of 2 parts in 10^9 per day. Ask for Bulletin 26,000.

Time Code Readers—accept serial time code input in forward or reverse direction, fast or slow speed. Available for a variety of time codes or in universal multi-code models. Displays time reading and produces parallel and serial outputs of time for data processors, graphic recorders and other data devices. Also available as combined Time Code Generator/Readers. Ask for Bulletins 5,000 and 6,000.

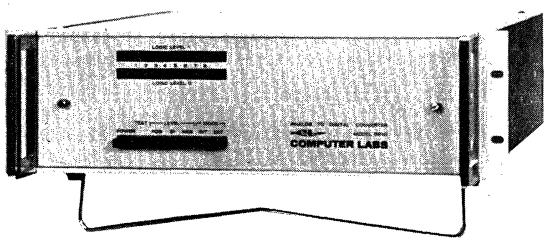
Automatic Tape Search Control—controls tape drive to search for data at high speed and play back selected portions of recording. Provides front panel selection of start and stop times. Ask for Bulletin 8,000.

CHRONO-LOG
CORPORATION

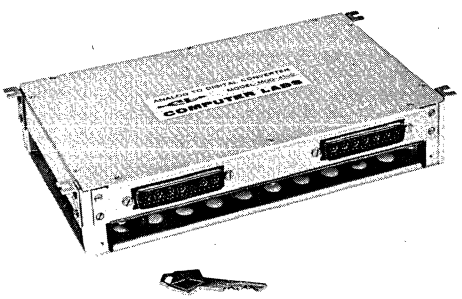
2583 West Chester Pike, Broomall, Pa. 19008. (215) 356-6771

5000/7000 SERIES A/D CONVERTER

The Computer Labs 5000 Series A/D Converters are capable of random or periodic word rates. Resolutions of 6, 7, or 8 bits are available at 5 MHz and 10 MHz; 9 bits at 5 MHz; and 10 bits at 3 MHz. Prices range from $3,400 to $6,900. The 7000 Series A/D Converters are capable of **9-bit resolution and 10-bit resolution through 10 MHz with aperture less than 25 ps.** All units in both series include internal track-and-hold, built-in test words, and power supplies. Priced from $7,300 to $10,000.



TRUE A/D CONVERSION UP TO 100 MHZ

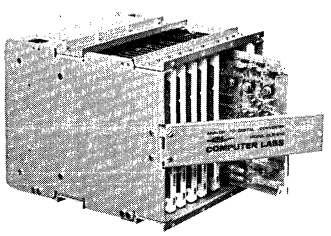


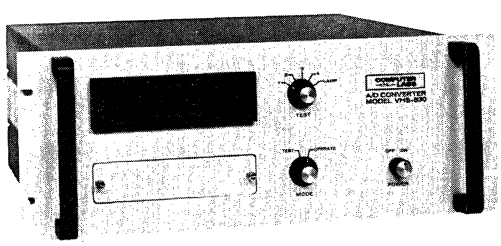
MOD-4100 A/D CONVERTER

The MOD-4100 is the first commercially available A/D converter capable of converting 0-50 MHz analog signals into 4-bit digital words at word rates through 100 MHz. It has an aperture time of less than ±400 ps and a dc accuracy of 10 mV ±½LSB. A "DATA READY" pulse for the digital output can be used to gate the ECL-compatible output into external equipment. The MOD-4100 is only $2000.

"BARE BONES" CLB A/D SERIES

For systems with an external power source available, a stripped-down version called the "Bare Bones" CLB Series provides the speed and resolution of the 5000 and 7000 Series at reduced cost and power. The open-frame units are only 7"x8"x9". Price from $2,800 to $8,700.



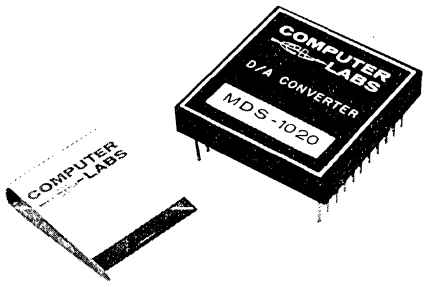


VHS SERIES A/D CONVERTERS

The VHS-630 is capable of 6-bit resolution at any random or periodic word rate from dc through 33 MHz. **Aperture time is less than 40 picoseconds.** Transient response is 15 ns; over-voltage recovery is 30 ns. The VHS-720 and VHS-815 units provide 7-bit resolution at 20 MHz and 8-bit resolution at 15 MHz, respectively. The price of $11,400 to $13,200 includes built-in test circuits.

COMPUTER LABS

1109 South Chapman Street / Greensboro, North Carolina 27403 / (919) 292-6427 / TWX 510 922-7954



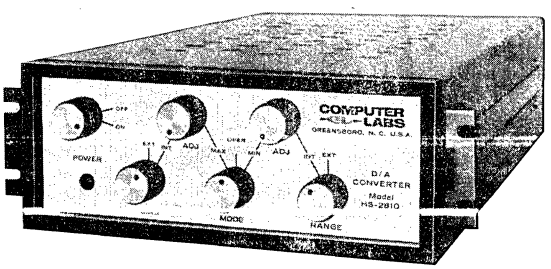
MDS/MDP SERIES D/A CONVERTERS

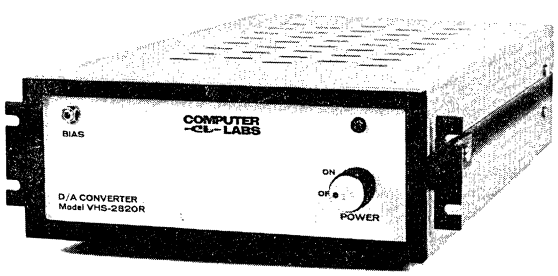
The MDS/MDP D/A Converters are the ideal choice when the application requires fast settling without sacrificing drive capability. The 8-bit unit is available with settling times as short as 15 nanoseconds; and the 10-bit unit is available with 20-nanosecond settling. These PC-board units supply 15mA or 1.5V (unipolar); or ±7.5mA at ±1.0V (bipolar). Priced from $89 to $149.

D/A SETTLING TIMES AS FAST AS 15 NS

HS-2000 SERIES D/A CONVERTERS

Computer Labs HS-2000 Series D/A Converters convert parallel binary words into analog voltages accurate to within ±2 mV. No strobe signal required. **Output settles to within 0.1% of input in less than 90 ns.** External bias and reference signals can be applied from dc to 25 MHz, making units useful also as programmable attenuators, function generators, or modulators. Prices range from $1,480 to $1,760.





VHS SERIES D/A CONVERTERS

The VHS-2820 D/A can convert digital words of up to 8 bits into analog voltages at word rates through 20 MHz. **Under typical conditions, the analog output voltage will settle to 0.2% of its final value within 30 ns after a "worst-case" change in the digital input** . The VHS-282OR has a deglitcher option which removes discontinuities from the analog output. The VHS-2630 D/A converts 6-bit words into analog voltages at word rates through 33 MHz. Priced from $1700 to $2600.

HIGH-SPEED ANALOG MULTIPLEXER

The MUX-810 Multiplexer connects eight analog inputs to a single output at a rate of 6.6 million connections per second. Channels can be connected sequentially, with any number in the sequence; by random access; or manually, with a front-panel pushbutton. **Equivalent "ON" resistance is 0.2 ohm, ideal for switching 100-ohm lines.** Price is only $2,400.

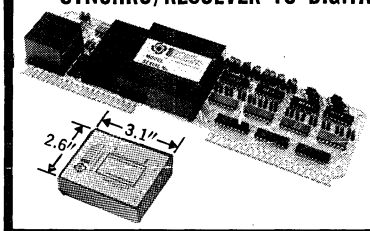
COMPUTER LABS

1109 South Chapman Street / Greensboro, North Carolina 27403 / (919) 292-6427 / TWX 510 922-7954

SYNCHRO CONVERTERS/DISPLAYS/ENCODERS

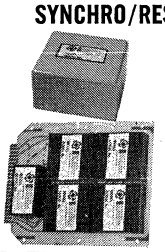
STANDARD LOW COST UNITS TO SATISFY ALMOST ANY SYNCHRO/RESOLVER OR SHAFT INTERFACING REQUIREMENT

SYNCHRO/RESOLVER TO DIGITAL Series SDC40/60



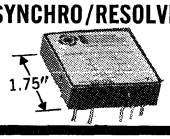
INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** 14 or 12 bits parallel binary or BCD. **ACCURACY:** ±5.27, or ±15 minutes of arc. **PACKAGE:** A) 2.6″ x 3.1″ x .82″h Module B) 2.6″ x 9.25″ x .9″h or 4.5″ x 6.5″ x .75″h repairable PC Card.

SYNCHRO/RESOLVER TO LINEAR DC Series SLD200



INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** A) −10 to +10 vdc linear with angles from −180° to +180° B) −10 to +10 vdc linear with angles from −90° to +90° C) 0 to +10 vdc linear with angles from 0° to 360°. **ACCURACY:** ±6, ±15, ±30, or ±60 minutes of arc. **PACKAGE:** A) 3.2″ x 3.4″ x 1.8″h Module B) 4.5″ x 6.5″ x .75″h repairable PC Card.

SYNCHRO/RESOLVER TO SINE-COSINE DC Series SD100

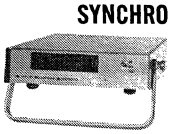


INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** ±10 sin θ vdc; ±10 cos θ vdc. **ACCURACY:** ±2 or ±4 minutes of arc. **PACKAGE:** 1.75″ x 1.75″ x .6″h or 3″ x 3″ x .625″h Module.

INVARIANT SYNCHRO/RESOLVER TO SINE-COSINE Series SD100 I

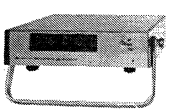
INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** ±10 sin θ vdc, ±10 cos θ vdc. **ACCURACY:** ±4 minutes of arc. **INVARIANCY:** A ±10% change in the input or reference voltage results in a ±.5% change in the individual DC outputs. **PACKAGE:** 3″ x 3″ x .625″h Module.

SYNCHRO ANGLE INDICATOR Series AI500



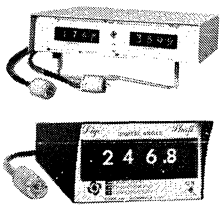
INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** 5 Digit display and BCD data. **ACCURACY:** ±.1° or ±.05° with .02° resolution. **PACKAGE:** 9.5″w x 1.75″h x 12″ Deep — Bench or Rack Mounting.

BINARY ANGLE INDICATOR (BINARY TO BCD) Series BAC100



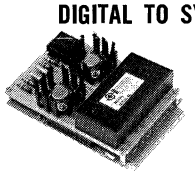
INPUT: Up to 16 bits of parallel binary data, TTL compatable. **OUTPUT:** 5 digit display of angle (0° to 359.99°) OR ANY OTHER SCALE FACTOR DESIRED FROM 0 TO 99999 REPRESENTING ENCODER POSITION, RANGE, PRESSURE, WEIGHT, ETC. **ACCURACY:** ±.01° (±1 lsb). **PACKAGE:** A) 7.0″w x 1.75″h x 8.25″ deep — Bench or Rack Mounting B) 4.5″ x 6.5″ x 1.8″h PC Board requiring +5 vdc at 1 amp.

SHAFT TO DIGITAL (ENCODERS) Series DS70 & DS100



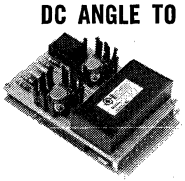
INPUT: Shaft angle position, coupled to "DIGI-SHAFT" system. **OUTPUT:** Four digit display (0° to 359.9°) + BCD data available. **ACCURACY:** ±.1° from shaft position input to digital output. **PICKOFF:** Resolver (Size 15 — 1.4″od x 2.6″L). **PACKAGE:** A) SINGLE AXIS (DS70) — 3.5″h x 8″w x 12.5″ deep — Bench/Rack Mount B) DUAL AXIS (DS100) — 3.5″h x 16″w x 12″ deep — Bench/Rack Mount.

DIGITAL TO SYNCHRO/RESOLVER Series DSC800



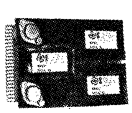
INPUT: 14 bits parallel binary and 26/115 vrms reference. **OUTPUT:** 11.8/90 vrms L-L, 60 or 400 Hz capable of driving up to three size 11 T.R.'s (75 ohms L-L). **ACCURACY:** ±6, ±15, or ±30 minutes. **PACKAGE:** (2) repairable 4.5″ x 6.5″ x 1″h PC Boards, stacked with one edge connector.

DC ANGLE TO SYNCHRO/RESOLVER Series LDS500



INPUT: ±10 vdc or ±100 vdc representing ±180° of angle. **OUTPUT:** 11.8/90 vrms L-L, 60 or 400 Hz capable of driving up to three size 11 T.R.'s (75 ohms L-L). **ACCURACY:** ±15 or ±30 minutes of arc. **PACKAGE:** (3) repairable 4.5″ x 6.5″ x 1″h PC Boards stacked with one edge connector.

DC SIN COS TO SYNCHRO DRIVERS Series DCS400



INPUT: ±10 vdc representing sin θ and cos θ. **OUTPUT:** 11.8/90 vrms L-L, 60 or 400 Hz capable of driving up to three size 11 T.R.'s (75 ohms L-L). **ACCURACY:** ±6, ±15, ±30 minutes of arc. **PACKAGE:** 4.5″ x 6.5″ x .8″h repairable PC Card.

RECTANGULAR TO POLAR Series RP600

INPUT: R sin θ and R cos θ from 50 mv to 10 vdc. **OUTPUT:** R and θ. **ACCURACY:** θ: ±15 minutes at R = 10, R: ±.1% F.S. **PACKAGE:** 3.2″ x 3.4″ x 1.8″h Module.

ADDITIONAL PRODUCTS

- Multiplexed Syn to Digital
- Multiplexed Syn to Linear DC
- Digital Sin-Cos to Synchro
- Incremental Encoder Readouts
- Demodulators
- Selsyn to Digital/DC
- Modulators
- Polar to Rectangular
- Solid State Control Transformer + Differential Transmitter

ALL SYNCHRO INPUT/OUTPUT UNITS

- Available in 0°C to 70°C or −55°C to +85°C temperature range
- TTL compatable outputs and inputs
- Operate from ±15 v, or ±15 and +5 vdc
- Transformer isolated inputs/outputs
- Solid State construction
- CAN BE MADE FIELD OR FACTORY REPAIRABLE
- Available hermetically sealed and to MIL SPECS (E-5400)
- Delivery: Stock to 4 weeks (small quantity)

SPECIAL UNITS AND PACKAGES AVAILABLE ON REQUEST

Write or phone for detailed specifications, applications assistance and evaluation units. See yellow section for typical pricing.

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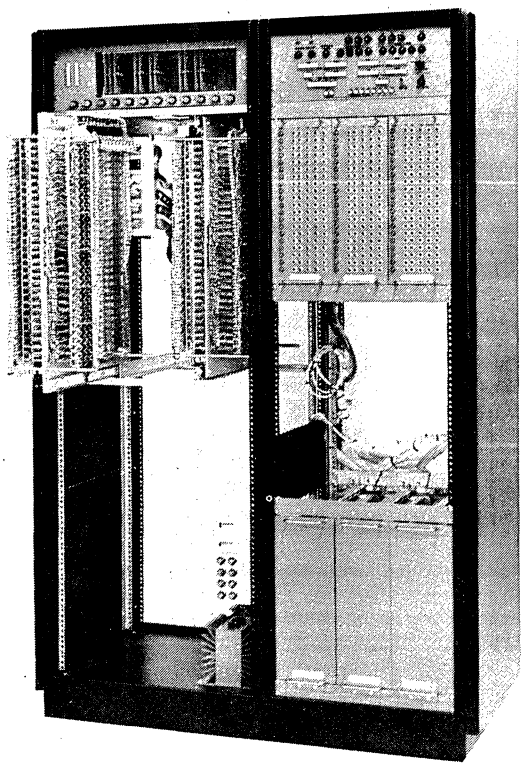

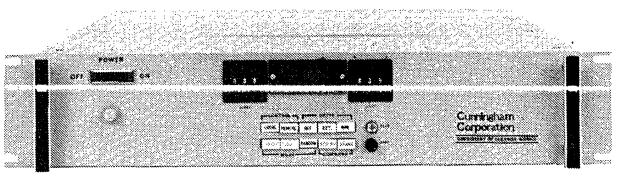

instrumentation scanners/ multiplexers

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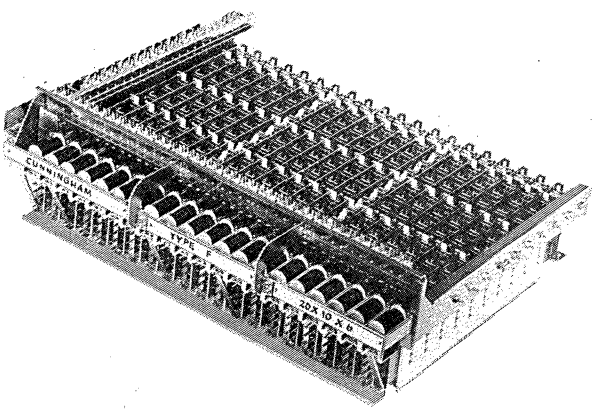
- reed scanners

matrix switches

- crossbar matrix
- reed matrix



OUR COMPLETE CATALOG IS IN EEM VOL. 4 p. 327-334 (1973)

CHECK OUR SPECIFICATIONS. MOST USE OUR PRODUCTS AS A REFERENCE.

For further technical information contact your nearest Cunningham representative or the factory. For up-to-date sales office information, DIAL EEM 800-645-9200 (in N.Y. State call collect (516) 294-0990.)

Cunningham Corporation

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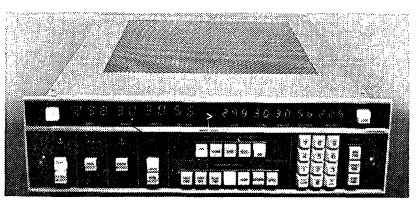
Datatron Timing Instrumentation Products

Time Code Generator/Translators

Model 3000

Model 3000 is a universal generator/translator which can output up to 5 serial time codes (IRIG, NASA, AMR, XR3, 2137, 1892, etc.) and can translate virtually any time code through plug-in cards. Standard features include a front panel display of accumulated time in seconds, minutes, hours and days, 42 lines of parallel BCD data and pulse rate outputs of 1K, 100, 10 & 1 pps. Synchronization controls mounted on an internal subpanel permit manual correlation to an external time standard such as WWV. The translator section includes carrier filters and digital error bypass. Special pulse rates, sine waves, parallel binary outputs and code dropout protection are available as options.

The 3000 can be packaged in a 3½ in. high rack mount configuration with Datatron's unique fold-in circuit cards, in a 7 in. high top loading cabinet, or as a ¾ ATR (7½ x 8 x 15) package including batteries so it can be hand carried without losing time integrity.



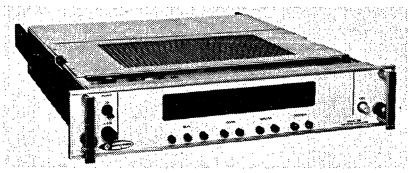
Model 3030 Time Search Unit

Model 3030 is industry's first computer-controlled time code generator, translator/tape search unit in a single 7 in. high rack cabinet. During data acquisition, the 3030 acts as a time code generator, outputting a serial time code for recording on analog magnetic tape. During data reduction, the time code translator converts the previously recorded serial data to a parallel format to automatically control the search of a transport for a pre-selected playback interval.

Either the front panel keyboard or the computer can control playback interval, fast forward, fast reverse, play forward, play reverse, stop and record. Logic levels for all computer interface signals are +5V and 0V.

The 3030 can output IRIG B or other codes in both DC level shift and modulated carrier forms. An internal frequency standard (5 pts/10^7/day) or an external 1 MHz input can be used. The translator, which can translate virtually all time codes, features a wide AGC range, digital and analog filtering.

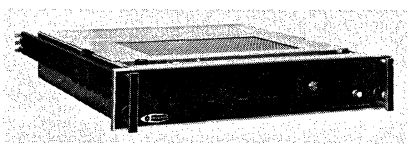
Time Code Generators



Model 3100

Model 3100 is a universal time code generator available in a 3½ in. rack cabinet with fold-in cards, a 7 in. top loading cabinet, or a 7½ x 8 x 15 ATR case. The unit accumulates a BCD representation of days, hours, minutes and seconds from an internal frequency standard — or from an external input. Where close correlation to WWV is required, a high stability oscillator having a drift rate of less than 50 micro-seconds per day is available as an option. The 3100 can output up to 5 simultaneous serial time codes for recording on magnetic tape, film and/or oscillograph recorders, including two special multiple rate slow codes. A visual display of seconds, minutes, hours and days, a 42 bit parallel BCD output, and pulse rates of 1 K, 100, 10 and 1 pps are also provided.

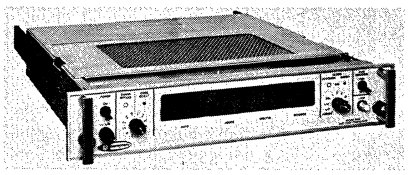
Synchronization controls, including advance/retard, mounted on an internal subpanel to prevent unintentional activation, permit the operator to manually time correlate the 3100 to an external time standard. As an option, the generator can be started automatically from a WWV "tick" with circuitry and controls to compensate for the propagation delay between the generator and the external time standard.



Model 3150

Model 3150 is less versatile — and less expensive — then the 3100. It's available in the 3½ in. rack configuration. Like the 3100, up to 5 serial time codes can be simultaneously generated including the IRIG, NASA & AMR families, the XR3 2137 and 1892 codes and a special multiple rate code designed specifically for visual recorders. Each code is provided in both the DC level shift and where applicable the modulated carrier. Visual display, BCD parallel output and pulse rates are standard. In fact, the economical 3150 will do everything the 3100 will do except for automatic synchronization with propogation delay to an external time standard.

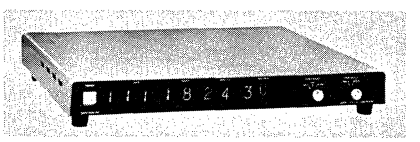
Time Code Translators



Model 3200

Model 3200, housed in a compact 3½ in. cabinet, will accept nearly any input code simply by changing the plug-in code translation card. Available code cards include the IRIG format, A, B, C and E, the NASA 36 and 28 bit codes, the Apollo and Gemini code, the AMR D5 code, and the XR3, 2137 and 1892 codes. Special codes can also be translated. Many of the 3200 code translation cards accept an entire family of time codes, with a front panel rotary switch to select the proper code. The 3200 has a wide dynamic range AGC amplifier so that the translator can operate with a magnetic tape transport at widely varying record-to-playback and record-to-search ratios. Carrier filters separate the timing signals from other data to insure accurate translation, and a front panel rotary switch with 0,1,2,4,8 and infinity permits selection of the number of consecutive erroneous frames to be bypassed.

Two serial slow codes are available for "quick look" on visual recorders. Where protection against momentary time code dropout is important, Datatron offers an option card which fills in for missing carrier cycles at one of two fixed frequencies. Also available is the Model 3600 DC Code/Failsafe unit which operates over a frequency range of 20 Hz to 64 kHz. Accumulated time in seconds, minutes, hours and days is displayed in the front panel.



Model 3270

The 3270 is a simple, low cost, compact time code translator which occupies just 1¾ in. of rack space and can translate IRIG A or B, switch selectable from the front panel. A visual display of hours, minutes and seconds is provided. Options include days display, "on time" parallel BCD outputs, pulse rates, digital error bypass, automatic forward and reverse reading, display and BCD output freeze and a 600 ohm isolated and balance input.

A NASA 36 and an XR3/2137 card is also available.

Other Timing Products

Model 3350 — Digital Clock
Model 3400 — Tape Search Unit
Series 3500 — Timing Systems
Model 3600 — DC Code/Failsafe Unit
Series 3700 — Remote Displays
Series 3800 — Timing Terminal Units
Model 3900 — Coincidence Comparator

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Data Acquisition Systems priced from $1,900

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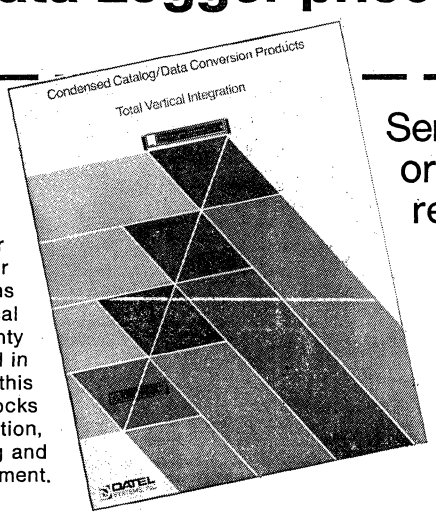
This comprehensive 36-page catalog contains detailed electrical and mechanical information on ultraminiature A/D and D/A converters, plus accessory sample and holds, multiplexers and miniature D.C. power supplies. Also included are computer compatible data acquisition systems and low power data loggers. See local rep listing for immediate reply. Eighty models of 17 series are described in detail. Hardware described in this catalog forms the basic building blocks for many forms of data acquisition, data analysis, data reproducing and graphic display equipment.



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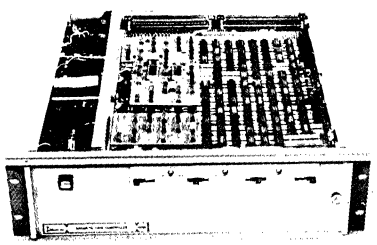
Datum... the miniperipheral

Most things for most minis with

flexibility...

Magnetic Tape Systems
DATUM's I/O systems let you add up to four magnetic tape units to any of 20 makes of minicomputer. Seven- and nine-track mix, NRZ and phase-encoded formats, different densities, several speeds and compatible software.



Key conversation piece in the mini-to-tape dialogue is DATUM's Series 5091 Formatter. This lets you generate and read IBM-compatible NRZ and/or phase-encoded formats. One formatter will handle up to four 7- or 9-track, multiple density (200, 556, 800 bpi), multiple-speed (6.25 to 112.5 ips) magnetic tape units. Plug in a computer adapter and you have a complete controller system. Daisy-chain two formatters and control up to four 7- and 9-track NRZ plus one to four 1600 bpi tape units.

Over 1,000 DATUM magnetic tape systems are operating reliably here and abroad. They're field-proven. We like to provide you with a total system — tape units, formatter/controller, software, installation and all the expertise derived from decades of systems experience. But we also furnish formatters with blank PC boards for the knowledgeable systems man who wants to build his own computer adapter. These boards have 196 IC sockets already mounted. DTL/TTL integrated circuit logic is used throughout the formatter design to ensure compatibility.

Total systems prices start about $3,350. Delivery off-the-shelf much of the time, 30 days to be on the safe side.

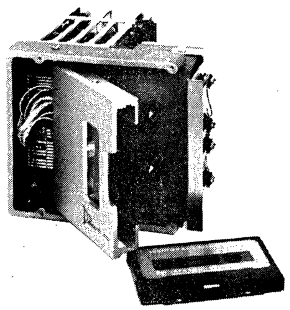
performance...

Digital Cassette Systems
DATUM's cassette systems create new standards of performance. Using the Peripheral Dynamics Model 4200 Digital Cassette Transport — the cassette with reel performance — these systems offer:

storage capacities of over 20 million bits, two- or four-track recording, NRZ or phase-encoded formats, read/write or read-after-write heads, Pertec compatibility.

And no more tape-chewing. A reel-driven servo system, without capstans or pinch rollers, keeps tape velocity constant. A torque feedback tension servo maintains tape tension. A reference-edge tape guidance system provides precise tracking (±0.001 inch) and cuts skew to less than 2 microseconds at 37.5 ips. So tape will last.

Standard speed is 37.5 ips, though you can have up to 75 ips or down to 10 ips. Search and rewind speed is 120 ips. Operates bidirectionally at high or low speeds, under local or remote control.



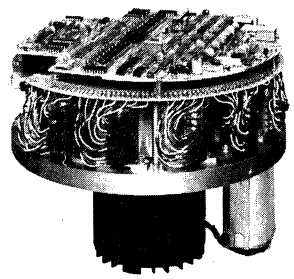
Reliability? It's the simplest cassette drive on the market. Two moving parts in the drive mechanism. No springs, capstans, pinch rollers or solenoids to get out of whack. It is as reliable as it is simple.

OEM versions or systems, with the same formatters, controllers and software as with conventional reel-to-reel tape drive systems.

Total system prices start about $840.

reliability...

Mass Memory Systems
DATUM's mass memory systems—drums or disks—offer low cost expansion to core-limited minicomputers, or solutions to other storage problems requiring a highly reliable, rapid-access, economical data base.



At the lower end of the storage scale, DATUM's Series 55 rotating drum memories provide 16K 16-bit word capacity on 4 tracks and an average access time of 17.5 milliseconds.

At the upper end, 262K words on 64 tracks, with 4096 words per track. Word transfer rate is 122 kHz. Prices for simple units from $1,750 to $2,950 with self-clocked read-write electronics.

Series 88 drums, rugged and reliable, provide up to 1.2 million words of storage. Designed for tough environmental conditions, high vibration and shock-prone applications.

All drums have head-per-track, fail-safe, flying heads. And low cost per reliable bit.

DATUM's new Series 44 dual disk drives are designed primarily to provide both sizeable on-line random access storage and unlimited off-line storage. Small system compactness and price, with big system features like top-loading removable disks, air filtration systems and optical head positioning. Storage capacities to about 3 million words.

As with tape and cassette systems, DATUM offers formatters, couplers and software for most common minicomputers.

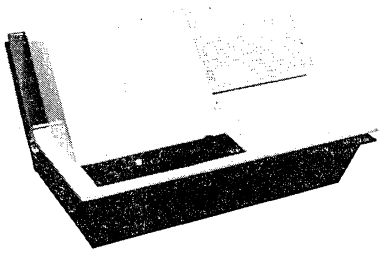
Total systems prices start at about $2,000.

people with systems know-how

economy...

Source-data Entry Systems
Datum's Optical Mark Reader provides a low-cost system for a wide range of source data entry applications: remote order entry, inventory reporting, survey tallying, billing, insurance record maintenance, and sales ticket reading.

This OMR terminal reads pencil-marked and pre-printed data from prepared forms, tapes, and paper-sized documents. Data is read, assembled into ASCII alphanumeric characters and formatted for asynchronous transmission at up to 9600 baud rates, by phone-line modem. Any conventional asynchronous remote receiver may be used: teleprinters, paper-type punch terminals, CRT displays, etc.



Each 12-bit document entry is translated into two 10-bit (or optionally 11-bit) asynchronous serial characters: one start bit, six data bits, one dummy bit and one stop bit. Standard scan speed is 9 inches per second. Transmission rates are 120, 60, 30, 15, or 10 characters per second. Interface signals conform to EIA standard RS232C.

Popular input request characters from a remote computer can also be recognized.

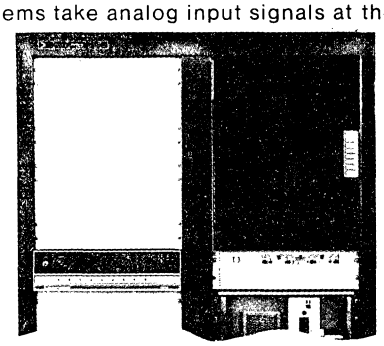
For error correction, automatic retransmission control via reverse channel signal is provided.

DATUM's Model 5098 Optical Mark Reader terminal systems start under $2,000.

expertise...

Data Systems
DATUM's SYSTEM 70 packages data acquisition, control and automation expertise in low-cost, 'universal' hardware and software modules.

Turn-key minicomputer-controlled systems take analog input signals at the



transducer level, condition, multiplex and convert them to digital numbers required for the NOVA series general purpose processor to exercise system control, instructed by a comprehensive software package.

DATUM's proprietary Universal Data Acquisition Module (UDAM) contains power supplies, timing and control logic, high-, or low-level multiplexer, sample-and-hold and analog-to-digital converter to provide an uncomplicated 'black box' link between signal source and computer.

A Real-Time Interface Unit (RTIU) acting as a bus extender, links the output of the UDAM to the processor using either a programmed I/O, or direct memory access. The RTIU also lets you interface a wide range of input/output hardware to the processor.

Programming packages, as modular as the hardware, offer an extensive applications software library.

Know-how accrued from building multiple millions of dollars worth of systems, ensures hardware best suited for your particular application, present budget and future expansion. And absolves you of systems responsibility.

System 70 prices start under $20,000.

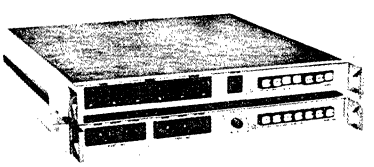
precision...

Timing Systems
DATUM's timing systems are less peripheral to minicomputers than the other way around. Instrumentation for generating coded time signals, dispensing, decoding and displaying them creates a time base to which all other data can be correlated.

From simple low-cost digital clocks counting with six-digit resolution (99 hours 59 minutes, 59 seconds) to range generating stations with precise, nanosecond correlation and triple-redundant reliability. DATUM timing equipment has become synonymous with excellence.

Problem: searching for random data on segments of recorded magnetic tape, quickly and repetitively. Solution: DATUM's Tape Search System. Simply set thumbwheel switches for the hour, minute and second (or millisecond) marking the beginning and end of the segment sought and hit the Search Switch. Your tape transport spins, the segment is found, and its recorded time track is displayed digitally throughout the playback sequence. Computer-compatible versions speed the most sophisticated processor-controlled data reduction processes.

Much of the science of time-correlation grew from the exacting needs of man-in-space programs. DATUM's unique timing know-how derived from these programs



is rapidly finding application in industrial, medical, law enforcement and scientific pursuits. DATUM staff members help you create new uses for timing instrumentation. The benefits of over 100 man-years of timing systems applications experience are yours for the asking.

DATUM

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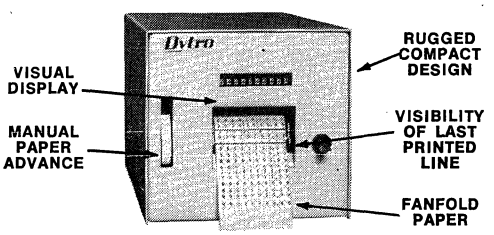

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- Unique Echo-Check Feature for Reliable Printed Data
- Designed for OEM Use
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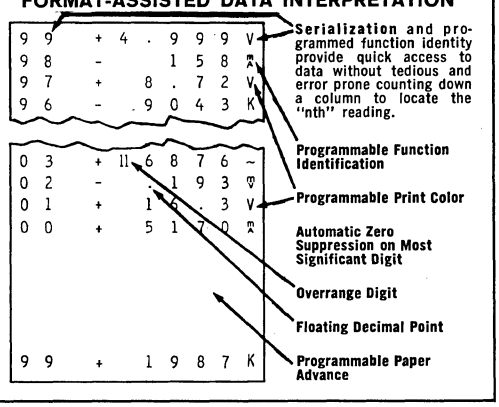
- Includes Power Supplies
- 10 Column Capability—2, 10 or 12 Elements per Column
- Parallel BCD Entry—Parallel Decimal, Excess 3, Excess 3, Gray and Serial Codes Available
- Counting Capability
- Floating Decimal Points
- Programmable Print Color and Paper Advance
- Auto Zero Suppression
- Overrange Digit
- Clock Option, Clock Printout on Each Print Line, Example: 11:59+937 V.
- Decimal Readout, one of ten Contact Closure for Each Decade
- Programmable Function Identification (+, —, V. MA, MV, etc.)
- Serialization (Log Identifying Digits)
- Easy Paper Loading
- Reliable Data • Extended Life • Shortened Cycle Time

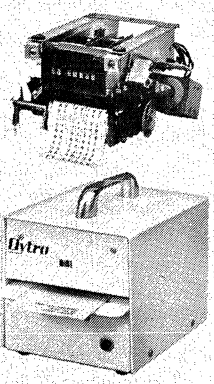
(Address-O-Print Averages 1/2 Cycle per Printout vs. Full Cycle for Incrementing Type Printers)

FORMAT-ASSISTED DATA INTERPRETATION

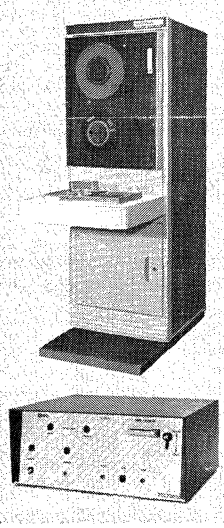


Dytro

printers



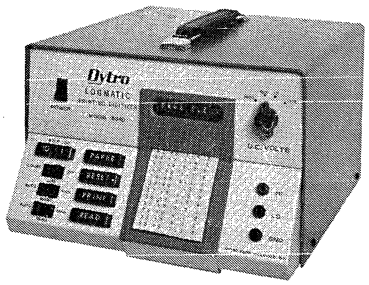
digital cassette convertors



logmatic® pdvm®

Analog Input Printing Digital Voltmeter

SERIES 8040



- **CONVERTS** 0-1100 Volts DC in 3 ranges into 4 digits (plus overrange) and autopolarity. AC and Resistance options
- **IDENTIFIES** Two additional digits indicate which of 100 readings has been made.
- **DISPLAYS** all eight data elements: logging numbers, polarity, reading, and range (decimal point).
- **PRINTS** the complete display, in single or multiple copies, on command or automatically.

- Available in OEM Versions
- 2, 3 and 4 digits
- Card/Ticket PDVM's
- Up to 5 Digit Ratio Capability
- Hi/Lo Limit Checking
- Self Check Mode
- Manual/Auto Print
- Scanner/Multiplexer Available
- Clock for Auto/Read and Printout
- BCD and 10 Line Codes Available as Outputs
- Rack Mounting Versions Available
- Reset/Preset of Log Digits
- Inkless Printing
- Paper Tape Punch (ASCII) Ability
- Complete Data Logging Systems Using the 8040 PDVM Available, Tailored to Specific Customer Needs

PDVM APPLICATION AREAS:

- Automatic Potentiometer Checker
- Pollution Monitoring Data Loggers
- Medical—Clinical Lab Equipment
- Process-Control Monitoring
- Ships Data Logger

OEM DIGITAL CASSETTE TAPE SYSTEMS

AVAILABLE FEATURES & APPLICATIONS

- Minicomputer Interfaced Keyboard to Cassette
- Multiplexed A/D Entry
- Cassette To: 7 or 9 Track Tape, TTY, Punched Card, Paper Tape
- Write Only, Read Only, Read/Write, Read After Write
- Parity Detection
- Error Correction Codes
- Tape Sensing—BOT, EOT, and EOT Warning
- Inter-Record Gap—0.1" Inches Min.
- Automatic Self Test Features
- Synchronous or Asynchronous Operating Modes
- Data Rate: 3.75 KC Typical
- Data Capacity: 4 Million Bits
- Fast Forward/Fast Reverse Capability
- Address Capability
- Correction Capability
- Stack Loader/Reader
- Unequal Read/Write Speeds

PORTABLE CASSETTE

DATA LOGGER

- Battery Operated
- Self-Contained A/D Converter

Dytro

Dytro also manufactures other analog card/ticket printers, cassette tape checkers, hybrid & digital acquisition, recording, formatting and printing equipment.

DYTRO CORPORATION, 63 TEC STREET
HICKSVILLE, NEW YORK 11801 ▪ (516) 822-2130

Dytro

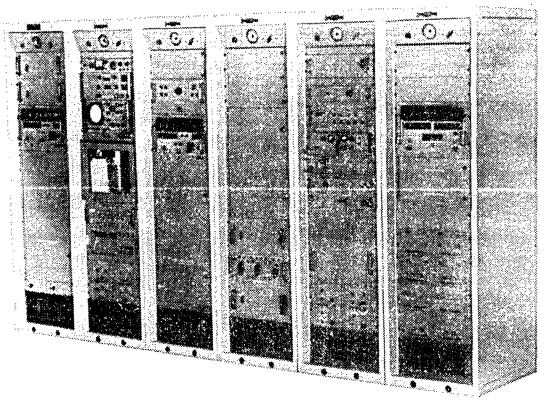
DYTRO / originators of the ***PRINTING DIGITAL VOLTMETER***

APOLLO TIMING SYSTEM

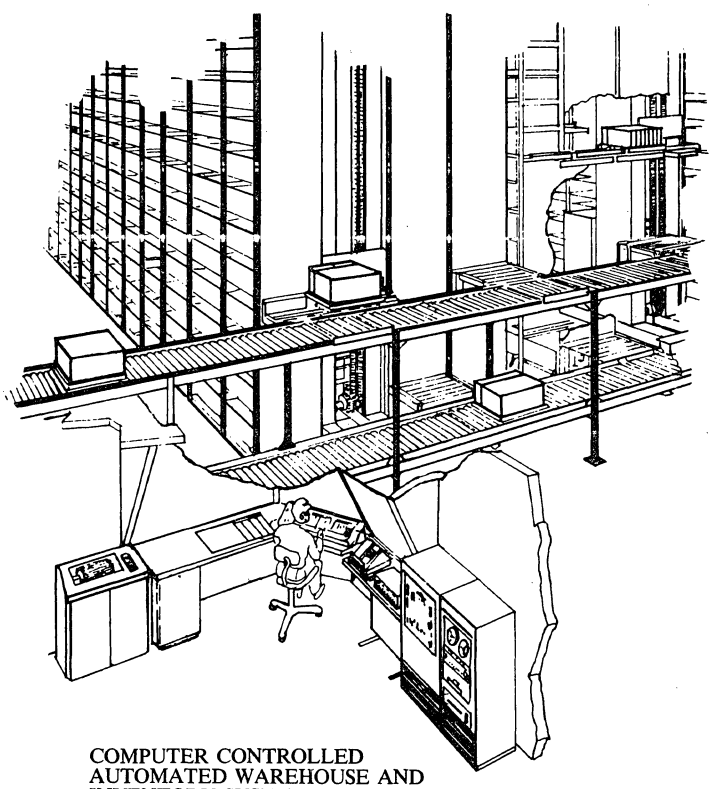
Sophisticated central timing systems were installed on NASA's Apollo instrumentation ships. Time codes, standard, and non-standard reference frequencies are generated and distributed to range instrumentation equipment located on the ships. Time signals are synchronized within one ten thousandth of a second with the Naval Observatory.

Precise rubidium and crystal frequency standards control redundant master time-of-year clocks and time signal generators. Elapsed time clocks feature manual or automatic initiation for pre- or post-event timing. All frequencies and time codes are programmable. A time scaler produces time and event markers for event recorders and plotting boards.

Time comparison equipment includes a WWV receiver, VLF doppler compensated receiver, chart recorders and an oscilloscope. Redundant master power supplies are backed up by an internal battery pack. Chargers keep the stand-by pack ready at all times.

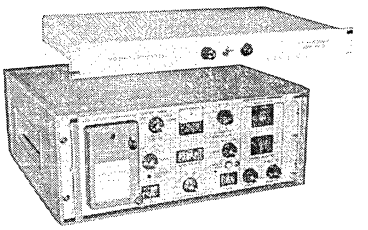


DIGITAL EQUIPMENT, DATA ACQUISITION AND TIMING SYSTEMS



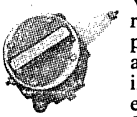
COMPUTER CONTROLLED AUTOMATED WAREHOUSE AND INVENTORY SYSTEM

Electronic hardware and computer software provides a fully automated material handling and inventory warehouse system. Included are computer, disc mass storage unit, magnetic tape system, teletype, card reader, medium speed line printer, interface controllers for conveyors and storage and retrieval units. A variety of inventory reports are available.

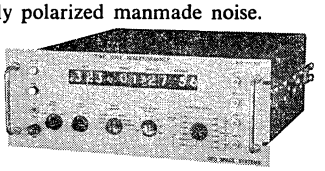


VLF RECEIVERS AND ACCESSORIES

Solid state VLF receiver/phase comparators accept signals from expanding VLF network. Frequency range 10.0 - 30.0 KHz, image rejection 60 db or better, AGC greater than 40 db, tracks input levels of 0.01 μV at signal-to-noise ratio of −50 db. Less than 0.1 μs tracking error. Servo-tuned.

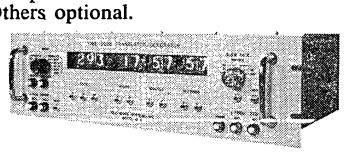


VLF antenna multicoupler reduces desensitization, phase shift, cross coupling, and coherent ground circuit interference. 50 Ω input, eight 50 Ω outputs with 50 db isolation, 3 db gain. Long-wire or whip antenna matches 50 Ω coax transmission line. Reduces horizontally polarized manmade noise.



TIME CODE READER/SCANNER

Model 8108 provides reliable phase-coherent serial and parallel outputs from noisy time code modulated non-coherent carriers. Acquisition/lock assures coherent time outputs for up to 32 frames of signal dropout once synchronized. Handles NASA 36-bit time code at 1 KHz rate plus four non-coherent carrier rates. Others optional.



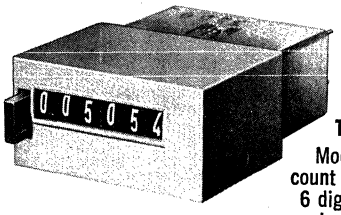
TIME CODE TRANSLATOR/GENERATOR

Capable of functioning either as subcentral timing system or independent timing generator. Generates all timing signals and pulse rates for radar and computers, including NASA BCD and serial codes plus binary time-of-year in tenths of a second.

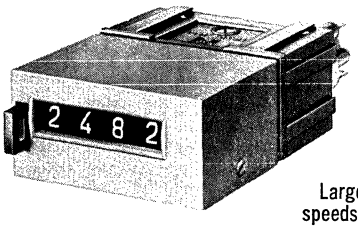
GEO SPACE SYSTEMS INC.

4722 Eisenhower Boulevard, Tampa, Florida 33614, (813) 884-0492

High Performance Electromagnetic Counters Digital Line & Ticket Printers

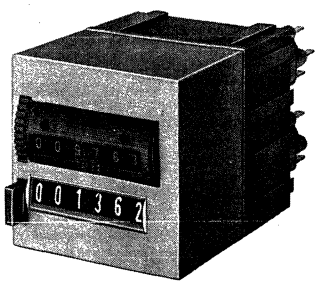


Totalizing Counter 404
Modular plug-in counter, count speeds up to 60 cps, 6 digits, non-reset, manual and electrical reset. Life in excess of 200 MIO operations.

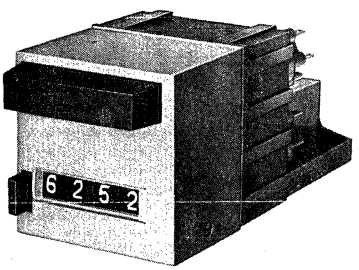


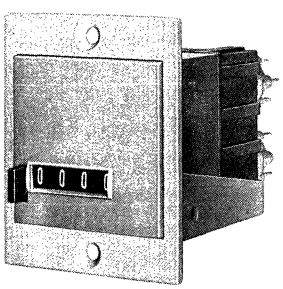
Totalizing Counter 414
Large figure totalizor count speeds up to 40 cps, 4 digits, non-reset, manual & electrical reset. Many standard options.

Predetermining Counter 422
Operates on adding principle, count speeds up to 40 cps, 6 digits, with manual, electrical or automatic reset, preset retained for repetition.

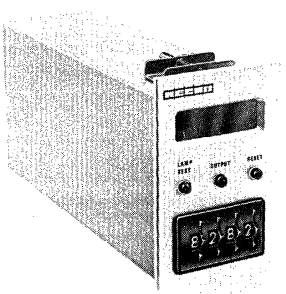


Predetermining Counter 441
Operates on subtracting principle, count speeds up to 40 cps, 4 digits, with easy push button preset optional presignal available.



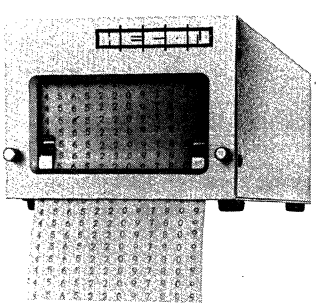


Bi-Directional Counter 431
Accepts positive and negative inputs serially or simultaneously without loss of counts. Count speeds up to 25 cps. Optional zero contact available.

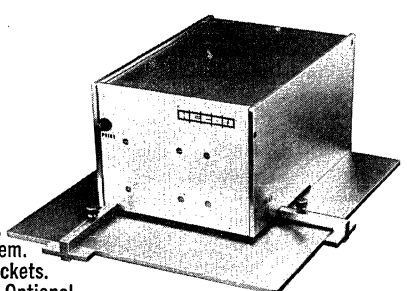


Electronic Predetermining Counter 611
Predetermining counter with or without LED display, up to four digits and up to 5000 cps, thumbwheel preset. Optional fixed presignal.

Digital Line Printer AO 501
4 to 12 active columns, asynchronous operation, BCD or pulse train input. Print speed 3 lines per second. With control electronics.



TICKET PRINTER TP 900
Up to 18 active columns, including Time-Date system. For single and multiple tickets. BCD or pulse train input. Optional ticket adjustments available.



HECON
Better by Design

HECON CORPORATION 31 Park Road, New Shrewsbury, New Jersey, (201) 542-9200 Telex 132-457
HECON OF CANADA LTD., 80 Galaxy Boulevard, Rexdale, Ontario, Canada 416-678-2441 Telex 0622-773
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10514 Dupont Avenue • Cleveland, Ohio 44108
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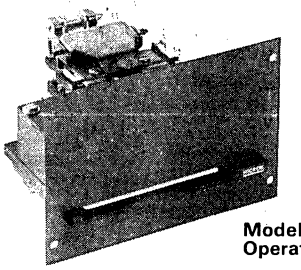
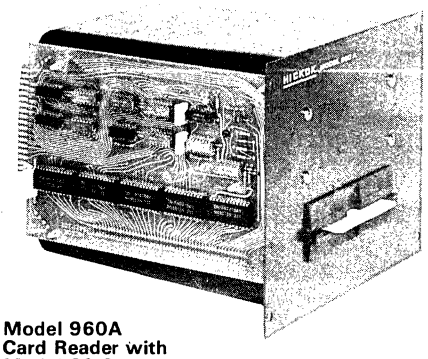


Model 264A-02 Remote Operation Badge Reader



Model 960A Card Reader with Model 80 Scanner

STATIC CARD READERS

- *22-column Badge and 80-column Tab Card Readers*
- *Choice of Wiring and Reset Configurations*
- *Interface Electronic Packages*

264-Bit Output Badge Reader, Model 264A, will read column 1 through 22 of a standard tab card (Media I) or a standard size CR60 plastic badge with Media I punching.

960-Bit Output Card Reader, Model 960A, will read 80 columns of a standard 80-column tab card (Media I).

Choice of output bussing combinations with diode isolation matrices is available for both the badge and card readers to reduce external wiring.

BRIEF SPECIFICATIONS, MODELS 264A, 960A READERS

CONTACTS: Form "A"; hole in card makes contact. Spacing per EIA-RS-292, Media I.
264A: 264 contacts. 12 rows x 22 columns.
960A: 960 contacts. 12 rows x 80 columns.
BADGE SIZE: 2.328 in. x 3.250 in. Thickness: 0.007 in to 0.035 in.
CARD SIZE: Standard Media I tab card. Thickness: 0.007 in to 0.015 in.
PRICES (single quantity):

264A Badge Reader	$175
960A Card Reader	$495

INDUSTRIAL CARD READERS

- *Reliable Performance in Rugged Environments*
- *Interposer Contacts for Error-Free Readings*

Proven success in industrial environments: applications include programmed control of batching and blending processes, automatic storage/retrival and conveyor systems, and automated test equipment, using high current contact closures.

Little maintenance is needed; the self-wiping interposer contact design eliminates periodic dissassembly or cleaning.

Sure, accurate readings result from using the interposer techniques. An interposer (switching mechanism post) slips through a hole in the card when the reader is actuated. Contacts are remote from the card, avoiding misreadings due to contaminants on the card often found in heavy industrial environments.

Additional choices are offered for manual and motor operation, and for form A (switch normally open) and form B (switch normally closed) switching. Blank and preprinted durable vinyl and mylar cards and card punches are available from Hickok.

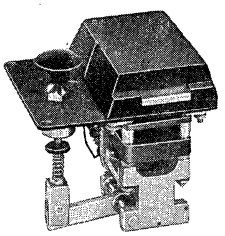
Set/reject options offer electrical actuation for remote control or manual actuation for economy.

TTL-compatible electronic scanners provide all circuitry for 12-row output in parallel, column serial. The Model 22 Scanner, for the 264A Reader, and the Model 80 Scanner, for the 960A Reader, translate the punched card data into TTL-compatible interfaces. The Scanners have two operating modes: sequential and addressable (random column selection).

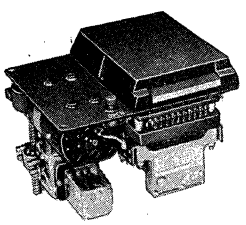
BRIEF SPECIFICATIONS, MODELS 22, 80 SCANNERS

OPERATING MODES: Sequential scan or addressable modes.
LOGIC LEVELS: TTL/DTL levels.
OUTPUTS: 12 data lines; ready; column control; deck position; address; overflow; enable.
INPUTS: 12 row lines; mode selection; inhibit; address; enable; advance; reset; eject (optional 5-volt control).
POWER REQUIREMENTS: 5 volts at 500 milliamperes.
PRICES:

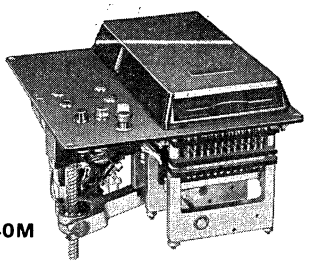
Model 22 Scanner for 22-column 264A Badge Reader	$195
Model 80 Scanner for 80-column 960A Card Reader	$295



Model 50



Model 187M



Model 540M

DATA CONVERSION MODULES

D/A CONVERTERS — MULTIPLYING

MODEL	FEATURES	NO. of BITS	INPUT CODE	F.S. OUTPUT	ANALOG REF.	SETTLING to 0.05% DIGITAL	SETTLING to 0.05% REF.	STABILITY-TC LINEARITY[B]	STABILITY-TC ACCURACY[C]
DAC 310D-10	Fast, Low Drift, 2 Quadrant, Current Output	10+Sign	Binary	+2mA	Int. or Ext.	750nS	5μS	5PPM/°C	15PPM/°C
DAC 310D-11		11+Sign	Binary	+2mA		750nS	5μS	5PPM/°C	15PPM/°C
DAC 310D-12		12	Binary	+2mA		750nS	5μS	5PPM/°C	15PPM/°C
DAC 310D-BCD		12	3 Dec BCD	+1.25mA		750nS	5μS	5PPM/°C	15PPM/°C
DAC 390D-10	Ultra Fast, 2 Quadrant, Current Output	10+Sign	Binary	+5mA	Int. or Ext.	50nS	5μS	5PPM/°C	30PPM/°C
DAC 390D-11		11+Sign	Binary	+5mA		50nS	5μS	5PPM/°C	30PPM/°C
DAC 390D-BCD		12	3 Dec BCD	+2mA		50nS	5μS	5PPM/°C	30PPM/°C
DAC 316-8	4 Quardant Multiplying, Voltage Output	8+Sign	2's Compl	±5V, Adj. to ±10V	Int. or Ext.	20μS	20μS	10PPM/°C	30PPM/°C
DAC 316-10		10+Sign	2's Compl			20μS	20μS	10PPM/°C	30PPM/°C
DAC 316-11		11+Sign	2's Compl			20μS	20μS	10PPM/°C	30PPM/°C
DAC 316-12		12	2's Compl			20μS	20μS	10PPM/°C	30PPM/°C
DAC 316-8-BCD		8+Sign	2 Dec BCD			20μS	20μS	10PPM/°C	30PPM/°C
DAC 316-12-BCD		12	3 Dec BCD			20μS	20μS	10PPM/°C	30PPM/°C

D/A CONVERTERS — GENERAL PURPOSE

DAC 371-8	Economy, Current Output	8	Binary	0 to +2mA	Int.	950nS	20PPM/°C	100PPM/°C
DAC 371-I-10		10			Int.	950nS	20PPM/°C	100PPM/°C
DAC 329	Economy, Compact	8	Binary	+10V	Int.	5μS	15PPM/°C	50PPM/°C
DAC 329-BCD		8	2 Dec BCD	+10V	Int.	5μS	15PPM/°C	50PPM/°C
DAC 329-I		8	Binary	+2mA	Int.	400nS	15PPM/°C	50PPM/°C
DAC 329-I-BCD		8	2 Dec BCD	+1.25mA	Int.	400nS	15PPM/°C	50PPM/°C
DAC 372-8	General Purpose, Voltage Output	8+Sign	2's Compl	±5V^, +10V	Int.	5μS	15PPM/°C	50PPM/°C
DAC 372-10		10+Sign	2's Compl		Int.	5μS	15PPM/°C	30PPM/°C
DAC 372-11		11+Sign	2's Compl		Int.	5μS	15PPM/°C	30PPM/°C
DAC 372-12		12	2's Compl		Int.	5μS	15PPM/°C	30PPM/°C
DAC 372-12-BCD		12	3 Dec BCD		Int.	5μS	15PPM/°C	30PPM/°C
DAC 372-I-8	General Purpose, Current Output	8+Sign	Offset Bin	±1mA, +2mA	Int.	300nS	15PPM/°C	50PPM/°C
DAC 372-I-10		10+Sign	Offset Bin		Int.	300nS	15PPM/°C	30PPM/°C
DAC 372-I-11		11+Sign	Offset Bin		Int.	300nS	15PPM/°C	30PPM/°C
DAC 372-I-12		12	Offset Bin		Int.	300nS	15PPM/°C	30PPM/°C
DAC 372-I-BCD		12	3 Dec BCD		Int.	300nS	15PPM/°C	30PPM/°C
DAC 372-WB-8	High Speed, Voltage Output	8+Sign	2's Compl	±5V^, +10V	Int.	950nS	15PPM/°C	50PPM/°C
DAC 372-WB-10		10+Sign	2's Compl		Int.	950nS	15PPM/°C	30PPM/°C
DAC 372-WB-11		11+Sign	2's Compl		Int.	950nS	15PPM/°C	30PPM/°C
DAC 372-WB-12		12	2's Compl		Int.	950nS	15PPM/°C	30PPM/°C
DAC 372-WB-BCD		12	3 Dec BCD		Int.	950nS	15PPM/°C	30PPM/°C
DAC 395-12C	Ultra Fast, Current Output	12	Offset Bin	+5mA	Int.	50nS	15PPM/°C	30PPM/°C
DAC 395-12A		12	Offset Bin	±2.5mA	Int.	50nS	15PPM/°C	30PPM/°C

Standard Range is ±5V; for ±10V range add suffix G. No extra charge. [B] The drift of each bit relative to other bits. [C] Includes all effects of temperature — scale factor, effect, and linearity.

A/D CONVERTERS — GENERAL PURPOSE

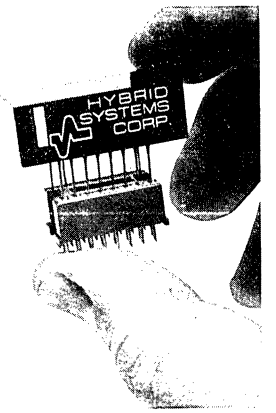
MODEL	FEATURES	RESOLUTION	RELATIVE ACCURACY	QUANTIZATION	CONVERSION TIME	INPUT
590-8	• 8 Bit • Subminiature • Economical	8	0.2%	±½LSB	200μS	±5V, 0 to +10V
590-2-BCD		2 Dec BCD	0.2%	±½LSB	100μS	0 to +10V
540-8		8	0.2%	±½LSB	5μS	0 to +10V
540WB-8		8	0.2%	±½LSB	3μS	0 to +10V
560-12C-E	• Standard or ratiometric • High Accuracy • All 12 bit units	12	0.05%	±½LSB	20μS	±5V*, 0 to +10V
560-12B-E		12	0.025%	±½LSB	20μS	
560-12A-E		12	0.0125%	±½LSB	20μS	
560-12C-S		12	0.05%	±½LSB	20μS	±5V*, 0 to +10V
560-12B-S		12	0.025%	±½LSB	20μS	
560-12A-S		12	0.0125%	±½LSB	20μS	
560-12C-LD		12	0.05%	±½LSB	20μS	±5V*, 0 to +10V
560-12B-LD		12	0.025%	±½LSB	20μS	
560-12A-LD		12	0.0125%	±½LSB	20μS	
ADC550-10-E	• General Purpose • Economy • Ready to Use	10	±0.05%	±½LSB	40μS	±5V, 0 to +10V
ADC550-10-S		10	±0.05%	±½LSB	40μS	
ADC550-12-E		12	±0.0125%	±½LSB	40μS	
ADC550-12-S		12	±0.0125%	±½LSB	40μS	
ADC592-8	• Ultra Fast • Complete • Compact	8	±0.2%	±½LSB	800nS	±5V*, 0 to +10V
ADC592-10		10	±0.05%	±½LSB	1μS	
ADC592-12C		12	±0.05%	±½LSB	3.5μS	
ADC592-12A		12	±0.0125%	±½LSB	3.5μS	

* For ±10 V operation, add Suffix G. No extra charge.

HYBRID SYSTEMS CORP. 87 Second Ave., Burlington, Mass. 01803 • Tel: (617) 272-1522 • TWX: 702-332-7584

ALL UNITS

- Powered from ±15V
- Suited for PC mounting
- Short circuit protected
- Factory repairable
- Ready to use
- Power Burn-In — All units are burned in 72 hours under power . . . a real reliability bonus
- Thin Film Resistors — Precision resistors in all units are of the thin film type . . . assures good accuracy with excellent stability
- Hermetically Sealed Active Components — No plastic transistors or IC's are used in most models . . . keeps failures to an absolute minimum



LINEARITY	POWER	SIZE	NOTES	PRICE (1-9)
±0.05%	+15V@40mA −15V@5mA	AA	• Operates either as a multiplying (analog x digital) D/A accepting signals in the range of 0 to +6.2V or as a conventional D/A using its own internal +6.2V reference. • Dual inline pin spacing	$125.00
±0.025%		AA		135.00
±0.0125%		AA		145.00
±0.05%		AA		135.00
±0.05%	+15V@55mA −15V@5mA	AA		$150.00
±0.025%		AA		175.00
±0.05%		AA		175.00
±0.1%	±15V@30mA	AA	Same as above for the 310D Series except the analog range is ±10V, AC or DC.	$ 95.00
±0.05%	±15V@30mA	AA		125.00
±0.025%	±15V@30mA	AA		150.00
±0.0125%	±15V@30mA	AA		175.00
±0.1%	±15V@30mA	AA		125.00
±0.05%	±15V@30mA	AA		150.00

DIMENSIONS: AA 2" x 3" x 0.4"

DAC371I-10 MINIATURE 10 BIT — $19

- Plugs into Single 1C Socket
- Ultra Small — 1.4" x 0.6" x 0.5"
- Complete with Reference
- 10-Bit, Current Output

±0.2%	+15V@10mA	CC	• Plugs into a single DIP 16 pin IC socket	$ 12.50
±0.2%	+15V@10mA	CC		19.00
±0.2%	±15V@15mA	DD	• Compact • Voltage output units pre-trimmed to 0.2% • Dual inline pin spacing	$ 29.00
±0.2%	±15V@15mA	DD		29.00
±0.2%	+15V@10mA	DD		29.00
±0.2%	+15V@10mA	DD		29.00
±0.1%	±15V@20mA	EE	• Voltage output units pre-trimmed to 0.1% • Dual inline pin spacing	$ 39.00
±0.05%	±15V@20mA	EE		49.00
±0.025%	±15V@20mA	EE		69.00
±0.0125%	±15V@20mA	EE		75.00
±0.05%	±15V@20mA	EE		59.00
±0.1%	±15V@20mA	EE	• Fast settling version slews 30-50V/μS • Voltage output units pre-trimmed to 0.1% • Dual inline pin spacing	$ 39.00
±0.05%	±15V@20mA	EE		49.00
±0.025%	±15V@20mA	EE		69.00
±0.0125%	±15V@20mA	EE		75.00
±0.05%	±15V@20mA	EE		59.00
±0.1%	±15V@20mA	EE		$ 84.00
±0.05%	±15V@20mA	EE		94.00
±0.025%	±15V@20mA	EE		114.00
±0.0125%	±15V@20mA	EE		120.00
±0.05%	±15V@20mA	EE		104.00
±0.0215%	+15V@55mA	EE	• Ultrafast • Dual inline pin spacing	$ 95.00
±0.05%	−15V@5mA	EE		125.00

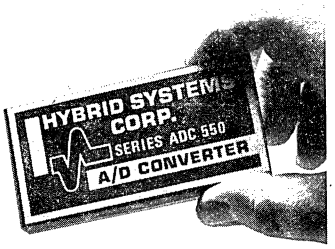
DIMENSIONS: CC 1.3" x 0.6" x 0.5" — DD 1.1" x 1.7" x .385" — EE 2" x 2" x 0.4"

ADC 560-12C-E ABSOLUTE AND RATIO MEASUREMENTS — $99

- Accuracy To 0.01%
- 20:1 Reference Range
- Fast — 20μS

TEMPCO ACCURACY	LINEARITY	SIZE	NOTES	PRICE (1-9)
50PPM/°C	20PPM/°C	AA	• Subminiature— 2" x 2" x 0.4" • Fast • Economical	$ 59.00
50PPM/°C	20PPM/°C	AA		59.00
50PPM/°C	20PPM/°C	AA		95.00
50PPM/°C	20PPM/°C	AA		195.00
50PPM/°C	15PPM/°C	BB	• Takes either standard or ratiometric readings • Fast • Pretrimmed	99.00
50PPM/°C	15PPM/°C	BB		125.00
50PPM/°C	15PPM/°C	BB		149.00
30PPM/°C	15PPM/°C	BB		150.00
30PPM/°C	15PPM/°C	BB		165.00
30PPM/°C	15PPM/°C	BB		180.00
15PPM/°C	10PPM/°C	BB		190.00
15PPM/°C	10PPM/°C	BB		205.00
15PPM/°C	10PPM/°C	BB		220.00
50PPM/°C	15PPM/°C	BB	• Fast • Pretrimmed • Accurate	$ 89.00
30PPM/°C	15PPM/°C	BB		99.00
50PPM/°C	15PPM/°C	BB		115.00
30PPM/°C	15PPM/°C	BB		125.00
50PPM/°C	30PPM/°C	BB	• Fast • Ready To Use	Consult factory
30PPM/°C	15PPM/°C	FF		
30PPM/°C	15PPM/°C	FF		
30PPM/°C	15PPM/°C	FF		

DIMENSIONS: FF 2" x 4" x 0.8" AA 2" x 2" x 0.4" — BB 2" x 4" x 0.4"



ADC550- ECONOMY 10-12 BIT ADC — $89

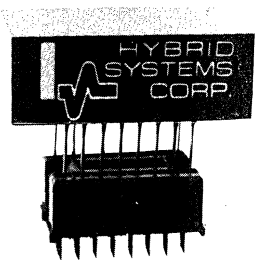
- Accurate — ±0.0125%
- Fast — 40μS
- Compact — 2" x 4" x 0.4"

DATA CONVERSION MODULES

SH725 MINIATURE SAMPLE-HOLD

- Plugs into 16 Pin DIP
- Tiny —1.5" x 0.6" x 0.5"
- Economical

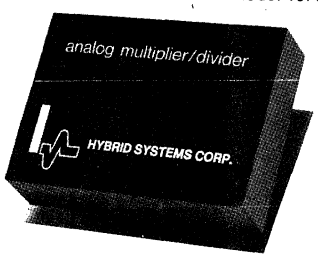
$29



ANALOG MULTIPLIER DIVIDERS

- Factory Trimmed
- 1% Accuracy Guaranteed
- Ready to Use

$39
Model 107C



MULTIPLEXER

MODEL	CHANNELS	THROUGHPUT	ON RES.	OFF RES.	SETTLING	RANGE	POWER	PRICE (1-9)
MUX201	8	750 kHz	250Ω	1000MEG	1μS	±10V	±15, +5V	**$ 49.00**

SAMPLE-HOLDS

MODEL	GAIN	ACQUISITION	APERATURE	UNCERTAINTY	DROOP RATE	FEED THROUGH	POWER	PRICE (1-9)
SH725	+1±0.01%	35μS	100nS	10nS	1μV/μS	±.01%@1 KHz	±15V	**$ 29.00**
SH725WB	+1±0.01%	5μS	100nS	10nS	5μV/μS	±.01%@1 KHz	±15V	**55.00**
SH730	+1±0.001%	1μS	50nS	5nS	.1μV/μS	±.01%@1 KHz	±15V	**89.00**
SH740	+1±0.2%	25nS	1nS	250PS	5μV/μS	±.01%@1 KHz	±15V	**N/A**

NO DROOP PEAK DETECTORS & ADCs

MODEL	INPUT	OUTPUT	CODE	SLEW RATE	LINEARITY	INPUT Z	POWER	PRICE (1-9)
750	0 to +10V	0 to +10V	N/A	0.25V/μS	0.2%	⩾10K	±15, +5V	**$235.00**
850-12	0 to +10V	Digital	Binary	10V/mS	0.1%	⩾10K	±15, +5V	**235.00**
850-3-BCD	0 to +10V	Digital	BCD	25V/mS	0.1%	⩾10K	±15, +5V	**235.00**

MULTIPLIER/DIVIDERS

MODEL	MODES	ACCURACY	LINEARITY	NO. OF QUADRANTS	BANDWIDTH	SIGNAL RANGE	POWER	PRICE (1-9)
107C	Mult/Div	1%	±0.75%	4	400 kHz	±10V	±15V	**$ 39.00**
106A	Divides	0.1%	±0.02%	2	500 Hz	±10V	±15V	**120.00**
108	Multiplies	0.1%	±0.02%	2	500 Hz	±10V	±15V	**120.00**
101	Mult/Div	0.2%	±0.02%	4	500 Hz	±10V	±15V	**175.00**

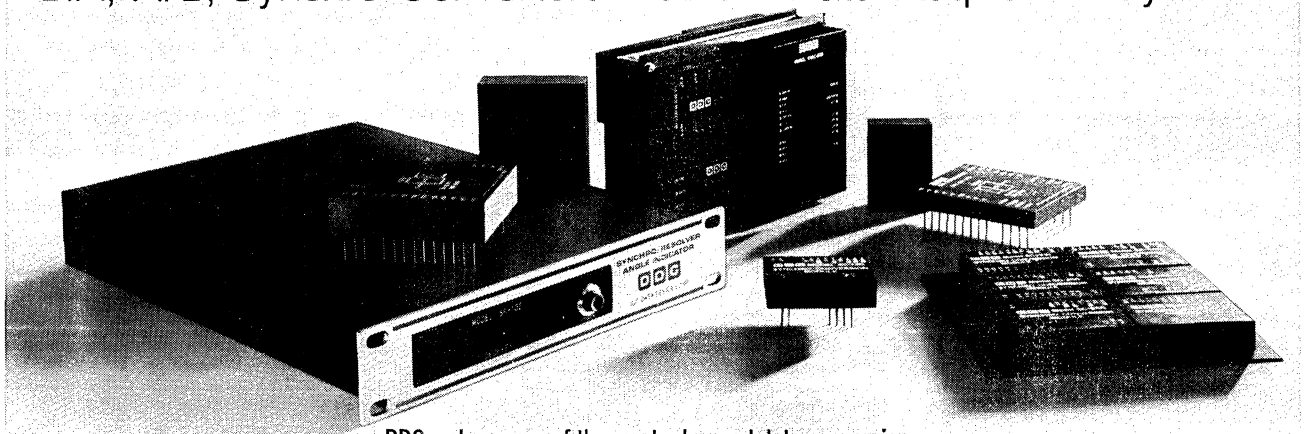
FAST OP AMPS

MODEL	TYPE	SETTLING TIME	BANDWIDTH	SLEW RATE	OPEN LOOP GAIN	DRIFT	INPUT TYPE	PRICE (1-9)
A1160B	Buffer	600nS	30 mHz	100V/μS	10^5	20μV/°C	FET	Consult factory
A1156B	Fast	1.5μS	12 mHz	40V/μS	3×10^5	25μV/°C	FET	
A1161B	Very Fast	400nS	30 mHz	250V/μS	10^5	20μV/°C	FET	

HYBRID SYSTEMS CORP. 87 Second Ave., Burlington, Mass.01803 Tel: (617) 272-1522 TWX: 702-332-7584

DATA DEVICES from DDC

D/A, A/D, Synchro Converters. Custom Data Acquisition Systems.



DDC makes some of the most advanced data conversion devices available today. All are rugged solid-state construction, and meet applicable MIL-specs. There's a DDC converter or system to meet virtually any interface requirement.

SINGLE MODULE & HYBRID CONVERTERS

DIGITAL-TO-ANALOG

- Resolution to 14 bits
- Accuracies to ±0.0031%
- Settling times to 50 nS
- Output currents to 100 mA
- Binary or BCD inputs
- Internal, external DC reference
- MULTIPLYING DAC, and universal reference models
- DISPLAY DAC glitch-free outputs

ANALOG-TO-DIGITAL

- Resolution to 11 binary bits
- Accuracies to ±0.025%
- Rates to 100 nS/bit (also 8-channel MULTIPLEXER and differential input SAMPLE and HOLD modules)

SYNCHRO/RESOLVER-TO-DIGITAL

- 14 bit resolution
- ±4′ ±0.9 LSB accuracy
- Compatible: synchros, resolvers

DIGITAL-TO-SYNCHRO/RESOLVER

- 14 bit resolution
- ±4′ accuracy
- Compatible: synchros, resolvers

SYNCHRO/DC AND DC/SYNCHRO

- 0.1° accuracy, 0.1 min/°C max drift
- Choice of linear range
- Compatible with simulator requirements
- Synchro to SIN/COS D.C.

DDC

ILC DATA DEVICE CORPORATION

100 TEC STREET, HICKSVILLE, N.Y. 11801
(516) 433-5330

MULTI-MODULE & HYBRID CONVERTERS

VIDEO ANALOG-TO-DIGITAL

- Accuracy and resolution to 9 bits
- Word rates to 12 MHz
- 100 pS aperture time
- 10 MΩ input impedance

HIGH SPEED ANALOG-TO-DIGITAL

- 4 bits
- 16 MHz word rate
- 100 pS aperture time
- $10^{11}\Omega$ input impedance (also video signal SAMPLE-and-HOLD and MULTIPLEXER modules)

AVIONIC SERIES S/D AND D/S

- Resolution to 20 bits
- Accuracies to ±1′ single speed converters
- Multi-speed converters to any integral speed ratio

MULTIPLEXED SYNCHRO CONVERTERS

- 13 bit binary or 4-decade BCD resolution
- ±5.3′ binary or ±0.1° BCD accuracy
- 75 μS/channel conversion time
- Simultaneous sampling of all channels

HYBRID SYNCHRO CONVERTERS

- 16 bit tracking S/D
- 13 bit multiplexed S/D
- 16 bit D/S

APPLICATIONS AND SERVICE CENTERS

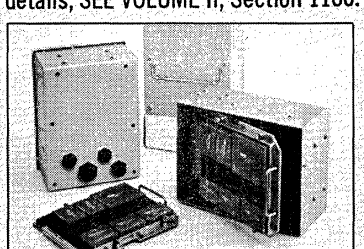
CALIFORNIA: Mr. Bill Wille, 2750 Bellflower Blvd. Long Beach 90815 (213) 597-5744
WASHINGTON: Mr. Al Dolgoff, 900 So. Washington St. Falls Church, Va. 22046 (703) 536-2212
BELGIUM: Mr. Fred Gans, Ave Roger Vandenriessche 51, 1150 Bruxelles, Belgium Tel. 62.01.59

SYNCHRO/RESOLVER ANGLE INDICATORS

- 5 digit LED display and BCD output
- Accurate to ±0.01°
- Wideband: 47-1,000 Hz
- All solid state; no drift
- Half-rack wide, 1¾″ high
- No velocity tracking error to 1000°/sec.
- Accepts synchro or resolver input
- Low cost DPM configuration

OTHER DDC PRODUCTS

Our other products include synchro load drivers, high frequency line drivers, discrete and hybrid wideband fast slewing and fast settling amplifiers, custom hybrid assemblies, ladder networks, comparators, circuit over voltage protectors, sample-and-hold amplifiers, logarithmic and operational amplifiers of all types. For details, SEE VOLUME II, Section 1100.



SYSTEMS Utilizing our modular, high technology products, DDC can supply custom systems and sub-assemblies for such functions as multiplexed data acquisition, digital direction, computer interfacing, simulator interfacing, ruggedized flight-test and flight-line data conversion and instrumentation.

HOW TO USE eem

electronic engineers master

1973-74

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EEM contains four complete directories which provide the most up-to-date information available. These directories are listed and described at the right. They appear in all three volumes, with the exception of the Trade Mark Directory which appears only in Volume 1. Directory references to Volume 4 indicate the 1973 edition, which you received in January. That copy of Volume 4 should be retained to complete the 4-volume set.

Add Volume 4/1973 to your copies of Volumes 1, 2 and 3 to make a complete set of **EEM** for 1973-74.

UNITED TECHNICAL PUBLICATIONS

Included in this volume are:

The Product Index and Directory

The Product Index and Directory (green section, page 9) lists more than 6,000 types of electronic products alphabetically, by product. Under each product heading is a complete, alphabetical listing of manufacturers who make that product. **Bold face** listings indicate which manufacturers have provided catalog data on that product in the white pages.

The Manufacturers and Sales Office Directory

The Manufacturers and Sales Office Directory (starts yellow section of each volume) lists more than 3,000 manufacturers of electronic components, materials, instruments, assemblies, systems, and key services. Provided are complete addresses, phone numbers, sales managers' names, names of application engineers, TWX numbers where applicable, selected distributors. **Bold face** listings indicate that manufacturers have provided catalog data in the white pages and that sales offices are listed.

The Distributor Directory

The Distributor Directory (yellow section, page 1594, with black edge marking) lists more than 1,000 electronic distributors and branch locations, alphabetically by distributor's name, geographically by state and city.

Need catalog information?

For complete catalog information on any product, refer to the Product Index and Directory (green section, page 9, all volumes) which provides a complete listing of all the manufacturers who supply a particular product. Those manufacturers listed in bold face with page and volume number references have provided catalog data on this product in the catalog section (white pages) where you can find the information you need. References to Volume 4 indicate the Volume 4 you received in January and which should be retained to complete your 4-volume set of EEM.

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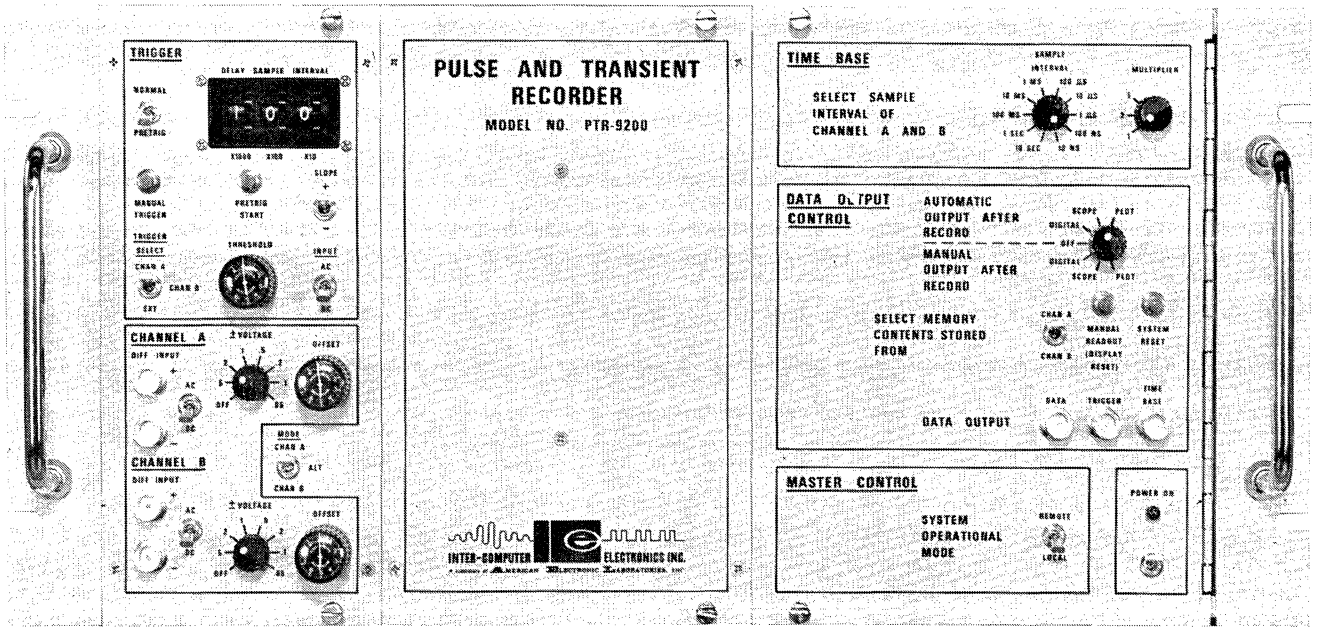
INTER-COMPUTER ELECTRONICS INC. P. O. BOX 507 • LANSDALE, PENNSYLVANIA 19446 • TELEPHONE (215) 855-0922
A Subsidiary of AMERICAN ELECTRONIC LABORATORIES, INC.

PULSE AND TRANSIENT RECORDER Model PTR-9200



Our ICE Pulse and Transient Recorder IS Better.

It's a sophisticated electronic recording instrument designed for easy operation and easier reading. Unlike similar operations which require the use of an oscilloscope with a camera and the added effort of digitizing the photo information for inputting to a computer, our PTR-9200 by-passes these steps for faster, more accurate and more efficient operation.

Our PTR-9200 digitizes the input signal directly via an A/D converter, stores the information in a high speed digital memory and at your convenience, will transfer the stored information into a computer for processing.

All of the operational aspects — sample interval, input voltage, trigger selection and data output can be under remote control.

With the capability to digitize signals at speeds up to 100 MHz with 8 bits of resolution and store over 2800 words, our PTR-9200 proves to be the most accurate and flexible recorder on the market today.

The Inter-Computer Electronics Pulse and Transient Recorder features:

- Sampling frequency range DC to 100 MHz
- High speed memory with 2,816 data points
- Records transient waveforms and repetitive signals
- Dual differential inputs ±50 millivolts to ±5 volts full scale
- Pre-trigger mode stores 110 points of baseline and leading edge of signal
- Over voltage protection up to 50 volts
- 1% DC stability over 0 to 70°C temperature range
- Complete remote control of front panel controls
- Ease of operation better than storage oscilloscope
- Analog output for oscilloscope, plotter and strip chart recorders
- Digital memory output speed from DC to 4 MHz
- Sampling interval from 10 nanoseconds to 50 seconds
- Easily interfaced to TTY, printer, magnetic tapes, or digital processors
- A flexibility that's of use to anyone involved in recording instantaneous non-repeating or repeating signals, including such diversified disciplines as:

Laser Processing	**Chemical Engineering Applications**
Nuclear Applications	**Electronic and Electrical**
Medical Applications	**Accelerated Food Processing**
Process Control	**Pollution Monitoring**
Radar Systems	**X-Ray and Gamma Ray Detection**
Spectral Analysis	**Alpha, Beta Particle Recording**

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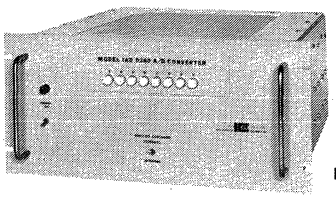
A Subsidiary of AMERICAN ELECTRONIC LABORATORIES, INC.

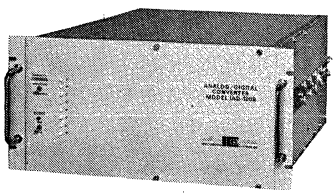
HIGH SPEED ANALOG-TO-DIGITAL SYSTEMS

OUTSTANDING FEATURES

- DATA CONVERSION RATES UP TO 400 MEGABITS
- APERTURE TIME ON THE ORDER OF TENTHS OF NANOSECONDS
- WORD SIZES RANGING FROM 4 TO 12 BITS
- WORD CONVERSION RATES FROM 500 kHz TO 100 MHz
- INPUT BANDWIDTH UP TO 100 MHz



Model IAD-2312



Model IAD-1208

GENERAL DESCRIPTION

Inter-Computer Electronics' Analog-to-Digital Converter Systems bring digital signal processing to areas never before thought possible. They are able to link up real world wide bandwidth signals, and translate them into a digital language for the processing requirements of high speed digital computers.

The ultra-high speeds of Inter-Computer Electronics' converters enable it to process digital signals in radar, television, X-ray analyses in multi-channel wideband communication systems and control systems. They offer the capability to convert and communicate digital signals in the speed range of the fourth generation solid-state technology, keeping in step with the computational power of the computer, providing fast and accurate signal processing.

Inter-Computer Electronics' Analog-to-Digital Converters come in two series:

- **Series A,** which incorporates new ultra-high-speed comparators, dual sample-hold modules, digital-to-analog converters, and wide bandwith amplifiers—all designed specifically by Inter-Computer Electronics.
- **Series B,** which utilizes more conventional integrated circuit components in conjunction with high-speed circuitry — providing a basis for wide bandwith signal processing at reasonable prices.

Because many interface problems can occur at the ultra-high-speeds of its A/D converter, Inter-Computer Electronics configures modular system components of its system all packaged in shielded cases. These modular packages are offered as complete analog-to-digital conversion systems, integrating: sample and hold, analog-to-digital encoder, system power supplies, timing and control systems, and all input/output circuitry. The converters are capable of being driven either from an internal clock at the maximum conversion rate, or synchronously from an external signal source at rates up to the maximum conversion rate.

All Inter-Computer Electronics' A/D converters utilize a modular design to accommodate a wide variety of word sizes, sampling speeds and mechanical formats. This is achieved with full consideration to the circuit layout requirements that are essential to the accurate performance of high-speed digital circuitry.

ELECTRICAL SPECIFICATIONS

ANALOG INPUT VOLTAGE RANGE

0 to +5 volt full scale
Other fixed input ranges both bipolar and unipolar are available as options.

INPUT IMPENDANCE

Series A or B — 50 ohms, 91 ohms, or 100 ohms
Special options are available to permit higher input impendance. These options are dependent on the maximum input frequency.

DIGITAL DATA OUTPUTS

Parallel Output — TTL compatable
Logical "1" — 3.3v typical, 2.4v minimum
Logical "0" — 0.4v maximum, 0.2v typical

CODES AVAILABLE

Both Series A and B conversion systems can be supplied with the following codes: direct binary or BCD; for bipolar signals signed 2's complement and binary magnitude annd sign.

DATA READY PULSE

Series A, Data Ready pulse is a logic one 10 nanoseconds wide. Series B, Data Ready pulse is a logic one 50 nanoseconds wide.

EXTERNAL CONVERT COMMAND

For synchonous drive from an external signal source, Series A requires a pulse 5v ±0.5v with a width of 25 nanoseconds into 91 ohm load. Series B requires 5v ±0.5v with a width of 100 nanoseconds into 500 ohm load.

MECHANICAL

The standard converters are capable of mounting in a standard 19 inch RETMA rack.
Dimensions of the standard packages:
Front Panel Width — 19"
Height—5¼" to 8¾" Depth — 17"

HIGH-SPEED ANALOG-TO-DIGITAL CONVERTERS

Model	Maximum Word Conversion Speed	Resolution	Maximum Aperture Time	% of Full Accuracy (± ½LSB) @ 25°C
SERIES A				
IAD-1104	100 MHz	4 bits	0.5 nsec	±3%
IAD-2105	50 MHz	5 bits	0.5 nsec	±1.6%
IAD-3106	30 MHz	6 bits	1 nsec	±1%
IAD-5107	20 MHz	7 bits	0.07 nsec	±0.04%
IAD-5105	20 MHz	5 bits	0.7 nsec	±1.6%
IAD-7108	15 MHz	8 bits	0.07 nsec	±0.2%
IAD-1208	10 MHz	8 bits	0.2 nsec	±0.2%
SERIES B				
IAD-2209	5 MHz	9 bits	0.5 nsec	±0.1%
IAD-2208	5 MHz	8 bits	0.5 nsec	±0.2%
IAD-5210	2 MHz	10 bits	0.25 nsec	±0.05%
IAD-1310	1 MHz	10 bits	0.3 nsec	±0.05%
IAD-1309	1 MHz	9 bits	1 nsec	±0.1%
IAD-2312	500 kHz	12 bits	1 nsec	±0.025%
IAD-2310	500 kHz	10 bits	1 nsec	±0.05%

INTER-COMPUTER ELECTRONICS INC. P. O. BOX 507 • LANSDALE, PENNSYLVANIA 19446 • TELEPHONE (215) 855-0922
A Subsidiary of AMERICAN ELECTRONIC LABORATORIES, INC.

HIGH-SPEED ANALOG-TO-DIGITAL ENCODER MODULES

OUTSTANDING FEATURES

- A/D Encoding Times — 4 Nanoseconds/Bit
- Resolution — 4 to 12 Bits
- Fastest Encoders Available

The high-speed and ultra high-speed analog-to-digital encoders offer new opportunities for digital signal processing. The modules employ an improved version of the successive approximation, subranging and parallel method of encoding. The modules are available in a format that permits mounting on a printed circuit card or in a shielded case suitable for system use.

Series N modules are a new line of encoder modules using nuclear instrumentation module (NIM) packaging, adding a complete modular capability in configuring the system of your choice.

The design of these converters incorporates all mechanical features for reliable operation at ultra-high speed. Necessary signal terminations, ground planes, and case shieldings are provided for full compatibility with ICE sample and hold modules and D to A converters.

The Series M and N modules are suitable for a wide variety of digital signal processing applications and data acquisition systems. The modular analog-to-digital converters are compatible with the memory cycle times of many new computers and solid-state memories.

HIGH SPEED A/D MODULE SPECIFICATIONS

Model Number	Resolution	Conversion Time	Accuracy
IAD-1310N	10 bits	1.0 μsec.	±0.05% OF FULL SCALE ±½ LSB
IAD-2312N	12 bits	2.0 μsec.	±0.025% OF FULL SCALE ±½ LSB
IAD-2204M	4 bits	0.2 μsec.	±3% OF FULL SCALE ±½ LSB
IAD-5206M	6 bits	0.5 μsec.	±0.8% OF FULL SCALE ±½ LSB
IAD-1308M	8 bits	1.0 μsec.	±0.2% OF FULL SCALE ±½ LSB
IAD-1410M	10 bits	10 μsec.	±0.05% OF FULL SCALE ±½ LSB

ULTRA HIGH SPEED A/D MODULE SPECIFICATIONS

IAD-2105N	5 bits	0.02 μsec.	±1.6% OF FULL SCALE ±½ LSB
IAD-2104N	4 bits	0.02 μsec.	±3% OF FULL SCALE ±½ LSB
IAD-5104N	4 bits	0.05 μsec.	±3% OF FULL SCALE ±½ LSB
IAD-1206N	6 bits	0.10 μsec.	±0.8% OF FULL SCALE ±½ LSB

SAMPLE AND HOLD MODULES

Inter-Computer Electronics, Inc. sample and hold modules contain an ultra fast analog switch, holding capacitors, and input and output buffer amplifiers. This is a true sample and hold, and is used with Inter-Computer Electronics, Inc. high-speed analog-to-digital encoders and converters.

All sample and hold modules are available with long droop capability where a trade-off between long-term hold and repetition rate can be made.

Upon external command, the analog switch is closed and the charging capacitors charged to final value. After this acquisition interval, the charging capacitor is disconnected from the input and holds the value until the next sample pulse.

The sample and hold amplifier has a wide range of applications with analog-to-digital converters, data acquisition systems and transient analysis.

The unit is packaged in a shielded case. Appropriate signal terminations, ground planes and layout insure accurate operation in the most severe signal environments.

SPECIFICATIONS

	ISH-5105	ISH-2208	ISH-1409
ACQUISITION TIME*	20 nanoseconds	40 nanoseconds	80 nanoseconds
APERTURE TIME**	200 picoseconds	500 picoseconds	3 nanoseconds
ACCURACY	±1% of FS	±0.4 of FS	±0.1% of FS
INPUT RANGE	0 to +5 volts (bipolar option)	0 to +5 volts (bipolar option)	0 to +5 volts (bipolar option)
DROOP	10μV/μs	10μV/μs	10μV/μs
MAXIMUM REPETITION RATE	20 MHz	5 MHz	1 MHz
LINEARITY	1%	0.2%	0.1%
OUTPUT VOLTAGE	5V	5V	5V
INPUT IMPEDANCE Zi	50Ω	50Ω	50Ω
OPERATING TEMPERATURE	Range 0-50°C	Range 0-50°C	Range 0-50°C

* Time after convert command for the output to reach X% of final value.
** Total rms time error from initiation of convert command.

ULTRA-HIGH SPEED ANALOG MULTIPLEXER

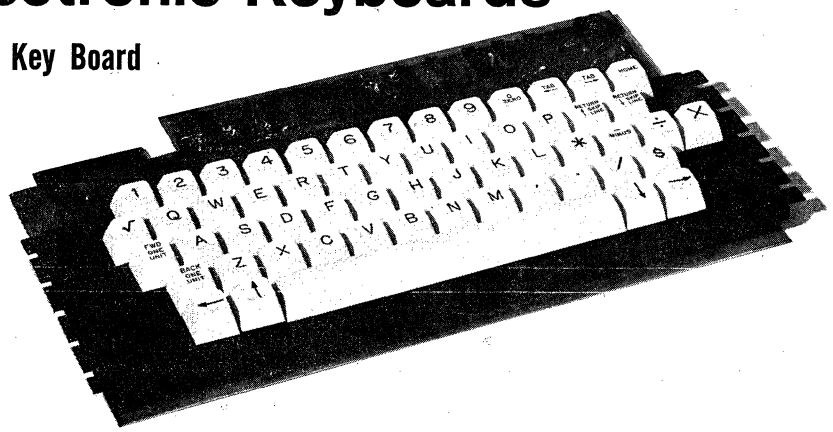
- 50 ns Switching Time
- Expandable
- ±5 Volt Analog Input
- TTL Compatible Input Logic Levels
- Fully Decoded
- Analog Output with Buffer/Driver
- Low Leakage Current
- High On/Off Resistance Ratio
- All Channel Blanking

The Inter-Computer Electronics Model IAM-3216 Ultra-High Speed 16-Channel Analog Multiplexer is designed specifically for applications demanding extremely fast switching times, high transfer accuracy and good driving capabilities.

The entire multiplexer, including logic decoding, precision analog switches and output buffer/driver, is contained either in a modular package as depicted, or as an integral part of any system built and delivered by Inter-Computer Electronics. The multiplexer is factory expandable to meet any requirement, no matter how demanding.

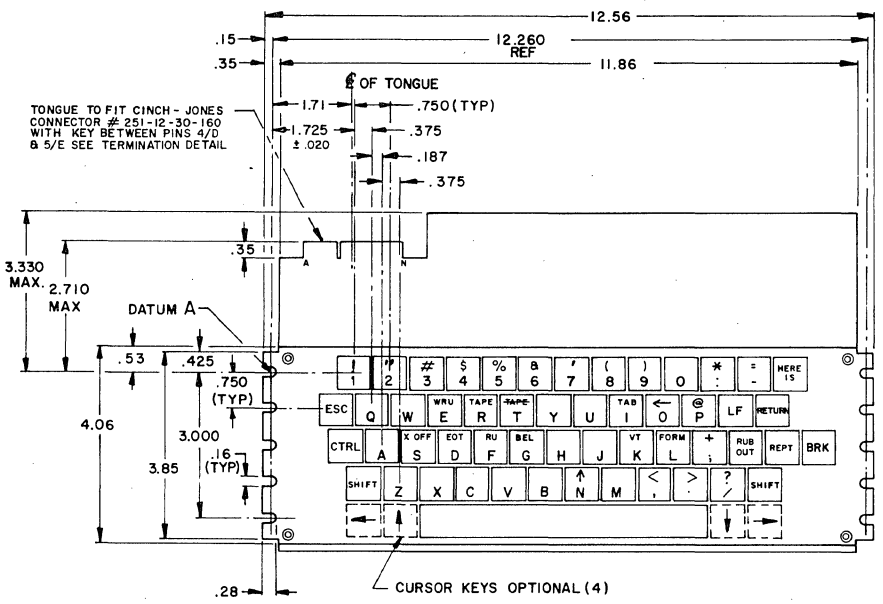
LICON Solid State Electronic Keyboards

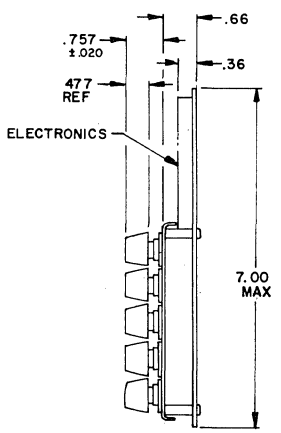
NEW FROM LICON ASR-33 Solid State Key Board



Featuring:

- Licon "Super Switch" Ferrite Core Keystations
- Field Selectable N-Key Rollover or 2 Key Rollover
- Working Life In Excess of 100,000,000 Operations/Keystation
- Rigid Chassis Mounting
- Simple Construction
- Low Profile
- Operator "Spill Proof" Design
- MOS Encoding and Interlock Generation





ASR 33 Available With 53 Keys Standard; 57 Optional

SPECIFICATIONS

ITEM	DESCRIPTION
ENCODING	USASCII
OPERATING MODES	4
INPUT POWER	+5VDC ±5% @ 500 MA MAX. −12VDC ±10% @ 50 MA MAX.
ENCODED KEY OUTPUT LOGIC	Parallel — 8 Bits, Positive Logic, Latched and Strobed
LOGIC LEVELS	Logic "O": +2.5VDC MAX. @ −1.5 MA DRIVE Logic "O": +0.4VDC MAX. @ 16 MA SINK
PARITY	ODD
SINGLE LINES (UNENCODED)	3 Standard, 7 Optional (UNSTROBED)
SINGLE LINE CHARACTERISTICS	Logic "1" in OFF STATE; Logic "O" in "ON" (ACTUATED) STATE: BOUNCELESS
INTERLOCK	2 KEY ROLLOVER OR N-KEY ROLLOVER, FIELD SELECTABLE
STROBE CHARACTERISTICS	N-KEY ROLLOVER: POS. PULSE OF 5μSEC NOM. WIDTH 2-KEY ROLLOVER: NEG. D.C. LEVEL CHANGE
TERMINATION	12 Position, 24 Pin, .156 Centers (.062 P.C. BOARD)

IF YOUR REQUIREMENTS ARE FOR "CUSTOM KEYBOARD" CONSTRUCTION, LICON'S KEYBOARD EXPERTS ARE AT YOUR SERVICE

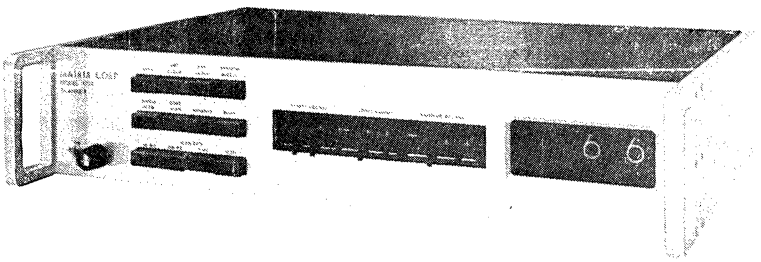
LICON/DIVISION ILLINOIS TOOL WORKS, INC. 6615 WEST IRVING PARK ROAD / CHICAGO, ILLINOIS 60634 / (312) 282-4040 / TWX 910-221-0275

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

Low Level Scanners and Switches by Matrix Corporation

MODEL 1701

- Random access. Channels controlled by a BCD input to allow programming by external source such as computer.
- Sequential scanning with end point selection by front panel digital switches.



GENERAL: The BCD input is compatible with standard TTL logic. The unit contains BCD output for use on auxiliary equipment. Switches are available in multiples of 10 up to 100 channels in a 3½" cabinet.

CAPACITY: 10 to 100 channels are available in the 3½" master. Slave units with 10 to 200 channels in 3½" cabinets allow expansion to 1000 channels.

SCAN RATE: The scan rate may be as fast as 5 msecs.

INPUT: 1. Level — Standard BCD TTL logic. True equals +5 volts and false equals 0 to +0.5 volts. Unused inputs must have a false level or be terminated in 500 ohms max. 2. BCD enable — A false signal must be applied to enable the input data.

CHANNEL READOUT: Neon numerical indicator lights are provided for a visual indication of the channel selected.

CONTACT RATINGS: 500 volts maximum between conductor and chassis, 350 volts maximum between conductors. Current should not exceed 100 ma for maximum life.

OPTIONS:

A. Manual Digital Switch — The switch can manually select any desired channel from the front panel.

B. Sequential Scan — 1. Advance: Application of a true level will cause the scanner to advance one channel.

2. Reset: Application of a true level will hold the scanner in reset (000) position until true level is removed. Short or open circuit is "false." Positive 5V is true. Input impedance is 10K ohms. 3. Stop or Ctr. Disable: Application of a true level will disenable the advance input or stop any external clock inputs. A false level is required to allow sequential scanning.

C. Sequential Scan with End Point Selection — Two digital switches are provided on the front panel to manually select the start and the stop channel for sequential scanning.

D. Int. Clock — 1. Rate: Continuously variable from .01 to 10 seconds per channel. 2. Single/Recycle: A front panel switch allows a single scan of all switches or continuous scanning of all switches. 3. Internal/External: Front panel switch selects the internal clock or an external clock input. 4. Start Input: Application of true level at the start input will initiate a scan of all switches only when the scanner is in the 000 condition.

DIMENSIONS: 3½" high x 17" wide x 10" deep.

LITERATURE: Write for Bulletin RS-71.

MODEL 1705

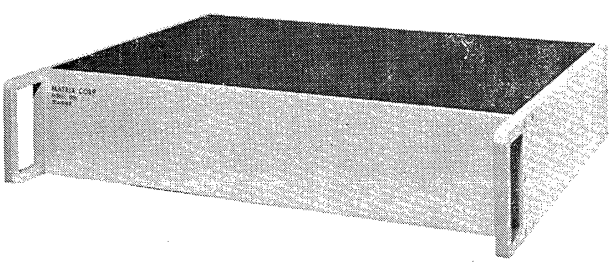
Programmable Switching Matrix

- Reed Relay Switching
- 100 Cross Points per Standard Cabinet
- Input and output connections completely programmable by BCD code
- Programming by 4 bit serial or parallel
- Strobe and latch available for both serial and parallel entry
- 1, 2 or 3 level (poles) per cross point
- TTL levels
- Multiple units can be used for added capacity.

APPLICATION: Any system requiring multiple input/output capability for control, loading, exercising and sensing, such as: Computer programmed test systems, simulators, integrated circuit test systems.

INPUT VOLTAGE & CURRENT RANGES: 500 volts maximum between conductor and chassis. 350 volts maximum between conductors, switching current 100 ma., carry 1.5 amps. Switching speed: 2 msecs. pull in/.75 msecs. drop out.

DIMENSIONS: 3½" high x 17" wide x 10" deep.



Switching Options and Input/Output Capacity

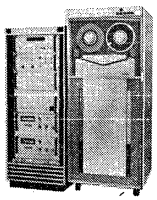
One "x" to one "y"		One "x" to any or all "y"s		Any or all "x"s to any or all "y"s	
x	y	x	y	x	y
1	100	100	1	100	1
10	90	50	2	50	2
20	80	30	3	30	3
30	70	20	4	20	4
40	60	20	5	20	5
50	50	10	6	10	6
		10	7	10	7
		10	8	10	8
		10	9	10	9
		10	10	10	10
One BCD input command for "x"; one BCD input command for "y".		One BCD input command for "x"; up to 10 BCD input commands for "y".		Up to 100 BCD commands for "x"; up to 10 BCD commands for "y".	

Matrix Corporation 520 NORTH 11th AVENUE • BEECH GROVE, INDIANA 46107
TELEPHONE: Area Code (317) 786-4601
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

METRIC Systems Corporation

DATA ACQUISITION SYSTEMS

HIGH SPEED DATA ACQUISITION



Model 8339

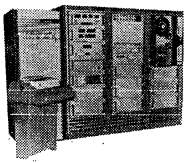
This system digitizes two channels of radar video at a 10 MHz rate. Time data is derived from IRIG Time Format "A." Digitize initialization signals are derived from a PCM bit stream.

The digitized video, time word, and auxiliary data bits are multiplexed and formatted for recording on magnetic tape. Tape format is 9-track IBM compatible. Internal self-test and calibration capability are included.

Model 8324

The Model 8324 Digital Recorder and Servo Loop Driver System accepts and multiplexes 21 analog data inputs gathered by a radar. The multiplexed data is converted to digital, rate buffered, formatted and stored in IBM compatible format on magnetic tape. The input data is also displayed on an oscilloscope built into the system. Selected input data channels are processed in accordance with predesignated algorithms to provide servo control voltages to the radar for system control in real time.

DATA ACQUISITION PERIPHERAL

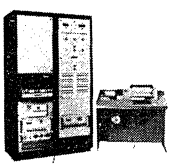


Model 8226

Model 8226 is a computer controlled data acquisition system. The computer performs data analysis, converts to engineering units, and prints out operator instructions. Data is analyzed in real time and recorded for future analysis. The system processes 40 analog channels to .01% accuracy.

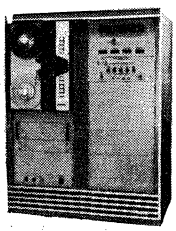
REAL TIME DATA SYSTEM

Model 8403A



The Model 8403A Real Time Data System is a computer controlled system designed to accept serially transmitted data from a remote point and process this data for displaying cartesian data on X-Y plotboards and decimal data on remote displays.

MAGNETIC TAPE DIGITAL RECORDING SYSTEM

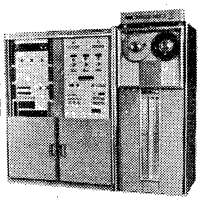


Model 8266

Model 8266 is basically a digital data formatter and recorder. The unit receives digital data words from several external devices at various data rates. The digital data is stored in a magnetic core memory and recorded on magnetic tape in IBM computer compatible format. The system contains a precision Time-of-Day clock for time tagging recorded data.

DATA ACQUISITION SYSTEM

Model 8176

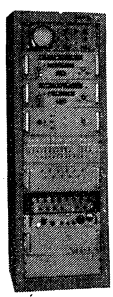


System Components Include:
- Irig Time Code Generator
- Tape Search System
- Sample and Hold Amplifiers
- Analog Multiplexer
- Analog/Digital Converter
- Magnetic Core Memory
- Magnetic Tape Recorder

System Capabilities Include:
- Accept analog input signals
- Accept digital input words
- High speed A/D conversion
- Prepare tape in IBM format
- Time tag all input data
- Patch panel selects operating modes

TIMING EQUIPMENT

CENTRAL TIMING SYSTEM



Model 8332

The Central Timing System (CTS) is an integrated timing system which generates, synchronizes, monitors, and distributes timing signals meeting typical range instrumentation requirements.

Remote locations utilize the Model 8332-6 Translator/Generator for synchronization to the central generator.

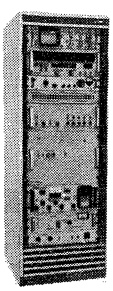
The CTS generates and distributes all IRIG time code formats. Dual generators are included for redundant operation. WWV synchronization is provided.

TIME CODE GENERATOR

Model 8332-1

The Model 8332-1 Time Code Generator provides IRIG carrier and DC level outputs. Oscillator stability is 1 part in 10^9 per day. Automatic synchronization to WWV by utilizing WWV receiver. Variable slew rates allow manual synchronization. Propagation delay adjustable for front panel switches.

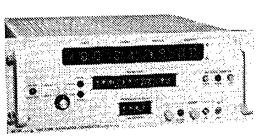
CENTRAL TIMING SYSTEM



Model 8259

Model 8259 Central Timing System contains a Model 8259-1 Time Code Generator, an oscilloscope, a WWV receiver, a VLF receiver, and a precision frequency standard. The Model 8259 Central Timing System provides an IRIG "B" output with built-in provisions for synchronization to WWV. Stability of the internal frequency standard is 5 x 10-9 per day. A VLF receiver is included for calibrating the frequency standard.

TIME CODE TRANSLATOR/GENERATOR

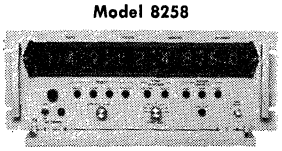


Model 8332-6

The Time Code Translator/Generator is a self-contained unit capable of accepting either IRIG "B" or "E" code formats and outputting phase coherent IRIG "B" and "E" time codes. When the input carrier is lost, the unit will automatically switch to the generator mode. Several pulse rates are also provided as outputs. Oscillator stability is 1 part in 10^9 parts per day.

TIME CODE GENERATOR

Model 8258



Model 8258 Time Code Generator provides four separate, isolated serial IRIG "B" outputs having individually adjustable levels. Parallel BCD outputs representing days, hours, minutes, seconds, and milliseconds, are also provided. The unit features a panel mounted days, hours, minutes, and seconds display plus digital advance/retard for fine synchronization.

TIME CODE GENERATOR

Model 8259-1

Model 8259-1 Time Code Generator provides both serial and parallel IRIG "B" outputs. The unit features a decimal display of days, hours, minutes, and seconds, semi-automatic WWV tick synchronization, propagation delay correction, 1 x 10-8 per day oscillator stability, and an optional two hour battery for continuous operation during power failures.

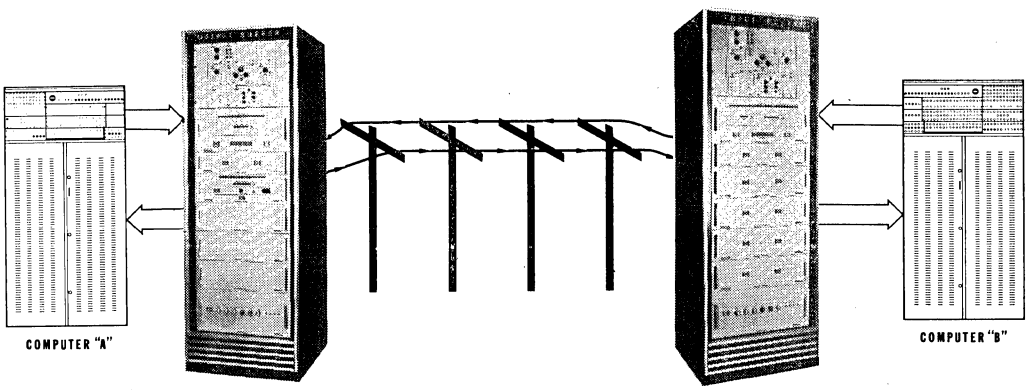
Metric Systems Corporation produces an assortment of digital equipment ranging in scope from simple logic modules to complex digital instrumentation systems. Digital Systems designed and fabricated by Metric Systems are now in operation on both the Atlantic and Pacific Missile Ranges and most other Aerospace Instrumentation installations. Metric Systems invites your inquiries for solutions to problems involving special applications.

METRIC Systems Corporation
736 N. BEAL STREET
FORT WALTON BEACH, FLORIDA
Tel: (904) 242-2111

METRIC Systems Corporation

DIGITAL DATA COMMUNICATIONS EQUIPMENT

The Model 8114 Data Transmitter (Output Buffer) and the Model 8114 Data Receiver (Input Buffer) form a complete two-way data transmission link between two digital computers. Data is transmitted at a rate of 2400 bits/second on Class 4B telephone lines. A single Model 8114 Transmitter/Receiver provides 4 separate channels each having a capability of transmitting 2400 bits per second. Two separate error detecting codes are employed to verify the quality of the data transfer.

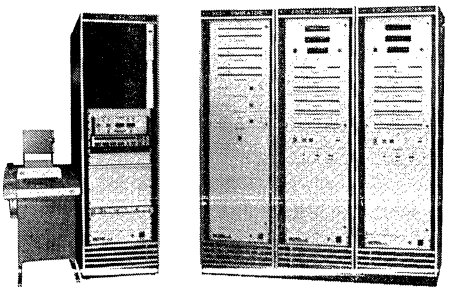


REAL TIME DATA SYSTEM

The Model 8264 Real Time Data System (EDDI III) is designed to interface with two asynchronous ECCM radars. Target data is digitized in various counters and registers and then loaded into six 160-bit shift registers. The data is then shifted out to the data transmitter and microwave link at a 1.28 MBPS rate. The data modulation scheme is split-phase change. Data is also shifted to the recorder where the tape format is determined by the program of a general purpose computer.

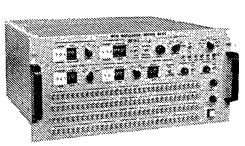
Data is received at the central computer site and loaded into a CDC-6600 computer. The central computer calculates the coordinates desired for simulated targets and provides this data to the Target Data Transmitter which transmits it back to the radar site.

The Simulator takes these coordinates and modulates a microwave source in a manner such that the radar receives target echoes at the proper position. Antenna pattern, scintillation, noise, and range loss are considered.



SIMULATION EQUIPMENT

MODEL 8435 PCM SIMULATOR

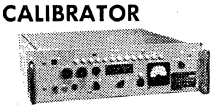


The Model 8435 PCM Simulator generates all IRIG approved formats under front panel control. This unit has frame lengths up to 999 words, subframe lengths up to 999 frames (words), and word lengths of 2 to 32 bits. Bit rates from 1 bps to 1,000,000 bps.

Output codes include NRZ-L, NRZ-M, NRZ-S, RZ, BI-ϕ-L, BI-ϕ-M, and BI-ϕ-S.

Provisions are included for external clock and external noise and jitter signals.

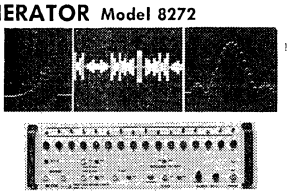
RADAR MOVING TARGET SIMULATOR/ CALIBRATOR



Model 8220

Series 8220 Radar Target Simulator has been designed for use either as a moving target video simulator or as a precise fixed range calibrator. The simulator is completely digital in operation, controlled by an internal precision VHF frequency standard. Range is preset by decimal thumbwheel switches. The instantaneous range value is available as a parallel binary output word and as an optional numerical display. Overall accuracy is ±3 feet in the internal PRF operating mode. The unit provides precise delay settings corresponding to radar ranges of 100 to 1,000,000 feet. Velocity may be varied from 0 to ±10,000 feet/second. The unit is designed to meet military specifications and has been designated SG903/APM-336V for government procurement purposes.

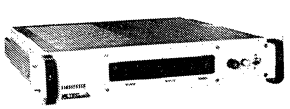
PROGRAMMABLE WAVEFORM GENERATOR Model 8272



Model 8272 Programmable Waveform Generator output consists of sixteen individually controlled voltage segments which may be individually adjusted to produce any desired pattern. Stepping rate for the segments may be varied from 10 steps per second to one million steps per second or controlled by a pushbutton. The pattern may be reflected to produce a symmetrical 32-segment waveform.

BINARY/DECIMAL & DECIMAL/BINARY CONVERTERS

BINAVERTER



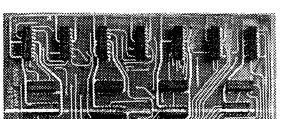
- **Read data in engineering units**
- **Conversion time less than 1 microsecond**
- **Card block model available for OEM Equipment**

The BINAVERTER is a high speed converter designed to accept binary input data in word lengths from 13 to 21 bits, and convert this input data into its decimal equivalent expressed in engineering units (miles, degrees, minutes, seconds, yards, etc.). Mathematical scaling is performed as an integral part of the conversion algorithm.

Conversion time is less than 1 microsecond. Converted output is displayed on front panel. Card block version available where display is not practical or required.

DECIMAL-TO-BINARY CONVERTER CARD

Model Z-253



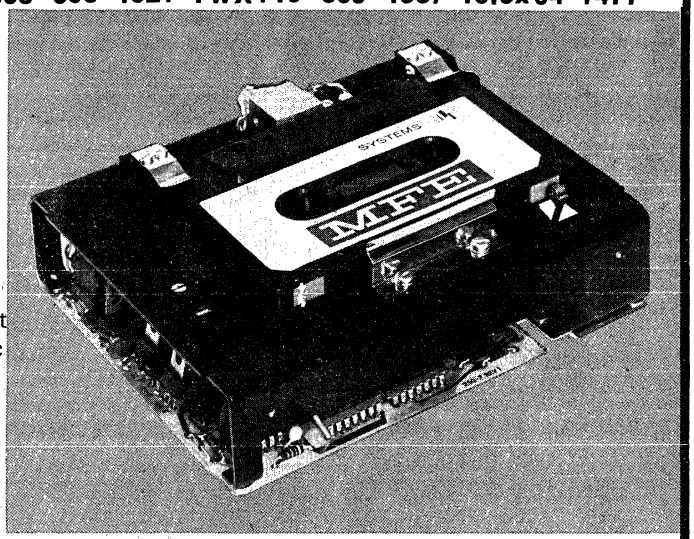
Model Z253 accepts three binary coded decimal digits on 12 lines and delivers a straight binary word on ten output lines. Decimal-to-Binary conversion is accomplished by a parallel logic matrix providing continuous output information. No external gating or control circuitry is required. The card operates from a single 5 volt power source and uses standard 0 and 5 volt integrated circuit logic levels.

METRIC Systems Corporation
736 N. BEAL STREET
FORT WALTON BEACH, FLORIDA
Tel: (904) 242-2111

MFE
COMPUTER ACCESS SYSTEMS

DIGITAL CASSETTE TAPE TRANSPORTS

Keewaydin Drive, Salem, New Hampshire 03079
Tel. 603-893-1921 TWX 710-366-1887 Telex 94-7477



MODEL 250

$325.00 EA. IN 100 PIECE QUANTITIES

FEATURES

• two moving parts • 15,000 hour MTBF • uniquely simple • low power • constant tape speed • constant tape tension • easily interfaced to TTL or DTL logic • guaranteed cassette interchangeability • error rate less than 1×10^{-7} • read-after-write head

SPECIFICATIONS

CASSETTE
Any cassette which conforms to the ANSI, ECMA, or ISO standard — leaderless and with a 1600 FCI clock track on track #2.

MODES OF OPERATION
Continuous
Incremental (30 increments per second maximum)

RECORDING DENSITY
50 to 800 Bits Per Inch

DATA TRANSFER RATE
Up to 9600 Bits Per Second

RECORDING METHOD
Single track, bit serial, phase encoded

TAPE SPEED
Electronically adjustable by user to any speed (infinite resolution) from 10 inches per second to 40 inches per second (25.4 centimeters per second to 101.6 centimeters per second). (Lower speed options available.)

SPEED CONTROL
Long term speed variation (end to end) <±1%
Short term speed variation (bit to bit "jitter") <±3%

INTER-RECORD GAP
0.7 inches minimum at 10 inches per second (ANSI Standard)
(1.78 centimeters minimum at 25.4 centimeters per second)

CASSETTE STORAGE CAPACITY
2.88×10^6 bits per cassette maximum

POWER REQUIREMENTS

	Voltage	Running Current	Peak Current	Regulation
Logic	+5V	200 MA	250 MA	±5%
Amplifiers	-5V	130 MA*	150 MA*	±5%
Servo	+5V	450 MA	1 AMP	±5%

*250 MA for units equipped with optical EOT/BOT

START/STOP PERFORMANCE

Speed: Inches per second (Centimeters per second)	10 (25.4)	20 (50.8)
Start (milliseconds)	50	100
Stop (milliseconds)	30	60

(Start time defined as the time from no tape motion to within the short term speed specification.)
(Stop time defined as the time from full speed until tape motion stops.)

INTERFACE
DTL or TTL interface

INTERFACE LINES TO MODEL 250
Forward Go Reverse Go Speed Control One Shot Reset Data Input Lines (2) Power Lines (2)

INTERFACE LINES FROM MODEL 250
Data Output Lines (3) Speed Control Clock Track Cassette Loaded Write Permit End of Tape/Beginning of Tape Busy

DIMENSIONS
With cover — Length 5.92" x Width 4.85" x Height 3.12" (15.04cm x 12.32cm x 7.92cm) Without cover — Length 5.46" x Width 4.39" x Height 1.60" (13.87cm x 11.15cm x 4.05cm)

WEIGHT
With cover — 2 lb. (907 g.) Without cover — 1 lb. 7 oz. (652 g.)

ENVIRONMENT
Operating: +50° to 120° Farenheit (10° to 49° Centigrade) with 10% to 90% Relative Humidity (no condensation)

Storage: -30° to 160° Farenheit (-34° to 71° Centigrade) with protection from dust and moisture

MOUNTING
Vertical or Horizontal

MODEL 260

$425.00 EA. IN 100 PIECE QUANTITIES

FEATURES

• allows use of both tape tracks • two moving parts • small size • 3000 hour MTBF • low power • high performance • guaranteed cassette interchangeability from transport to transport

SPECIFICATIONS

CASSETTE
Any cassette which meets the ANSI, ECMA, or ISO standard.

MODES OF OPERATION
Continuous or incremental. (Maximum Incremental Rate, 10 increments per second). Record Forward, Read Forward, Record Reverse, Read Reverse, Fast Forward, Fast Reverse.

RECORDING DENSITY
Any bit density from 50 to 800 bits per inch (BPI)

DATA TRANSFER RATE
Up to 9600 Bits per Second

RECORDING METHOD
Single track, bit serial phase encoded

TAPE SPEED
Slow speed set to customer requirements between 10 to 20 inches per second (set at factory). Fast speed, rewind or search 40 inches per second.

SPEED CONTROL
Short Term bit-to-bit "jitter" < ±5%. Long Term speed variation between transports < ±1%

START/STOP TIME
Start—60 milliseconds maximum at 10 inches per second.
Stop—30 milliseconds at 10 inches per second.

POWER REQUIREMENTS
+12V @ 1 amp maximum, -12V @ 300 mA maximum, +5V @ 100 mA maximum

CONTROLS
True 0 to +.5 VDC, false +3 to +5 VDC, DTL or TTL interface

CONTROL FUNCTIONS
1) Forward, 2) Reverse, 3) Fast/Slow, 4) Read/Write

STATUS INDICATIONS
1) End of tape, 2) Beginning of tape, 3) Cassette loaded—ready, 4) Busy—tape is in motion, 5) Write enable, 6) Warning of low tape supply, 7) Leader sensor

DATA INPUT LINE
Write data

DATA OUTPUT LINES
Data (+) indicates a flux charge on tape which was written toward the erase level. Data (-) indicates a flux change on tape which was written away from the erase level.

PHYSICAL
1) Size: 4-3/8" long X 5-1/2" wide X 3-3/4" high (without cover); 2) Weight: Two pounds (without cover)

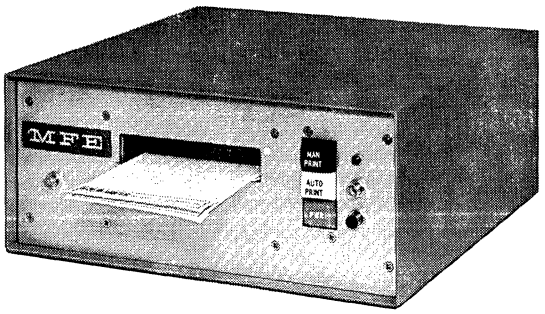
OPTIONS
Dual gap read after write head, Biphase encoder/decoder, Special cover or paint finish,

ENVIRONMENTAL
+50° F to +120° F operating; -30° F to 160

MFE
Keewaydin Drive, Salem, New Hampshire 03079
Tel. 603-893-1921 TWX 710-366-1887 Telex 94-7477

DIGITAL TICKET PRINTER

MODEL DPC11A



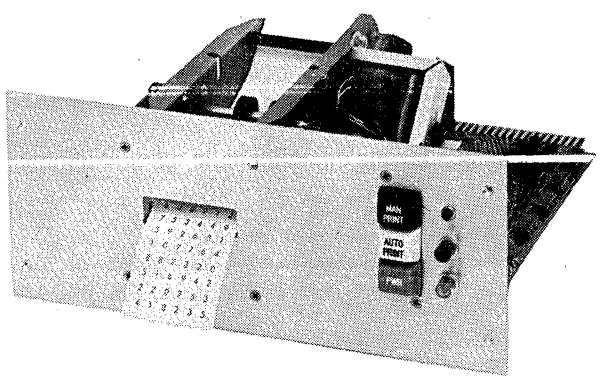
- Printout on Multiple Copy Ticket of TAB Card Size
- Indexing of 20 consecutive lines
- Parallel Entry BCD Input
- Floating Decimal Option in up to 11 Columns
- Column Suppression

MODEL DPC11MA	
Printing mechanism base price	$ 208.00
Add for each active column	$ 12.00
MODEL DPC11EA	
Printing mechanism with interface electronics	$ 360.00
Add for each active column	$ 25.00

• OEM • RACK ◦ PORTABLE

DIGITAL TAPE PRINTER

MODELS DPA12A and DPA6A



- Parallel ENTRY BCD INPUT
- 6 or 12 COLUMN MODELS
- FLOATING DECIMAL POINT
- COLUMN SUPPRESSION

MODELS DPA12MA and DPA6MA	
Printing mechanism base price	$ 104.00
Add for each active column	$ 8.00
MODELS DPA12EA and DPA6EA	
Printing mechanism with interface electronics	
Model DPA6EA base price	$ 220.00
Model DPA12EA base price	$ 240.00
Add for each active column	$ 25.00

• OEM • RACK ◦ PORTABLE

SPECIFICATIONS

Numerical Data Input: 1 - 2 - 4 - 8 BCD Parallel entry.

Logic Levels: Positive true logic standard. "1" state $>$ 2.4 and $<$ 5.5 volts, source Z less than 40 K Ω. "0" state $<$ 0.8 volts, source Z less than 200Ω.

Print Command: Change from logic "0" state to logic "1" state (STD.). 10 microsecond minimum duration capacity coupled. 100 nanoseconds minimum direct, coupled.

Print Rate: 400 milliseconds per line at maximum rate.

Temperature Range and Duty Cycle: Continuous duty 100% at 0°C to + 50°C for one line per second print rate. Intermittent duty 25% 150 consecutive lines maximum at +20°C for 2.5 lines per second maximum print rate.

Data Hold Signal: Changes from "1" state to "0" state (STD.) upon receipt of print command. Automatic return to "1" state upon completion of print cycle. Printer output Z less than 1000Ω for logic 1, less than 200Ω for logic 0 with 5 ma. maximum current.

Column Suppression: Positive true model—all inputs high; negative true model—ground all four inputs.

Overprinting: 12 lines of overprinting on Model DPA12EA and Model DPC11EA, and eight lines on Model DPA6EA. Change from logic "1" state to logic "0" state (STD.) Available for wheel positions 11 and 12 only.

Characters: .110 high by .100 wide, .010 face.

Extra Paper Advance (Models DPA6A and DPA12A): Advances paper tape one line per print command while 0 volts or switch closure applied to print inhibit terminal at rear of printer (useful to space groups of data).

Extra Ticket Advance (Model DPC11A): Advances ticket one line per print command while 0 volts or switch closure applied to print inhibit terminal at rear of printer (useful to space groups of data).

Fast Paper Advance: Grounding of appropriate rear terminal causes paper to advance at 30 lines per second rate. Front panel push-button switch supplied with Option F.

Fast Ticket Advance (Model DPC11A): Grounding of appropriate rear terminal causes ticket to advance at 30 lines per second rate. Front panel push-button switch supplied with Option F.

Columns and Line Spacing: DPA6A 1 to 6 columns, DPA12A 1 to 12 columns, DPC11A 1 to 11 columns. .275 inches between column centers, five lines per inch.

Paper Tape (Model DPA6A and DPA12A): DPA6A 1-22/32" wide, DPA 12A 8-3/8" wide. Pressure-sensitive paper 150 foot length with approximately 9,000 prints per roll.

Ticket (Model DPC11A): 3-1/4" x 7-7/8:: TAB size; TAB card plus 2 copies; 5 lines per inch.

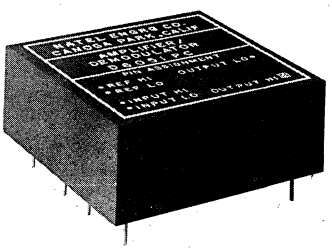
Weight: DPA6A 3.75 lbs, DPA12A and DPC11A 4.50 lbs. (half rack mount with Option F), instrument case 5 lbs.

Power: 117 volts ±10%, 60 Hz or 230 Volts ±10%, 50 Hz optional. 10 watts quiescent, 70 watts during print cycle with 10 active columns.

Natel Engineering Company

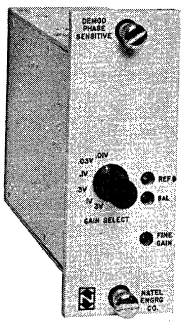
Electronics For Engineering Measurements

Transducer indicators
Signal conditioning systems
Synchro converters
Signal conditioning modules



Phase Sensitive Demodulators Models D510, D610

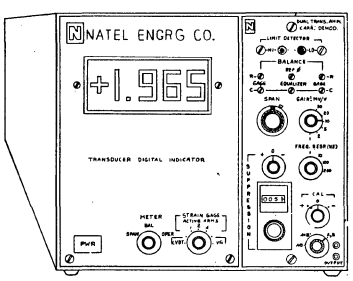
Miniature, low cost D510 & D610 carrier demodulators convert phase sensitive suppressed carrier a.c. signals to a linearly proportional bipolar d.c. output. Combining proprietary demodulator designs with integrated circuit active filter techniques provides superior accuracy, performance and reliability under military environments. This module is currently offering solutions in these areas: Antenna Position Converters, Carrier Systems, Hydraulic Valve Drivers, Phase Measurements.

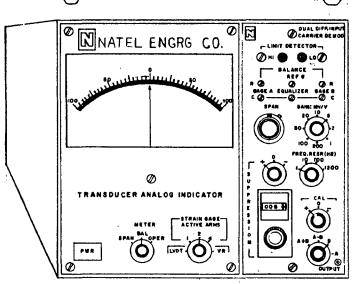


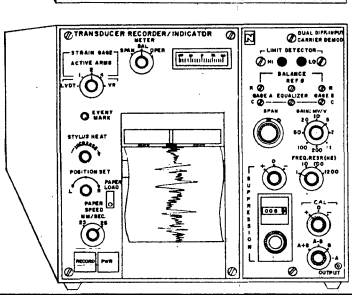
Phase Sensitive Amplifier-Demodulators Models D6116, D7116, D8116

Provides precision conversion of low-level AC transducer signals to high level linearly proportional DC outputs compatible with magnetic tape recorders, computers, controllers, galvonometers, and VCO's. When the basic transducer is either a synchro, gyro, LVDT, or strain gage, the transduction principle can be accommodated by the demodulation process of this carrier demodulator which eliminates undesireable noise.

Transducer Indicators Servo Controllers

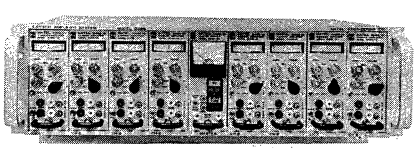






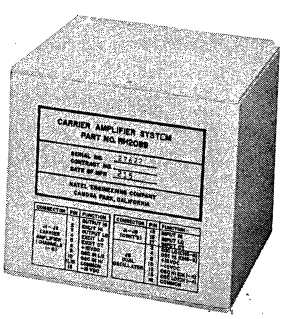
Carrier Amplifier System "N" Model 2088

A carrier amplifier system designed for use with cable-connected transducers remotely located as far as two miles from the conditioning system. "UNIVECTOR" 360° phase shift adjustment offsets any possible phase shift error due to line length, and AC type conditioning provides improved signal and noise characteristics.
The Model 2088 features 120 dB or greater common mode rejection, 0.1% accuracy and 0.1 MV noise referred to the input.

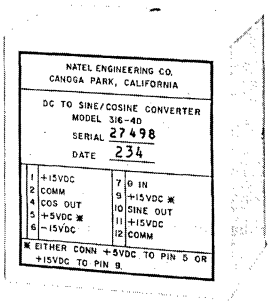


Radiation Hardened Carrier Amplifier System Model 2089

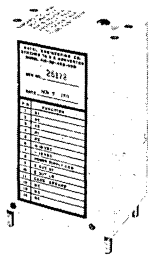
2089 RH is a carrier amplifier system specifically designed to operate in radiation and shock environments encountered in underground nuclear testing. Designed to operate with strain gages and/or variable reluctance transducers, the system is comprised of eight plug-in carrier demodulators and one master oscillator. Because of the high shock level encountered, 300 g's for 20 msec, all adjustments are accomplished with pre-selected fixed component values rather than potentiometers.



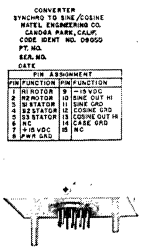
Natel Engineering Company,



4 Quadrant
DC to SIN/COS Converter
Model 316
Model 316 converts ±10 VDC to both Sine and Cosine outputs through ±180° with ±15 minute accuracy. Application besides trigonometric conversion, is augmented when combined with Natel's Model 2066 Solid State Synchro Transmitter. In tandem, Model 316 and Model 2066 transform a DC input voltage to 3 wire synchro or resolver outputs particularly suited to computer controlled navigation and radar simulation or display applications.

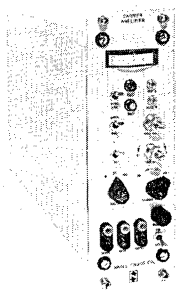


Synchro to Linear DC
Converter Model 416
The Model 416 Synchro to DC Converter is a small, solid state, lightweight unit designed to transform a 3 wire synchro or 4 wire resolver input to a linear DC voltage proportional to the input shaft angle. The 416 is designed to serve applications requiring stringent angular accuracies such as servo loops, data acquisition systems and recorders or other synchro/resolver related systems. Angular conversion accuracy is better than ±6 minutes of arc.

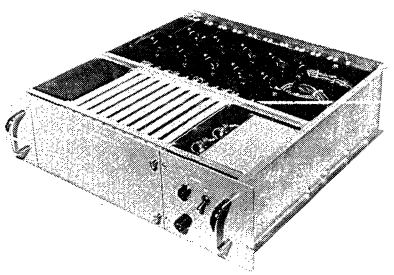


SIN/COS Converter
Model 431
The Model 431 Synchro to Sine/Cosine converter is a solid-state device which converts typical synchro or resolver output signals into sine DC and cosine DC voltages. The conversion process maintains an accuracy of ±0.1%, including effects of reference and stator voltage variations (±10%). Designed primarily for radar display systems, the Model 431 is also used in data acquisitions or recording systems for simulator control.

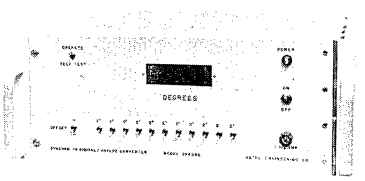
Transducer Amplifier
Model S800
Models S800 and SU800 are premium self-contained measuring instruments, converting low level transducer inputs to high level DC voltage or current outputs. Compatible with strain gage, variable reluctance and LVDT transducers, the outputs are compatible with magnetic tape recorders, galvanometers and/or controllers. Balancing techniques eliminate cable length between transducer and amplifier. Carrier frequencies from 1 KHz to 150 KHz with bandwidths to 40 KHz are available.



Solid State
Synchro Transmitter
Model 2066
A multi-channel DC or sine/cosine to synchro converter, designed for use in simulator or other type control systems. Model 2066 provides a 3-wire synchro or 4-wire resolver output accurate within .05% of the analog inputs. Models are available providing all standard or non-standard synchro or resolver output voltages and can be intermixed at customer option. Designed to work in conjunction with Natel's Model 316 in DC to synchro or resolver applications.

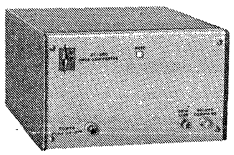


Angle Position Indicator
Model 2X4060
The Model 2X4060 Angle Position Indicator is a solid state synchro to digital converter designed to convert 2-speed synchro information into a digital signal representative of the rotor shaft angle. This digital angle is simultaneously displayed on a 5 decade LED display.
The converter offers an ability to offset the displayed angle up to ±20° by means of binary switches located on the front panel.



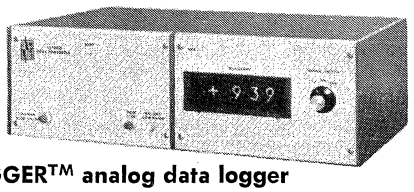
8944 Mason Avenue, Canoga Park, California 91306, Phone (213) 882-9620

NES data communications



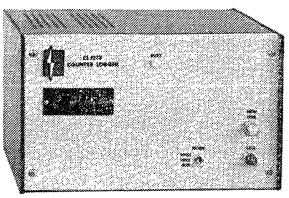
DIGILOGGER™ digital data logger

Compact, low cost, data acquisition unit. Accepts a 10 digit BCD (40 bit) input, and converts the data to a serial ASCII output code for driving teletypewriters. The data printout is formatted into seven 10 character words per line. The input lines to the storage memory are buffered; a logic "1" is from 2v to 80v. Switch selected positive or negative true logic signals. Switchable even or odd parity. Isolated (10^{10} Ohms) constant-current output. Many options available. **Price: $845.**



ANALOGGER™ analog data logger

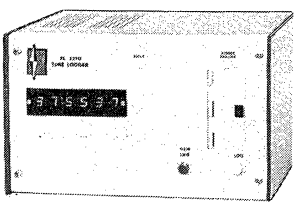
Reads out and logs any electrical analog input voltage, current or resistance; voltage 19.999 mV to 1999.9 V., resistance 199.99Ω to 19.999 meg. Ω, current 19.000μA 19.999 A. Output is isolated serial 11 bit ASCII with selected even or odd parity. Drives TTY directly with constant-current output. Seven loggings per line format, full scale range plus space digit, i.e. 3½ digit meter prints 4 characters, a fixed decimal plus space. Many options. Full rack wide. **Price: $1050-$1500.**



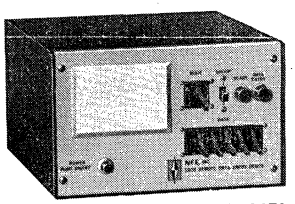
A. COUNTER LOGGER including range counter

A. COUNTER LOGGER including range counter. Event record, accumulate, totalize from DC to 10 megahertz counter. Converts data to permanent record and visual display. Can be transmitted over long distances. Self contained. Buffered inputs and outputs. **Prices: $875-$1150.**

B. TIMER LOGGER. Gives visual, electrical and printed output of real or elapsed time. Options include 12 or 24 hour clock, calendars showing days, day and month, a time display in decimal hours, minutes or seconds. 60 Hz and other time bases. **Prices: $925-$1350.**



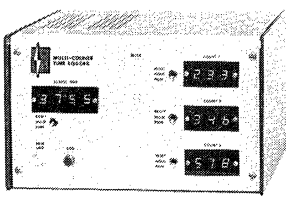
B. TIME LOGGER



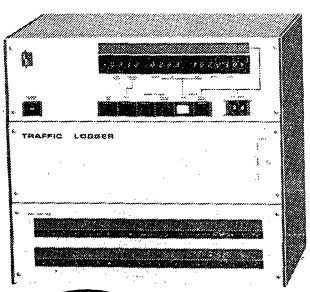
D. REMOTE DATA ENTRY SYSTEMS

C. MULTI-COUNTER & CLOCK LOGGER. Log multiple countings per time period simultaneously. Data logged is ready for computer input. Modular building block concept permits any number of originating stations. **Prices: From $800.**

D. REMOTE DATA ENTRY SYSTEMS. Permits various input data, identification codes, and manipulation to be remote controlled at outlying stations of a computer system. **Prices: $425 to $750.**

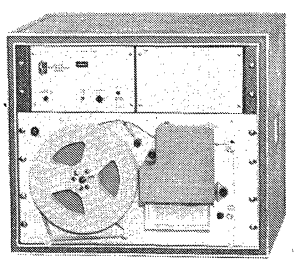


C. MULTI-COUNTER & CLOCK LOGGER



E. PEAK & VALLEY DATA LOGGING SYSTEM. Converts strip chart type information to computer input. Captures peak and valley readings and time of occurrence. Detection magnitude adjustable to log only critical data. **Prices: From $2700.**

F. MINI DATA ACQUISITION SYSTEMS. Eliminates recording instruments and processes data directly to computer. Input to output level flexibility, full multiple digit display, input scanner, elapsed or real time clock, 4½ digit DVM, auto sample rates and more. **Price: $2000.**

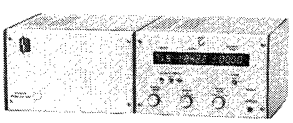


E. PEAK & VALLEY DATA LOGGING SYSTEMS

G. AUTOMATION COMPUTERS. Process control computers for real time manipulation and decision making. Typical main memory capacities of 4K x 12, 8K x 12 with string options. **Prices: $8500-$20,000.**

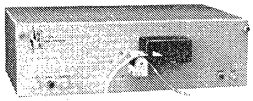
NEW!

H. TELEPHONE TRAFFIC LOGGER. Monitors up to 100 telephone lines and automatically logs starting time, ending time, dialed number, and extension number for every call made. For dial pulse and touch tone systems. Valuable tool for traffic surveys, reduction of telephone bills, and cost accounting.



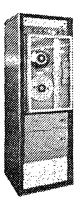
F. MINI DATA ACQUISITION SYSTEMS

I. CC1000 SERIES CODE CONVERTERS. A complete line of modular code converters which allows translating any data code to any other. This permits direct communications between "incompatible" equipment, formats, and coding. Also, the CC1000 Series can be used for security purposes by bastardizing or scrambling a code.



I. CC1026 CODE CONVERTER

J. DATA ACQUISITION SYSTEMS. Complete data acquisition systems on any type of storage media; this includes transducers, scanners, converters, multiplexers, transmission hardware, and storage equipment. **Prices: $3500-$25,000.**



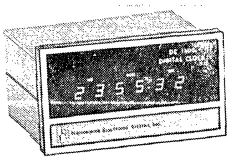
J. DATA ACQUISITION SYSTEMS

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N.Y. STATE CALL COLLECT (516) 294-0990)

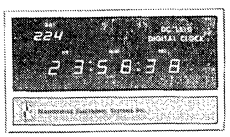
NATIONWIDE ELECTRONIC SYSTEMS, INC.

7N662 ROUTE 53, ITASCA, ILLINOIS 60143 TEL. (312) 773-0370 TWX 910-651-4713

digital clocks & calendars



Only 4½" w. x 2½" h.

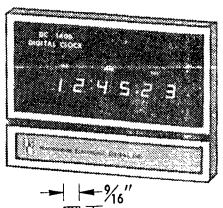


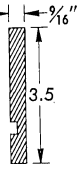
"compact" clock/calendars

Automatic month and day calendar in addition to 12 or 24 hour clock. A 10 MHz crystal oscillator that stays in sync with 60 Hz line on standby, AM-PM indication on 12 hr. models. Special LSI and MSI scan display techniques for reduced heat. 5 V. or 110 V. input. BCD output. LED display. All controls mounted on the front panel, hidden behind easy access inlay. With or without power supply. **Prices: $280 to $500.**

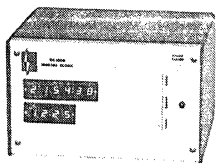
"slimline" clocks

Mounts right on the front panel. Only 9/16" thick. Set, run, and reset controls and selection buttons hidden behind front panel inlay. Low power circuitry, BCD outputs for complete compatibility with computers, CRT, loggers, TTY, etc. Auto reset to all zeros when power is lost. LED display. 60 Hz or 50 Hz line current time base. Complete selection of time ranges—11:59:59, 23.999. etc. **Price: $240.**



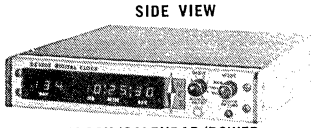


SIDE VIEW



B. DC-1206 CLOCK/ CALENDAR

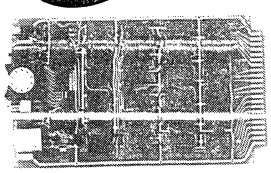
A. DIGITAL CLOCK (DC-1205). Clock, calendar, and power supply in a 1¾" h. x 8⅝" x 9½" d. cabinet. LED display of various ranges: 23:59:59, 12:59:59, 23:59.99, 12:59.99, 23.999, 12.999. Time base of 50 Hz, 60 Hz, or internal 1 MHz.
B. DC-1206 CLOCK/CALENDAR. Basically the same as the DC-1205 but in a larger cabinet (5¼" high) with a larger power supply to provide a broader range of options and specials. Front panel time setting controls. **Prices: $625-$875.**



A. CLOCK/CALENDAR/POWER SUPPLY

modular systems components

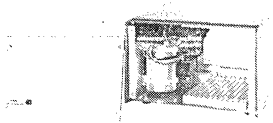
NEW!



A. CLOCK CARDS

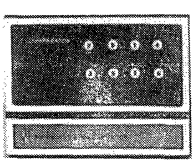
A. PC CARDS. Completely assembled and tested PC cards perform wide variety of functions; permit fast and economical systems layout and construction. Cards available include clocks, calendars, digital and analog scanners, serial and parallel code (TTY, ASCII) input and output cards, counters, comparators, touch-tone converters, and many more.

CARD FILE AND POWER SUPPLY. Designed for use with PC cards for fast systems building. Includes 12-position file and regulated IC 5VDC, 2.5A, overvoltage and short circuit protected power supply. Other voltages available. New high efficiency 2.5A supply mounted on a 4.5 x 7.5 PC card now available.

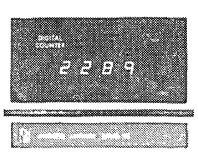


B. P.C. CARD/FILE/ POWER SUPPLY

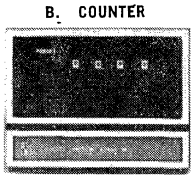
digital systems components



A. COMPARATOR



B. COUNTER



C. PRESET

E. 3-DIGIT DVM

STANDARD SERIES

Compact size, 4.5" w. x 2.5" h. x 6.0" behind panel, the standard series offers many options, including power supplies. Selected items shown here.

"SLIMLINE" SERIES

Only 9/16" thin, the "Slimline" mounts right on the front panel. Size is 4.5" w. x 3.5" h. x 9/16" deep. Selected types are shown. Available in all functions.

A. COMPARATORS. Single and dual limit models. Input is positive logic (1-2-4-8) TTL or DTL. Output is form C relay closure and BCD. 3 to 7 digits. Feature rotary switches. **Prices: from $120.**

B. COUNTERS. Uni- and bi-directional. Up to 20 MHz counting rate with TTL input. Uni-directional units totalize from single input. Bi-directional count A (+) and B (−). 3 to 7 digits. **Prices: from $150.**

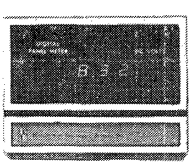
C. PRESETS. For control of other NES systems digital components. Provide pos. logic and BCD output. 3 to 7 digits, polarity control. **Prices: from $100.**

D. STOPWATCHES. Count up and count down models. Seconds, minutes/seconds and minutes. 60 Hz. and crystal time base. **Prices: from $165.**

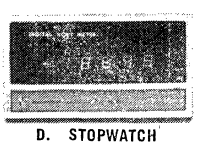
E. DVMs. 3 and 4½ digital voltage meters. LED display. **Prices: from $175 for 3 digits, $375 for 4½ digits.**

F. REMOTE DISPLAYS. Slave indicators for remote displays of BCD inputs without additional control signals. **Prices: from $130.**

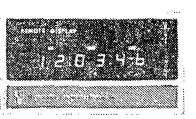
G. ELECTRONIC THERMOMETERS. Imput can be thermistor or thermocouple. BCD output. Internal reference temperature and linearization circuitry in degrees F or C. **Prices: from $200.**



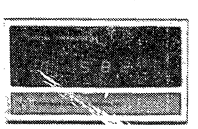
E. 4½ DIGIT DVM



D. STOPWATCH



F. REMOTE DISPLAY



G. THERMOMETER

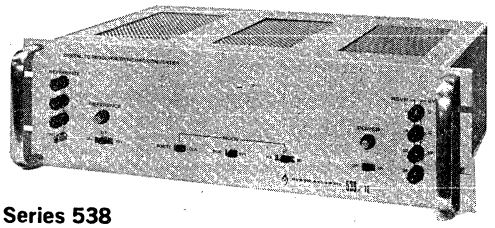
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N.Y. STATE CALL COLLECT (516) 294-0990)

NATIONWIDE ELECTRONIC SYSTEMS, INC.

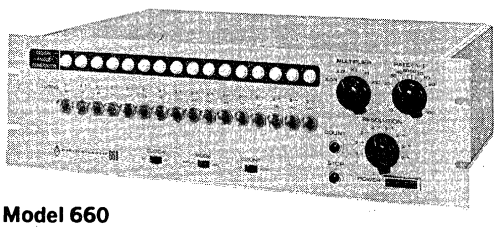
7N662 ROUTE 53, ITASCA, ILLINOIS 60143 TEL. (312) 773-0370 TWX 910-651-4713

PRECISION DIGITAL-TO-RESOLVER/SYNCHRO AND RESOLVER/SYNCHRO-

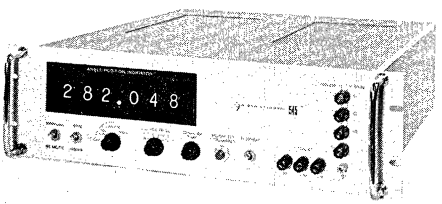
NORTH ATLANTIC *industries, inc.*



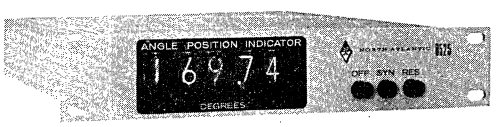
Series 538



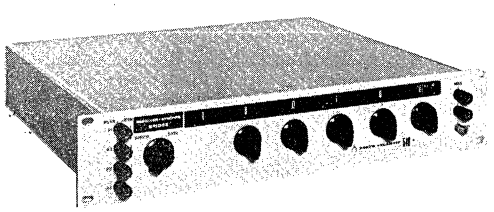
Model 660



Model 545



Model 8525



Series 540/10

Digital To Resolver/Synchro Converters

These digitally programmable solid-state units provide simulation of 400Hz resolver/synchro transmitter data. All models feature output transformer isolation and short-circuit protection.

Series 538 — Digital-to-Resolver/Synchro Converters

These converters are available with 14- to 17-bit single-speed digital input resolution. Analog output is resolver or synchro data at selected line-line voltages with better than 1-minute accuracy. Optional accuracy 40 arc-seconds.

Model 660 — Digital Angle Generator

This instrument provides digital angle input data and data strobe signals to the Series 538 D/R-S Converters with angular data rates from 1 arc-minute/second to 2000°/second.

Resolver/Synchro To Digital Converters

These solid-state converters continuously digitize resolver and synchro data at angular velocities up to 20,000°/sec. Continuous tracking is achieved through unique electronic servo techniques. Data frequencies include 60Hz, 400Hz, and higher frequencies in specific models.

Model 545 — Automatic Angle Position Indicator

This instrument has .001° resolution and 10-second accuracy for 11.8, 26V, and 90V line-line at 400Hz. The digital angle is displayed and available as BCD digital output. Other features include programmable or front-panel selection of resolver or synchro input, line-line voltage, and operating mode.

Model 545/100 — Automatic Angle Position Indicator

Similar to the Model 545 in overall function, but provided with .01° accuracy and resolution. This instrument accepts both 60 & 400Hz resolver and synchro data.

Model 546/20 — Binary S/D Converter

This half-rack R-S/D Converter features 16-bit digital output resolution with 15-bit accuracy for 400Hz resolvers and synchros at line-to-line voltages of 11.8, 26V and 90V. Front-panel selection of resolver or synchro input, and line-line voltage range.

Model 8525, 8225 — Angle Position Indicator

The half-rack 8525 offers 3-minute accuracy and .01° resolution, with 5-decade BCD digital output. Available as a two-channel instrument for any combination of synchro and/or resolver inputs at 11.8V, 26V, or 90V line-line 60Hz or 400Hz. The 8225 is a 4-decade, 6-minute accuracy model.

Resolver/Synchro Simulators & Bridges

Most instruments offer a dual mode capability, permitting a single model to work with both resolvers and synchros. All units feature direct in-line readout of angle, i.e. 359.999° and input/output isolation.

Series 530 — R/S Simulators

These 3½" full-rack simulators provide resolver and synchro output at 11.8, 26, 90 and 115V line-line voltages, with either 26V or 115V 400Hz excitation. Accuracy is 2 arc-seconds. Standard resolutions are .0001°, .001° and 1°.

Model 530/20 — Broadband R/S Simulator

This instrument features 10 to 20 arc-second accuracy from 50Hz to 10KHz.

Model 532 — Synchro Simulator

A miniature simulator at 11.8V (or 90V) 400Hz line-line with 5° thumbwheel switches and 30 arc-seconds accuracy. Also available with 26V resolver output.

Model 540/10 & 540/11 Resolver/Synchro Bridges

These 3½" rack-mounted bridges measure resolver and synchro transmitters with 2 arc-second accuracy at 400Hz (540/10) and 400Hz to 100Hz (540/11). Standard resolutions are .0001° and 1°.

Model 541/10, 542/10 Bridges

These miniature bridges measure angular position of 400Hz resolvers or synchros with accuracy of 5-arc-seconds. Manual balance is by 5° thumbwheel switches.

Model 540/20 — Broadband Resolver/Synchro Bridge

This bridge features 10 arc-second accuracy over most of the frequency band from 55Hz to 10KHz.

TO-DIGITAL COMPUTER-INTERFACE, ATE EQUIPMENT, AC PHASE SENSITIVE INSTRUMENTS, AND RATIO BOXES.

Angle Position Indicators

Model API-8025 — Angle Position Indicator

This electromechanical servo measures synchro and resolver transmitters with 6 arc-minutes accuracy. Optional features include 4 arc-minute accuracy, retransmit components, dual-mode, and two-speed operation.

AC RATIO BOXES These precision inductive voltage dividers feature high input impedance, low output impedance, and accuracy over a wide frequency band.

Model RB-503, RB-504 AC Ratio Boxes The RB-503 features 10ppm accuracy from 50Hz to 5KHz, and ratios from 0 to 1.111110. The RB-504 features 1ppm accuracy from 300Hz to 1KHz, and ratios from -0.111110 to +1.111110.

Model RB-503T — Inverting AC Ratio Box This model features isolated input with full inversion capability. Ratio range ±1.111110 with 10ppm accuracy.

Phase Angle Voltmeters

These instruments combine phase-sensitive modes with the functions of a conventional AC voltmeter with multiple range. They provide voltage measurements of the total, fundamental, in-phase and quadrature components of an AC signal, as well as phase angle. They feature high harmonic-rejection and quadrature overload capability, and signal and reference isolation.

Model 213 — Single-Frequency Phase Angle Voltmeter

This instrument provides phase-sensitive measurement at a single prespecified frequency with ±5% bandwidth from 30Hz to 10KHz with full-scale measurement from 300μV to 300V.

Model 214 — Four-Frequency Phase Angle Voltmeter

This instrument provides phase-sensitive operation at 2, 3, or 4 frequencies, 30Hz to 20KHz. Features include ±5% bandwidth, 300μV to 300V full-scale ranges, and rapid field change of frequency modules.

Model 220, 225 Digital Phase Angle Voltmeter

These new instruments directly measure and display phase angle and all components of signal voltage (total, fundamental, in-phase, and quadrature) at 1, 2, 3, or 4 push-button selected frequencies from 30Hz to 32KHz. Features include push-button and autorange selection of voltage, 4½ digit display of voltage and phase, push-button function selection, and panel display of selected function and voltage range. Other features are fully programmable operation, 0.1% full-scale voltage accuracy, 0.25° phase accuracy (0° to 360.0° display), digital output, and analog recorder output.

Phase Sensitive Converters

PSC-419 — Phase Sensitive AC/DC Converter For automatic test systems, this programmable instrument converts 400Hz signal components to high-level DC with .1% linearity. Input sensitivity 10mV full-scale for ±10VDC full-scale output.

Phase Generator

Model 350/351 Phase Generator & Calibrator

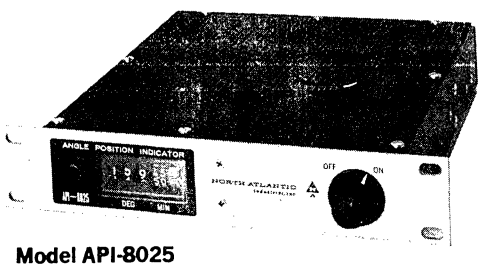
This instrument pair provides 360° phase shift with .01° resolution from 25Hz to 25.6KHz with direct reading of phase angle to .05° accuracy and output level of 10V.

D/S and S/D Modules

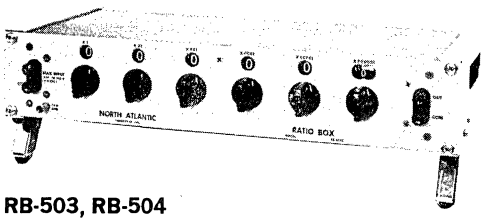
The Series 780 low cost modules, with built-in self protection circuitry, feature 14 bit (0.022°) resolution over 360°, and 4000°/sec data rates. Both types of modules are DTL and TTL compatible and a complete S/D or D/S converter requires only 5 modules and occupies less than 21 square inches of PC board space.

S/D specifications include 3 minutes ±0.9LSB accuracy, and continuous tracking with low velocity errors. D/S specifications include 4 minute accuracy with 1.0 VA output.

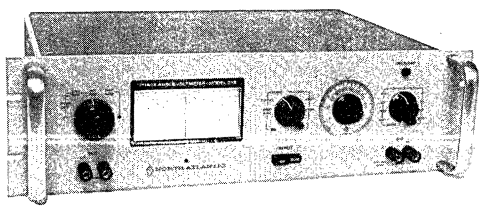
Also available is an interconnecting PC board. Standard module sets available for 70°C or 105° operation, single or two-speed S/D performance, digital CT, etc.



Model API-8025

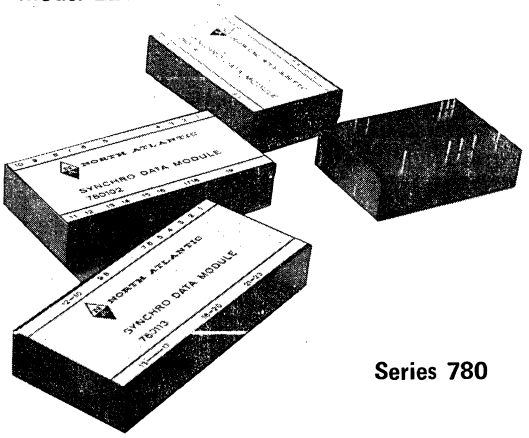


RB-503, RB-504



Model 213

Model 220



Series 780

NORTH ATLANTIC industries, inc.

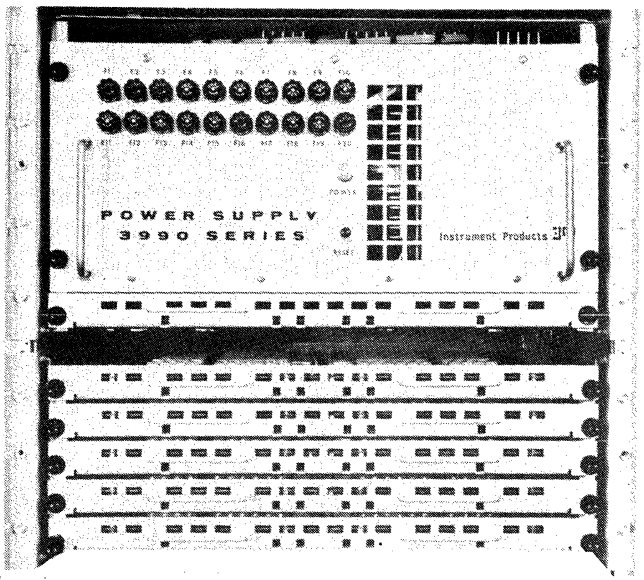
TERMINAL DRIVE, PLAINVIEW, NEW YORK • (516) 681-8600

REED SCANNERS SWITCHING MATRICES

North Hills

SYSTEMS APPLICATIONS FOR

- Data acquisition.
- Multiple channel recording.
- Calibration.
- Automatic test.
- Communications.
- Process control



3990 GUARDED SWITCHING MATRIX

- Random access two-dimensional reed relay switch matrix.
- Five-digit program command results in interconnection of selected matrix crosspoints. Command, consisting of five parallel BCD (1-2-4-8) characters, identifies up to 10,000 crosspoints and desired action (reset, close or open one, ten, one hundred or all points).
- Ten basic 1 x 10 matrix configurations with associated flip-flop storage (100 crosspoints) per plug-in module. Interconnectable in assorted combinations: 1 x 50, 5 x 10, 1 x 100, etc. Five plug-in modules per chassis.
- Power supply/decode module accommodates up to 2000 crosspoints.

3383/1221 GUARDED SCANNER/PROGRAMMER

- Programmer accepts address from digital programming device (computer, core programmer, tape reader, etc.) and connects desired scanner input channel to a single output. The single output channel may be further programmed through an optional output multiplexer to one of ten possible output locations.
- Number of maximum input channels per scanner: 1000 single-wire, 500 two-wire, 400 three-wire, 200 six-wire channels.
- Programmer maximum capability: 10,000 channels.

Typical reed contact characteristics:

Material:	Di-Met to diffused gold.
Current power rating:	0.5 A maximum, 10 VA.
Breakdown voltage:	300 V rms minimum.
Insulation resistance:	1 x 10^9 ohms.
Thermal emf:	10 microvolts maximum for 30 seconds maximum channel activation.
Switching speed:	3 milliseconds maximum after program command.
Life expectance:	2 x 10^7 at maximum rating. 5 x 10^7 at half maximum rating. 10 x 10^7 low loads.

FOR OTHER NORTH HILLS PRODUCTS — SEE EEM SECTIONS 1800 ADJUSTABLE & FIXED COILS; 2200 CONVERTERS, PROCESS CONTROL MODULES; 4000 PRECISION CURRENT & VOLTAGE SOURCES; 5600 WIDEBAND TRANSFORMERS & HYBRIDS.

North Hills Electronics, INC. / *GLEN COVE, N.Y. 11542 • 516-671-5700*

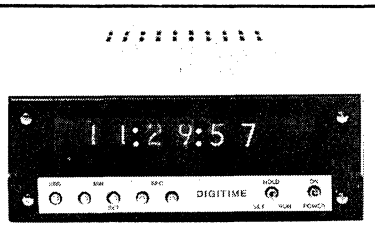
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

DIGITIME/THIEM

DIGITAL CLOCKS

IC-SOLID STATE — ELECTROMECHANICAL

For computers, data logging, missile launch count-down display and control. Multi-channel digital time programming for control of automatic processing and radio/TV broadcasts. Variety of logic outputs compatible with most data readout devices. Single or multiple remote glow-tube or projection-type time displays.



IC SOLID STATE CLOCKS

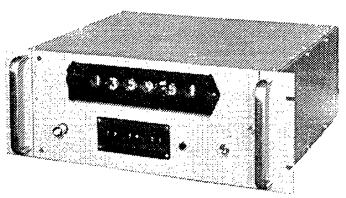
For time of day, countdown, elapsed time and other applications requiring display and output of precise time data. Combined calendars provide day-of-year or month-day. Many options available including multiple displays and contact closure as well as TTL logic type outputs.

From $250.00

features:

- Integrated circuits used for basic logic.
- Front panel display can be Nixie or Seven-Bar type.
- Logic output compatible with standard recording devices.
- Options: Battery operation, variety of time bases, variety of time ranges, multiple display.

Write for Tech. Bulletin No. 972-T1



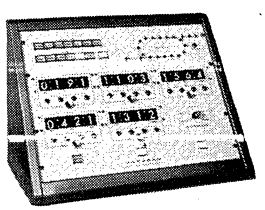
TIME CODE GENERATORS/READERS/ TRANSLATORS

For applications requiring time-of-day and date information in serial form, modulated or unmodulated, for use in data logging, data recording on tape, computers or strip chart recorders. Variety of output codes available. Features integrated circuit solid state design throughout.

features:

- Low power IC's used for all digital logic.
- Multiple Time Codes generated.
- Parallel outputs for computer applications.
- Modular design concept to reduce cost.

Write for Tech. Bulletin No. 273-T2



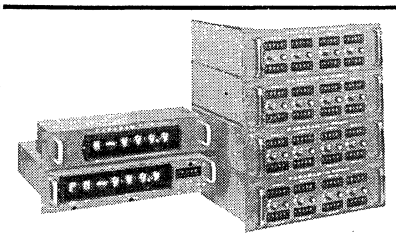
AUTOMATIC RACE TRACK TIMING SYSTEMS

Automatically measures and displays the precise quarter mile times and finish time for all types of races and for all race distances. Designed for operation by non-technical personnel.

features:

- All solid state electronics.
- For track, turf, and harness races.
- Output drives two tote board display units.
- Automatically programs photocells for selected race distances.

WRITE FOR DESCRIPTIVE LITERATURE



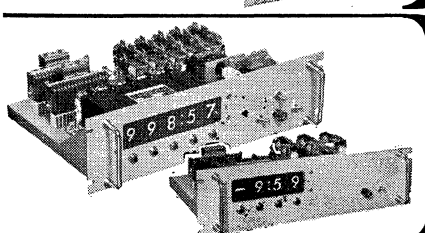
DIGITAL TIME PROGRAMMERS

Standard units accept time data inputs from solid state or electromechanical digital clocks and provide any number of precisely timed signal outputs as pre-selected by the wiring of one or more program plugs.

features:

- Programmed time interval accuracy well within the clock resolution.
- Display of output channel numbers and status available.
- Complete program changed in seconds by replacing program plugs.

Write for Tech Bulletin No. 566-24



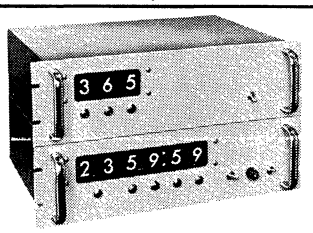
COUNT/DOWN, COUNT/UP DIGITAL CLOCKS

Used in missile launch, testing, radio-television — anywhere time is counted down, then afterward elapsed time is observed.

features:

- Available with digital logic output or for programming and recording.
- Plus/minus count in most time ranges and resolutions.
- Projection type or Nixie displays.
- Standard system operates up to 40 displays.

Write for Tech. Bulletin No. 162-16A



DIGITAL CALENDARS

Provide nonambiguous contact closures in parallel form corresponding to date in Month-Days (months from 01 to 12, days from 01 to 31) or Day-of-the-Year (from 001 to 365). Used in data logging, process control or other date of time oriented systems.

features:

- May be ordered in Month-Day or Day-of-Year Models.
- Outputs in decimal or various codes of binary coded decimal.
- Projection type or Nixie displays.
- Switch for leap year correction.

Write for Tech. Bulletin No. 1066-29

THIEM INDUSTRIES INC.

Special Design Charges eliminated through hundreds of off-the-shelf designs.

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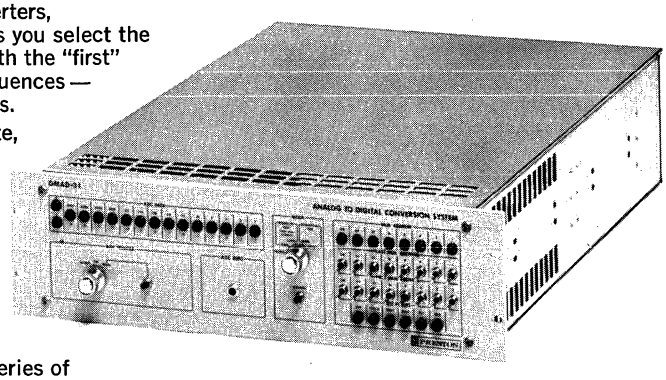
PRESTON

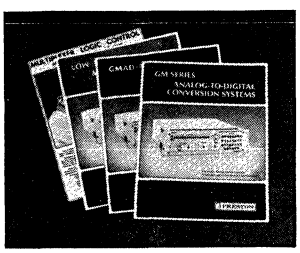
ANALOG-TO-DIGITAL CONVERSION SYSTEMS

Preston delivers the world's most reliable and complete line of Analog-to-Digital Conversion Systems—the GM Series—including the "World's Fastest ADC"—the GMAD-01!

Every model in the GM Series is designed around a complete set of compatible "building blocks"— basic sub-system components — that include plug-in Multiplexers, DC Coupled Amplifier/Multiplexers, A/D Converters, D/A Converters, and the GMC Logic Control System that lets you select the operating mode — Normal, Random, or Sequential — and both the "first" and "last" channels of short cycle "quick-look" address sequences — all from front panel switches and channel address indicators.

And every model in the GM Series is delivered complete, with integral power supplies and all of the necessary input and output control signals to match your special interface requirements. And it's all assembled in a standard 19" wide rack-mountable chassis only 5¼" high.





To obtain information on the entire Preston GM Series of ADCs, ask for our technical brochures that include the GM Series block diagrams, timing charts, and examples of overall system performance for many typical GM Series ADC Systems. We'll send you price, delivery and specifying information, too!

GMAD Series

Complete A-D Conversion Systems Wide Range of Speeds and Resolutions

Resolution	Accuracy (% of F.S. ±½ L.S.B.)	Conversion Time GMAD-01	GMAD-1	GMAD-2	GMAD-3	GMAD-4
14 binary bits + sign	0.010%	*	1.5 μsec	5.0 μsec	10 μsec	20 μsec
13 binary bits + sign	0.015%	*	1.4 μsec	4.5 μsec	9 μsec	19 μsec
12 binary bits + sign	0.025%	0.5 μsec	1.2 μsec	4.0 μsec	8 μsec	18 μsec
11 binary bits + sign	0.05%	0.4 μsec	1.0 μsec	3.5 μsec	7 μsec	17 μsec
10 binary bits + sign	0.1%	0.3 μsec	0.3 μsec	3.0 μsec	*	16 μsec
9 binary bits + sign	0.2%	0.2 μsec	0.2 μsec	2.5 μsec	*	*
8 binary bits + sign	0.4%	0.1 μsec	0.1 μsec	2.0 μsec	*	*
7 binary bits + sign	0.8%	*	0.1 μsec	1.5 μsec	*	*
4-digit BCD and sign	0.01%	*	*	10 μsec	40 μsec	*
3-digit BCD and sign	0.1%	*	*	8 μsec	32 μsec	*

*These configurations not available

The various models of the GMAD Series can be specified with many combinations of these plug-in sub-system components:

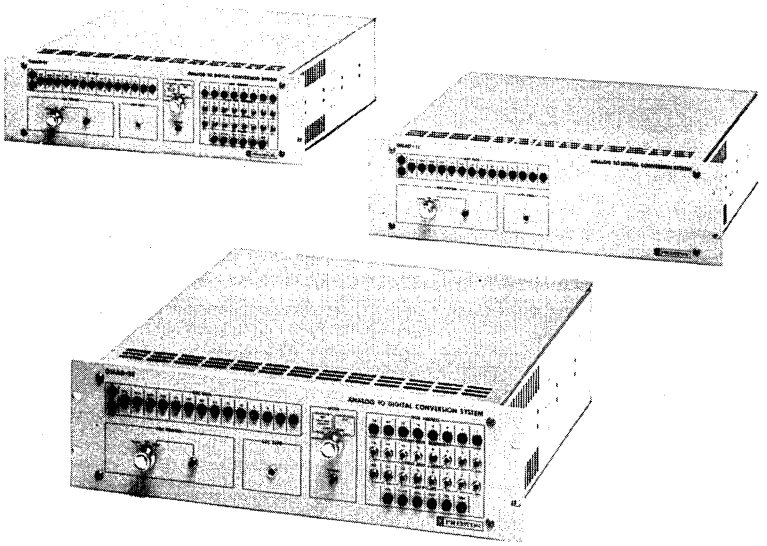
MULTIPLEXERS	GMM
Input Impedance	Greater than 50 Megohms
Switching Time	Less than 1 microsecond
Input Offset Current	Less than 10 nanoamps
Input Voltage	Up to ± 10 volts
Crosstalk	Less than ±0.01% for 100 channels
Linearity	±0.01% of Full Scale
Zero Drift	Less than ±0.01% of Full Scale
Number of Channels	Expandable to over 1024 channels in groups of four

SAMPLE-AND-HOLD AMPLIFIERS	GMSH-10	GMSH-100
Gain	Unity	Unity
Gain Stability and Linearity combined	±0.01% of Full Scale	±0.01% of Full Scale
Input Impedance	Greater than 10 Megohms	Greater than 10 Megohms
Noise	Less than 1 mV p	Less than 0.5 mVp
Hold Delay	100 nanoseconds	100 nanoseconds
Settling Time to 0.01%	Less than 0.5 μsec	Less than 2 μsec
Droop in Hold Mode	±1 mV after 1 ms	±1 mV after 1 ms
Aperture Error	10 nanoseconds	50 nanoseconds

AMPLIFIERS-MULTIPLEXERS	GMD-1 and -01		
Type	Direct Coupled, Fixed Gain, Unity or less.	Common Mode Rejection	80 db — DC to 60 Hz
Gain Accuracy	±0.01% of Full Scale	Bandwidth	1 MHz
Gain Stability	±0.01% of Full Scale for 6 months	Noise	Less than 1 millivolt.
Gain Temp Coeff.	±0.002% per °C	No. of Channels in 5½" high rack	48
Linearity	±0.01% of Full Scale	Output	Commutated ±10 Volts F.S.
Input Impedance	100 Megohms		

PRESTON SCIENTIFIC INCORPORATED 805 East Cerritos Ave., Anaheim, Calif. 92805 Tel: (714) 776-6400 TELEX 65-5321

LOW-LEVEL MULTIPLEXERS AND PROGRAMMABLE GAIN AMPLIFIERS



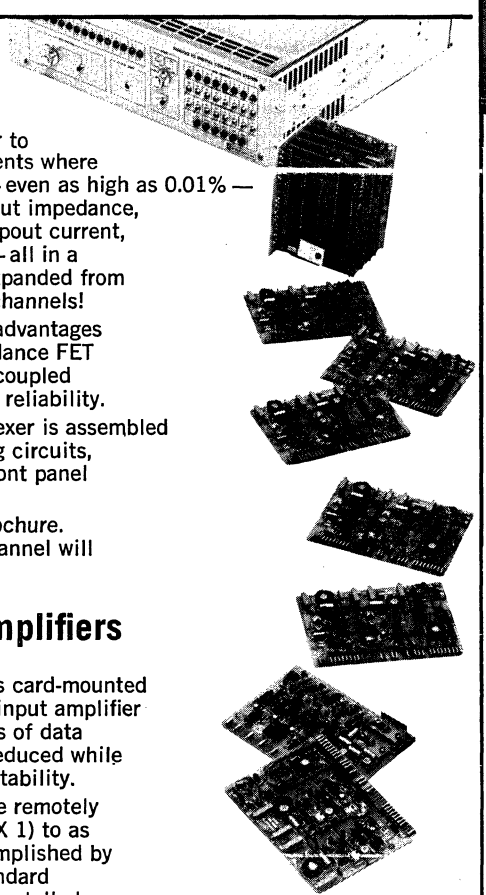
Low-Level Multiplexers

Preston's LLM Series of Low-Level Multiplexers provide the ideal answer to millivolt level multiplexing requirements where exceptional accuracy and linearity — even as high as 0.01% — must be combined with very high input impedance, low crosstalk, very low drift, low pumpout current, and excellent temperature stability — all in a single, reliable system that can be expanded from as few as 16 channels to over 2000 channels!

Preston has achieved all of these advantages by combining high speed, high impedance FET switches with a special, transformer-coupled input for vastly superior stability and reliability.

The LLM Series Low Level Multiplexer is assembled with its own power supply, addressing circuits, and GMC Logic Control System for front panel channel selection.

Ask Preston for the LLM Series brochure. The performance and low cost-per-channel will come as a pleasant surprise!



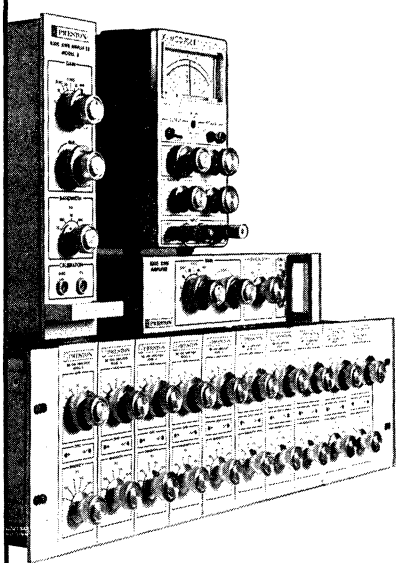
Programmable Gain Amplifiers

With a single Preston GMPG Series card-mounted Programmable Gain Amplifier as the input amplifier for as many as 64 channels, the costs of data acquisition systems can be sharply reduced while still maintaining high accuracy and stability.

The gain of these amplifiers can be remotely programmed in 10 steps from unity (X 1) to as high as 2500, with gain control accomplished by direct binary or switch control at standard digital logic levels! And they can be installed in any of Preston's GM Series of A-D Conversion Systems!

For complete information on how the GMPG Series can provide improved performance, greater system flexibility and lower cost-per-channel, give the engineers at Preston a call!

PRESTON Builds the World's Most Accurate Amplifiers, too!



The 8300 XWB Series Amplifiers provide greater accuracy than any other amplifier under all operating conditions! Every model has improved Common Mode Rejection, Temperature Stability, Overload Recovery and reduced "Pumpout Current," plus many combinations of accuracy, linearity and bandwidth for all the versatility you'll ever need!

And there's also the new MD-1000 Series of Wide-Band, Direct Coupled Amplifiers that extend the frequency range up to 1 MHz, and combine high performance and low price!

Take a closer look at these outstanding amplifiers from Preston! You'll find the details on pages 320 and 321 of Volume 2 of EEM!

Then ask for all the details. Write or call to —

PRESTON SCIENTIFIC INCORPORATED
805 East Cerritos Avenue,
Anaheim, California 92805
Telephone: (714) 776-6400
TELEX 65-5321

PRESTON

OPTICAL ENCODERS

ROTARY LINEAR ABSOLUTE INCREMENTAL HEAVY DUTY LOW INERTIA

RENCO CORPORATION

SANTA BARBARA RESEARCH PARK

26 COROMAR DRIVE GOLETA, CALIFORNIA 93017

TWX 910-334-1180 PHONE (805) 968-1525

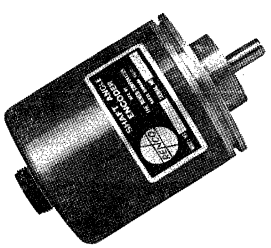
SERIES 2300 INCREMENTAL

This incremental encoder offers reliable performance at low cost. Available with quadrature phased outputs up to 2000 cycles/revolution with zero index.
Precision made all metal case.
Outputs available in T²L or quasi sinusoidal photocell outputs. Index can be gated or ungated.
Standard model terminates in 18" length pigtail.

SERIES 2500 INCREMENTAL/ABSOLUTE

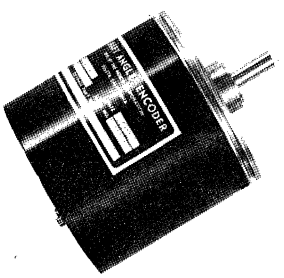
Renco's most popular and versatile encoder. Available in incremental resolutions up to 5000 cycles/revolution direct reading. T²L, or photocell, phase quadrature outputs, direction sensing, X4 multiplication, Zero index, are all available within this package size. Now available in Imperial/Metric Dual outputs.
ABSOLUTE: up to 13 bits/revolution in Gray code, or Natural Binary. Parallel non-ambiguous whole word output formats. Also available in cyclic X-S BCD or 8-4-2-1 BCD in a variety of counts up to 0-3599.

SERIES 3000 INCREMENTAL/ABSOLUTE



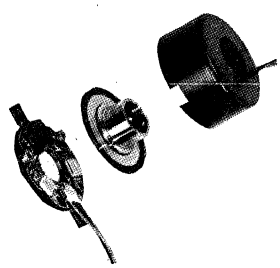
A ruggedized version of our Series 2500 for stringent environments, such as those found in the machine tool industry.
HEAVY DUTY FEATURES: Heavier shaft, mounting flange and bearings than in Series 2500. Shaft seal, MS connector and heavy duty housing. Bearings can take up to 40 lb. radial and axial loading.
OUTPUTS: incremental, Gray code, cyclic Excess BCD, 8-4-2-1 BCD or natural binary with the same resolution and accuracy as our Series 2500.

SERIES 4000 INCREMENTAL/ABSOLUTE



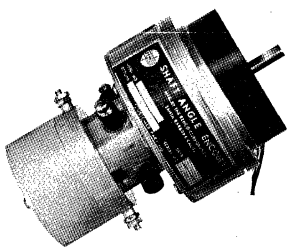
Available with integral electronics or photocell outputs offers the same input/output options as our Series 2500.
INCREMENTAL: up to 12,500 cycles/revolution, with optional X8 logic available for a maximum resolution of 100,000 pulses/revolution. Quadrature outputs for direction-sensing.
ABSOLUTE: up to 2^{13}/revolution in Gray or Natural Binary code or 359.99/revolution in cyclic Excess BCD, or 8-4-2-1 BCD with or without display.

SERIES KT-15 MOTOR-TACHOMETER KIT



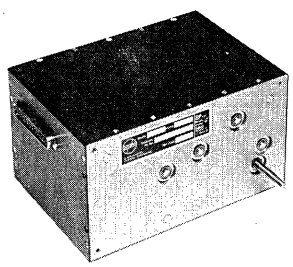
Adaptable for most motor-tachometer applications only 1.5" dia. x .75" high. For motor shaft sizes up to .50" dia. Available in resolutions up to 1000 cycles/revolution. Quadrature phased outputs in T²L or photocell output. Response flat up to 60 KC.
Comes in kit form with only 3 pieces. Complete with installation instructions.

SERIES KT-23 MOTOR-TACHOMETER KIT



Motor-tachometer in kit form. Outputs available in T²L or quasi sinusoidal photocell outputs. Resolutions up to 5000 cycles/revolution with quadrature outputs.
Index available up to 2000 cycles, gated or ungated.
Wide range of resolutions already available. Can adapt to many varied motors.
2.25" dia. x .75" high, will accept motor shaft sizes up to .75" dia.

SERIES MTAE MULTI-TURN ABSOLUTE



Multi-turn absolute encoders. Available to 19 bits in Gray or Natural Binary codes, up to 200,000 counts in 8-4-2-1 BCD with parallel non-ambiguous whole word output formats; in almost any number of counts/turn. Rectangular package 4.75" deep, 6.75" wide, 3.75" high.

Renco Corporation engineers many series of low cost precision optical encoders designed for universal applications.

These precision optical encoders feature long life, are light in weight, and are completely field serviceable.

They are available in tungsten or LED light sources, several mounting options and a multiplicity of input/output options, allowing you to economically tailor our standard precision optical encoders to meet your specific requirement.

Sangamo Recorders. For people who need 32 channels of data. And people who don't.

When you tackle a job that calls for 32 channel recording, you've pretty well got to come to us. We make the Sabre V, the only IRIG all-band portable tape recorder on the market with up to 32 channels on one-inch tape.

But not all jobs need the Sabre V, and we want you to depend on Sangamo anyway. So we also offer the Sabre III, Sabre IV and the Sangamo/Tandberg TIR 100— newest addition to our line.

Sabre III gives you lab quality and total bandwidth convertibility in a compact all-band portable.

Sabre IV is our laboratory model that's setting new standards of accuracy in recording and reproduction.

Both Sabre III and IV let you process data up to 2.0 MHz in the direct mode, 500 KHz in the FM mode, and with full serial and parallel PCM capability. They feature total bandwidth convertibility, too.

The Sangamo-Tandberg TIR 100 does almost everything you'd expect a $16,000 recorder to do but costs under $4,500. It features four channels including one for voice or data recording, a built-in CRT monitor and a portable size smaller than a cubic foot.

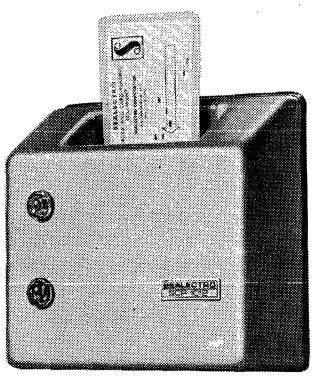
That's four Sangamo recorders in all. One of them is bound to do the best possible job on your data recording job— whatever it is.

For more information, write:
Sangamo Electric Company, Data Systems,
P.O. Box 3347, Springfield, Illinois 62714.
Or call (217) 544-6411/Telex 406-421.

SANGAMO RECORDERS

THE INNOVATORS IN TAPE INSTRUMENTATION

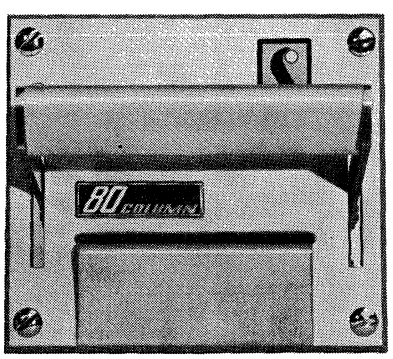
SEALECTRO CARD,



10 x 10-10 x 12 BADGE READERS

Completely automatic Badge Readers that accept standard IBM and Friden Type Badge cards in 10 x 10 or 10 x 12 formats. Ideal for personnel identification, production control and process control operations.

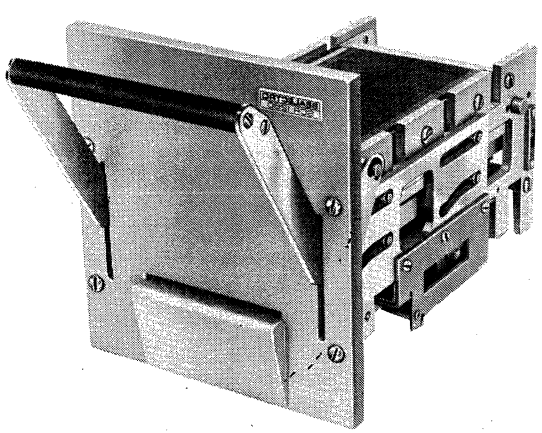
Go/no-go lights immediately indicate if the card is inserted correctly. No contacts actuate until the card is properly inserted. Remote solenoid-operated contacts sense hole patterns and read. Read function is automatically held until feedback from system releases contacts and card is automatically ejected. Flexible output wiring allows bussed or discrete contact interface connections.



12 x 80 CARD READER

The Sealectrocard Card Reader is designed to be completely compatible with all standard 12 x 80 TAB type punched-cards. This unit combines features which provide maximum reliability, convenience and economy in programming. The 12 x 80 Sealectrocard is ideally suited as peripheral equipment for a wide range of computers or as a programming device. Programs consisting of up to 960 bits of information can be read instantly from conventional punched-card formats. Features include:

- Remote contacts with double contact wiping surfaces.
- Positive mechanical lockout if a card is mis-oriented.
- Wide choice terminations.
- Simple, fast operation even by unskilled personnel.



12 x 51 TAB READER

Accepts and reads standard 80 column TAB card, but limits read area to 51 columns, providing 612 bits of information. Ideal for data acquisition in production control and other terminal operations of data processing systems not requiring full 960 point readout.

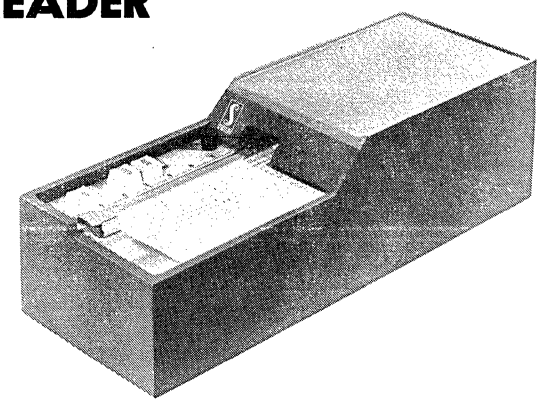
Completely foolproof. Correct orientation and positioning of card electrically interlocks operating handle eliminating faulty readouts. Card is inserted in insertion slot, handle pulled down to read position, and unit is in operation.

Utilizes same electrical contact assembly as 12 x 80 Reader. Can be bussed vertically or horizontally. It may be used with completely discrete circuitry for each of the 612 points.

BADGE & TAB READERS

INCREMENTAL CARD READER

- Completely solid state for maximum reliability.
- Column-by-column reading. Up to 80 columns per second.
- Sync pulse provided for each column for complete synchronization.
- May be stepped single column by external signal.
- Reads only desired number of columns.



Using a 12-station opto-electronic system and an incrementally moving card to replace the 960 individual contacts conventionally used in static 80-column Hollerith card readers, Sealectro has produced an extremely accurate and reliable incremental reader that programs test equipment, chemical processes, food processes, machinery, and many types of computers at a fraction of the investment formerly required.

The Model DS-80 compact single card incremental reader is a complete, self-contained unit with interface and performance characteristics offering compatibility with most computers and communication systems. The unit has the ability to read Hollerith coded information, one column at a time, upon command, up to a speed of 80 columns a second. All mechanisms and circuitry are modular, permitting complete interface compatibility. Among the features of the DS-80 are: single step function with return to start position from any column; automatic advance with automatic return; sync output with read control; and three variable speeds determined by the application. All control functions have remote operation capability.

The card is read optoelectronically. A phototransistor array senses light through the punched holes in the card.

CUSTOM ENGINEERED READERS

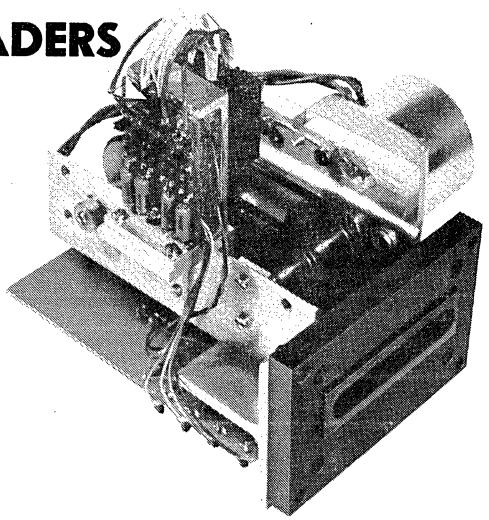
In addition to the standard Hollerith code reading devices, Sealectro supplies readers for sensing other data media.

A line of OCR readers is available for sensing digital information based upon bar codes. These devices feature serial output, with a constant speed document transport and solid state, reflective sensing. Accurate and reliable readouts may be made with a differential of 3:1 between data and non-data. Designs are flexible, permitting various size cards and tickets, with outputs paralleling several digit bits, depending upon the physical width of the document.

Also available from Sealectro are magnetic stripe readers, custom engineered to your particular requirements. These readers meet all the specifications of the ABA code.

In addition to the above, Sealectro provides readers with additional functions, such as reject action, mechanical stamping of the document, etc.

Submit your particular requirements for a proposal.



PROGRAMMING DEVICES DIVISION

SEALECTRO CORPORATION

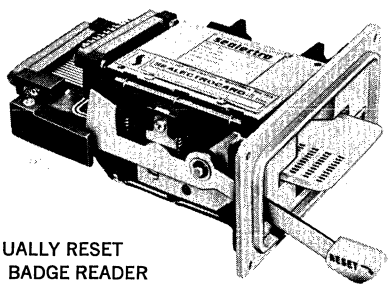
MAMARONECK, N. Y. 10543

PHONE: (914) 698-5600 TWX: 710-566-1110

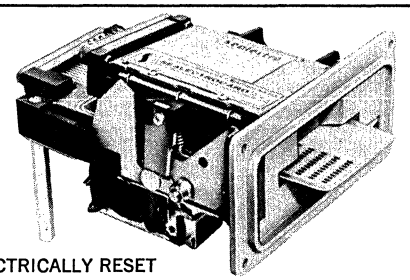
Sealectro Ltd., Portsmouth, Hants, England
Sealectro S.A., P.O. Box 24, Zone Industrielle de la Garde, la Garde 83, France

MBR SERIES
Punched Badge Mini-Badge Readers

- A NEW HIGH IN RELIABILITY
- A NEW LOW IN COST
- COMPACT
- MANUAL OR SOLENOID OPERATION
- REMOTE CONTACTS FOR MINIMUM MAINTENANCE
- READS UP TO 12 X 22 FORMAT (264 DATA BITS)
- FULL INTERLOCK FOR BADGE ORIENTATION
- READS PROVEN, RELIABLE, ECONOMICAL HOLLERITH CODE



MANUALLY RESET
MINI BADGE READER



ELECTRICALLY RESET
MINI BADGE READER

At last—the right answer for controlled access, time clock, library, warehouse, parking lot, vending machine, and credit card systems. Reads popular Hollerith code with ultra-reliable, remote switch closures. Dirt, grease, grime — makes no difference. No photo-optics to clean and pamper. No tricky auxiliary electronics. These readers just work and work. And the price is a fraction of what you'd think you would have to pay for this reliability. Positive orientation check eliminates mis-reads. Available in manual or solenoid operation. Models now ready for ID badge or credit-card sizes, with data areas from 10 x 10 to 12 x 22.

Here's the missing link for that data acquisition system you're building or planning—READY RIGHT NOW AND AT THE RIGHT PRICE! Send for complete details...

Specifications

Mechanical Specification

Operation: Manual or manual and electrical reset
Number of Columns: 10/12/20/22
Number of Rows: 12
Operating temperature range: +5°C to +55°C
Humidity: 30% to 70% relative
Interlocks: Card fully inserted
Card correctly orientated
Mounting: Front of panel and rear support
Weight: Manual Model: 1 lb.
Electrical reset model: 2 lbs.
*Solenoid Voltage: 24, 110, 230 Volts, 50-60Hz
*Solenoid Power Consumption: 430 V.A. Initial
17 V.A. Final Holding.

*Electrical reset model only.

Contact Specification

Electrical Life: 10^6 operations minimum
Mechanical Life: 10^6 operations minimum
Voltage rating: Up to 50 Volts DC
Current rating (switching): 100 mA (resistive load)
Current rating (static): 250 mA
Loop circuit resistance: Less than 300 m Ohms after 10^6 operations
Overall Size: Manual reset model: 5" wide x 2.60" high x 8" long (including 2" lever)
Electrical reset model: 5" wide x 4.13" high x 6" long

Badge Specification

Type II (F), Type III (M) or Sealectro Standard (H) Cut Corner Badges.

PROGRAMMING DEVICES DIVISION
SEALECTRO®
CORPORATION
MAMARONECK, N. Y. 10543
PHONE: 914 698-5600 TWX: 710-566-1110
Sealectro, West, 3003 Glendale Blvd., Los Angeles, Ca. 90039
Sealectro Ltd., Portsmouth, Hants, England
Sealectro S.A., la Garde 83, France

TAURUS

World Leaders in Card Readers

FEATURING HIGH RELIABILITY

A Complete Line of Punched Card Readers for Static and Serial Programming

APPLICATIONS

COMMERCIAL USES: Automatic test equipment, batching, automated warehousing, data processing, process control, flight simulators etc.

MILITARY USES: Ground checkout equipment, programming, testing, component testing, simulators, etc.

STANDARD SPECIFICATIONS

Cards—IBM, Rem. Rand or others.

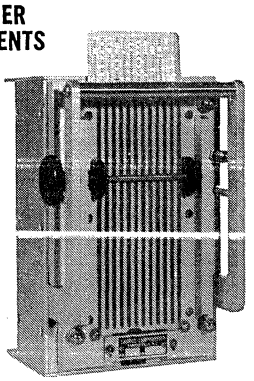
No. of Switches—10 to 960—(Form A, B or C).

Electrical—Dry Circuit to 3 AMPS.

MODEL M-4 *NEW!*

FULL IBM CARD STATIC READER
SMALLER — MANY IMPROVEMENTS

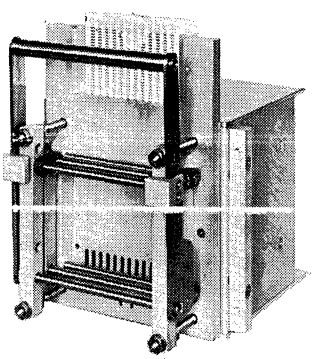
Reads up to 80 columns, or 960 switches, (complete IBM card). Most compact switching array available. Reads indirectly for maximum reliability. After insertion, punched hole has a closed switch, no hole an open switch. Switch reliability 100,000 cycles. Mechanical reliability 500,000 cycles.



MODEL JM-4 *NEW!*

SMALLER — MANY IMPROVEMENTS
STATIC READER
FOR ONE HALF OF AN IBM CARD

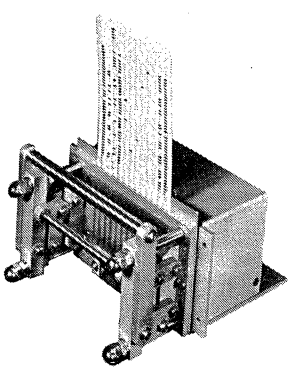
Reads up to 40 columns, or 480 switches, of an IBM card. After insertion, punched hole has a closed switch, no hole an open switch. Switch reliability 100,000 cycles. Mechanical reliability 500,000 cycles.



NEW!

MODEL CM-20

Reads up to 20 cards or 240 switches. Specifically designed for stacker cranes. Same switches as in M-4 and JM-4.

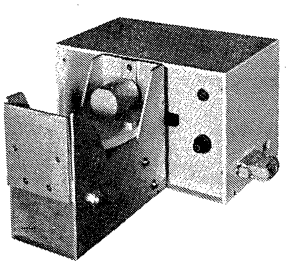


NEW!

MODEL 610-P

SERIAL READER
PHOTO-ELECTRIC

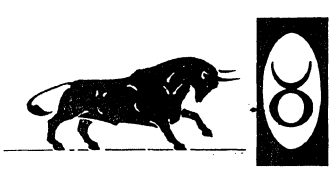
Less than $1,000.



Reads standard 80-column, 12-row cards, serially, column by column, 40 columns per second or less. For on line computer, remote transmission, interfaced with other machines, numerical control, card duplication or correction. Sizes 6¼" High x 9¾" Wide x 6½" Deep. Automatic card feed available for sequential feeding of up to 200 cards.

Also Teflon Terminals and Printed Circuit Board Guides

CUSTOM BUILT UNITS ARE OUR SPECIALTY. We will fill your requirements in spacing, switch action, number of switches and any other special needs, and will determine the most economical size and type for your operations.
Send for 1971 Catalog.



TAURUS CORPORATION
LAMBERTVILLE, NEW JERSEY 08530
AREA CODE (609) 397-2390

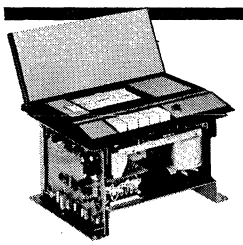
TELEX® TERMI SERIES

digital cassette recorders and memories

TELEX—world's leading designer and manufacturer of recording equipment—has drawn upon thirty-five years of expertise to create the new TERMI Series of digital cassette memories — basic transports to complete memory systems which are pre-engineered for virtually every modern digital application. TERMI equipment is ideally suited for:

- Point-of-Sale
- Data Capture
- Peripheral Storage
- Data Communications
- Keyboard-to-Tape
- and many other applications.

TELEX provides important mechanical enhancements, read/write subsystems including power supplies, digital control interfaces and parallel, NRZ, or serial start-stop interfaces to supplement basic TERMI transports. Detailed information is available for each, and will be forwarded upon request.



TERMI 137 SERIES
incremental cassette memory systems

The Termi-137 Series provides reliable, flexible, low-cost data storage with optimum reliability and unique configuration flexibility. Serially record and reproduce data at 500 bits-per-second, with full manual control for all modes of tape operation. With a packing density of 250 BPI, a standard Philips C60 cassette provides a capacity of 8.5 x 10^5 data bits. 137 Series machines will:

- Record/Reproduce incrementally at 10, 15 or 30 8-bit characters-per-second in serial or parallel format.
- Provide speed selection which permits changing operating speed to 10, 15 or 30 character record/play.
- Interface readily with any standard terminal device or computer system.

TELEX's unique incrementing mechanism results in unusual reliability; a typical character error rate of less than 1 in 10^5 can be achieved without sacrificing O.E.M.-oriented economy.

Silicon solid-state circuits and modularity provide a wide range of possible configurations without appreciable differences in unit size or cost.

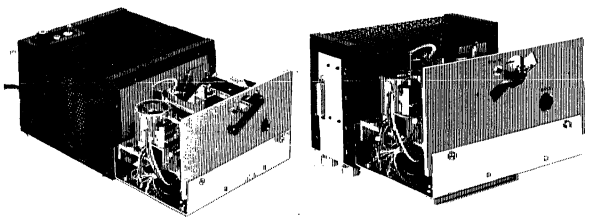
SPECIFICATIONS FOR 137 SERIES MODELS

Recording Medium (Tape)	Standard Philips C60 or C90 compact cassette
Recording Format	Saturation Harvard code redundant on 2 tracks
Storage Capacity	10/Steps per second: 17,000 characters
	15/Steps per second: 50,000 characters
Start Time	15 milliseconds
Stop Time	10 to 50 milliseconds
File Protect	Utilizes file tabs available on standard cassettes
Controls	Manual controls located at the recorder; interlocked so that no two functions can be accomplished simultaneously to prevent loss of data and mechanical malfunctions.
Optional Controls	Tape advance switch fitted for remote control of tape motion

137 SERIES MODELS

All machines in the Termi-137 Series are basically similar. Model numbers indicate interface capability.

MODEL	INTERFACE CAPABILITY
137A	NRZ
137AP	9-Bit Parallel
137ASE	EIA RS-232-C Serial Start-Stop
130ASC	TTY Current Loop



TERMI 138 SERIES
digital cassette memory subsystems

TERMI-138 Series subsystems provide O.E.M. users with exceptional reliability. The ultimate in low-cost tape storage and complete configuration flexibility. Four models are available.

- TERMI-138B, deck only with optional mechanical enhancements
- TERMI-138S, complete read/write subsystem
- TERMI-138P, parallel I/O subsystem
- TERMI-138E, featuring EIA RS-232-C serial start-stop interface

Each model includes Telex's 138 transport specifically engineered for digital applications which is constructed on a precision-bored, die-cast frame to ensure accuracy and achieve longest possible operational life.

TERMI-138B

Model 138B operates bi-directionally at speeds from 2 to 15 ips. Nominal fast/reverse speed is 60 ips, which will completely rewind a standard Philips C60 cassette in 60 seconds. Sensors provided include File Protect, Clear Tape, Low Tape and Cassette-in-Place. Includes a two-track, digital grade magnetic head or, optionally, a two-track read-after-write head. Additional options include: DC Servo-controlled capstan motor to replace standard hysteresis synchronous motor; electrically-controlled capstan speed change in 2:1 or 4:1 ratio, and DC Servo-controlled reel drive motors.

TERMI-138S

Model 138S extends the basic 138B through the addition of read/write electronics with NRZ data interface, control logic and optional power supplies to make the Model 138S a complete functional memory subsystem. Control is accomplished by means of four mode lines for simplicity of interface. Dual channels, read-after-write, high-speed IRG search, read-only and write-only features are among available enhancements.

TERMI-138P*

The Model 138P is a bi-directional, 800 BPI phase encoded unit with up to 16 bit parallel interface. Data transfer can be accomplished at up to 12,000 bps, depending upon tape speed. Model 138P consists of two major modules; a precision tape transport and complementary electronics package. May be configured for synchronous read/write, synchronous read/asynchronous write or incremental read/write operation to suit application. Capstan speeds from 2 - 15 ips; fast forward/reverse speed of 60 ips, top or slot loading.

TERMI-138E

Model 138E is a character (byte) oriented incremental memory designed for general-store and forward applications in conjunction with low-speed data terminals and input/output devices. It is also ideal for data capture applications where data is transferred to or received from remote equipment. TERMI-138E can directly replace paper tape reader/punch units, performing all the same functions (within prescribed speed limitations), while simultaneously offering edit, character search and general convenience in handling and operation. TERMI-138E operates at selectable data rates of 10, 15 or 30 CPS.

SPECIFICATIONS

Recording Format	800 BPI, Phase Encoded, compatible with ECMA, ANSI and ISO-proposed standards
Tape Speed	2-15 ips
	10-15-30 CPS for 138E only
Incremental Speed	To 15 steps/sec.
Storage Capacity	Approximately 2.88×10^6 bits max. on 300' (C60) cassette. Approx. 30,000 characters for Model 138E.
Fast Forward Rewind	60 ips or 1-minute for 300'
Start/Stop Time	22 msec. max. @ 6 ips
	50 msec. max. @ 60 ips
Tape Motion Control	Hysteresis synchronous capstan drive. Optional DC Servo capstan drive; patented clutch reel drive; optional DC Servo reel drive.
Number of Tracks	Two
EOT-BOT-Low Tape	Optical detection
Cassette Type	Standard or Improved Philips compact cassette

***OPTIONAL PDP-8 INTERFACE FOR TERMI-138P**

Telex offers an optional interface which will adapt the Termi-138P to DEC's PDP-8 computers. Features include:

- 3-cycle data break
- Connects directly to I/O bus
- Cables and connectors included
- Device handler permits cassette to serve as mass storage device
- Writes in forward direction; reads both forward and reverse; spaces forward or reverse at high speed (all under program control)
- Complete control with only seven computer instructions

TELEX® COMMUNICATIONS DIVISION 9600 Aldrich Avenue South • Minneapolis, Minnesota 55420

Theta INSTRUMENT CORPORATION

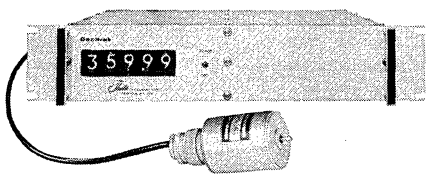
Encoders, Displays, Systems

DECITRAK® SHAFT ENCODERS

Theta offers two types of shaft encoders — absolute, providing a high accuracy BCD or decimal coded output; and incremental, an advanced optical design providing pulse outputs at very low cost.

ABSOLUTE

- Range 3-6 decades
- BCD and decimal codes
- DTL/TTL compatible outputs
- Angular and linear scales
- Rugged industrial design
- Output unaffected by power outage



STANDARD MODELS

Revolutions for Full Range	Numerical Readout
1	000° to 359°
1 or 10	000 to 999
1 or 36	000.0° to 359.9°
1 or 36	−179.9° to +179.9°
10 or 100	0000 to 9,999
36 or 360	00000 to 359.99°
36 or 360	−179.99° to +179.99°
100 or 1000	00000 to 99,999
36, 360 or 3600	000000 to 359.999°
36, 360 or 3600	−179.999° to +179.999°
1000 or 10,000	000000 to 999,999
24	0 to 23 HR 59 MIN 59 SEC

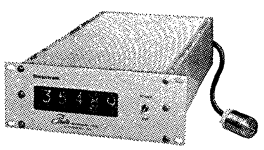
INCREMENTAL

- Noncontacting optical design
- Long-life LED light source
- Square wave or bi-directional pulse
- Metric scale available
- Use as digital tachometer
- Available as component kit for OEM uses
- Special scales available
- All encoders available with zero reference pulse

STANDARD MODELS

Revolutions for Full Count	Total Count
1	100
1	200
1	250
1	254
1	256
1	360
1	500
1	508
1	512
1	1000
1	1024
1	2000

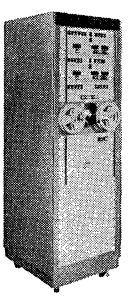
SYNCHRO/DIGITAL CONVERSION



These units instantly convert angular data from remote synchros to true digital display, with high speed and great accuracy. Applications include antenna positioning systems, ground support equipment, and synchro test stations.

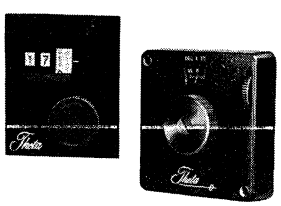
- Range 0 to 359.99 degrees
- Accuracy 0.05 degrees
- Resolution 0.01 degrees
- BCD or binary outputs
- Accepts synchro/resolver inputs at 11.8V, 26V or 90V, 60 or 400 Hz
- Floating zero available

DECITRAK SYSTEMS



Theta's DECITRAK systems utilize a building-block principle of standard logic modules and off-the-shelf encoders to provide custom-engineered solutions for control, display, interface, and data-logging problems, at very economical prices. Typical applications include multi-axis control, water level control, batch weighing, control and data-logging of test platforms, inventory control, control of three-axis inspection equipment, and many others.

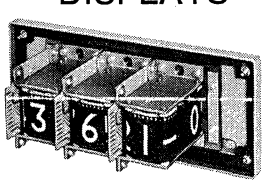
DIALS



Theta offers dials and dial assemblies in hundreds of styles and sizes.

- Accuracy to 6 minutes of arc
- Continuous rotation
- Fine setting with vernier control
- Front panel mounting

DISPLAYS



These numerical displays are complete, panel-mounted assemblies available with a variety of readouts and associated circuitry.

- Range 3-6 decades
- Accepts BCD or pulse input
- Character size to large three-inch numerals
- Complete with power supply

Theta INSTRUMENT CORPORATION
Specialists in Digital Automation
Fairfield, New Jersey 07006
Phone: 201-227-1700 Tlx: 138621

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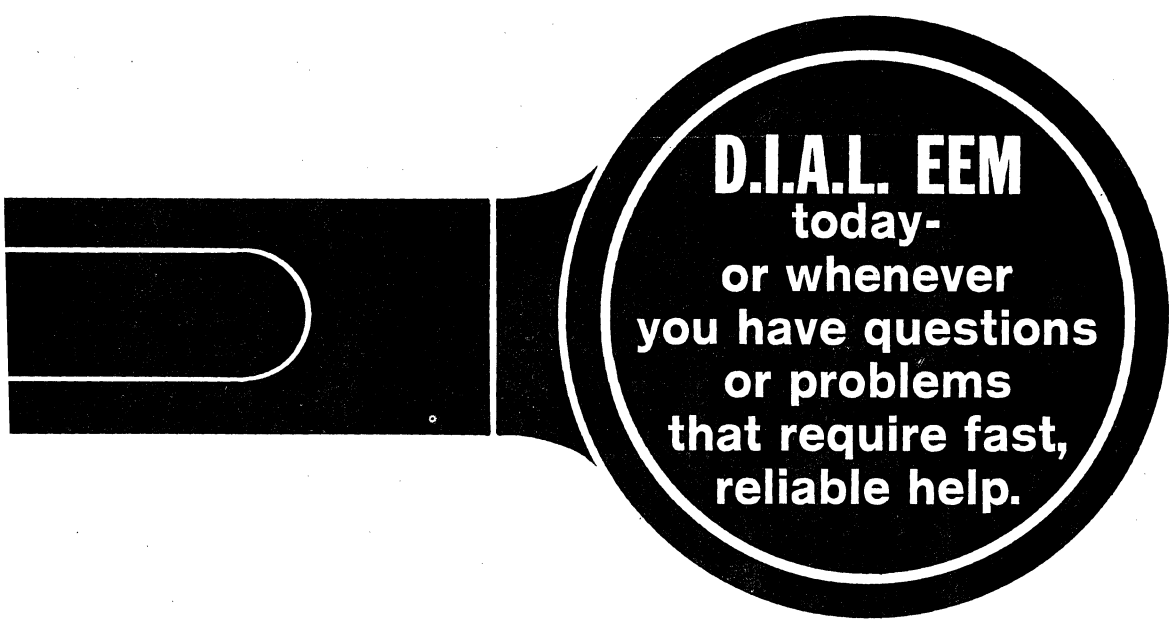

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PHONE NO: 516 293-3100 TWX510-224-6420

SOLID STATE SYNCHRO/RESOLVER CONVERTERS

	Input	Output	Static Accuracy	0 to −70°C	−55°C to +85°C	PACKAGE
14 BIT SYNCHRO OR RESOLVER TO DIGITAL CONVERTER Series 1623E Miniaturized, solid state unit that converts synchro or resolver inputs to binary or BCD outputs. Conversion Time: 2.4 ms max.	Frequency: 60 or 400 Hz. L-L V_{RMS}: 10, 11.8, 12.6, 18.2 or 90 volts. Reference: 26 or 115 volts RMS.	14 bit parallel binary, 4 decade BCD, or both. TTL, DTL compatible.	±4′ or 0.1°	√	√	Module 3.125″ x 2.625″ x 0.82″
DIGITAL READOUT ANGLE POSITION INDICATOR Series 2623 Adjustable brightness, solid state, compact, accurate and economical. BCD output available at connector. With or without built-in power supplies.	Frequency: 60 or 400 Hz. L-L V_{RMS}: 10, 11.8, 12.6, 18.2 or 90 volts. Reference: 26 or 115 volts RMS.	Front Panel Digital Display: Readout 359.9, ±179.9 or 9999. 4 decade BCD avail. at rear connector.	±0.1 degree. Total worst case.	√	√	5.5″ x 1.75″ x 5.5″
SYNCHRO OR RESOLVER TO LINEAR DC CONVERTER Series E678 — 1637 Converts all standard synchro or resolver inputs to linear DC output proportional to the angle. Switching point is non-ambiguous. All models are short circuit proof.	Frequency: 60 or 400 Hz. L-L V_{RMS}: 11.8 or 90 volts. Reference: 26 or 115 volts RMS.	**E678:** −10 to +10 VDC for angles from −180° to +180°. **1637:** −10 to +10 VDC for angles from −89.5° to +89.5°.	6′, 15′, 30′ or 1 degree	√	√	Module: E678: 0.82″ x 3.06″ x 3.625″ 1637: 0.78″ x 2.53″ x 3.22″
SYNCHRO OR RESOLVER TO SINE-COSINE DC Series 655 or 697 Miniature modules that generate sine and cosine DC outputs proportional to the synchro or resolver input signals.	Frequency: 60 or 400 Hz. L-L V_{RMS}: 11.8 or 90 volts. Reference: 26 or 115 volts RMS.	−10 volts to +10 volts DC, representing the sine and cosine of the input angle.	±6′	√	√	Module: P4: 2.1″ x 2.2″ x .58″ P5: 1.85″ x .85″ x .82″
NON-VARIANT SYNCHRO TO SINE-COSINE CONVERTER Series 655NV Miniature module that accepts 3 wire synchro inputs and furnishes 2 DC output voltages proportional to sine and cosine of the input. Insensitive to synchro line voltage variations.	Frequency: 48 to 63 Hz or 400 Hz. L-L V_{RMS}: 11.8 or 90 volts. Reference: 26 or 115 volts RMS.	−10 volts to +10 volts DC, representing the sine and cosine of the input angle.	±6′	√	√	Module .82″ x 3.19″ x 3.44″
LINEAR DC TO SINE-COSINE CONVERTER Series C670 This solid state device accepts a DC input voltage proportional to angle and provides two DC output voltages simultaneously proportional to the sine and cosine of this angle.	−10 VDC to +10 VDC representing angles from −180° to +180°. Input impedance is 75K minimum.	Two DC voltages, K sine A and K cosine A where K = 10 volts ±1%. Output Z less than 1 ohm. Resistive load - 2K minimum.	±10′	√	√	Module 0.82″ x 3.19″ x 3.44″
SINE-COSINE TO SYNCHRO DRIVERS Series B676 Solid state synchro drivers designed to handle large current surges of TR, CT and CDs. Will drive three 11TR4s synchro loads to a low null. Overload and short circuit protected.	Two DC inputs from −10 to +10 volts into 100K ohms minimum representing sine and cosine of the angle.	11.8 volts AC L-L 400 Hz, 90 volts AC L-L 60 Hz or 90 volts AC L-L 400 Hz.	±10′	√		P.C. Card 4.5″ x 8.0″ x 1.12″
DIGITAL TO SYNCHRO/OR RESOLVER CONVERTER Series A1670 Miniature solid state device accepting a 14 bit digital input and generating an isolated 3 wire synchro or 4 wire resolver output.	14 bit input representing angles from 0 to 360°. MSB = 180°. Freq.: 400 Hz. L-L V_{RMS}: 11.8 V.	11.8 volts AC L-L 400 Hz, 90 volts AC L-L 60 Hz or 90 volts AC L-L 400 Hz.	±4′	√	√	P.C. Card 4.5″ x 6.0″ x 1.5″
COORDINATE ROTATOR — SINE-COSINE GENERATOR Series A689 A solid state device that accepts rectangular input (X and Y) and rotates the input through an angle proportional to a linear DC. Dynamic Response: 450 conversions per second.	Input A: X = R cos A and Y = R sin A, −10 to +10 VDC, R may vary from 20 mV to 10 V. Input B: −10 to +10 VDC for angles 0 to 360°.	R sin (A+B) and R cos (A+B) 10 sin β and 10 cos β.	±10′	√	√	Module 0.82″ x 3.19″ x 3.44″
POLAR TO RECTANGULAR Series A1618 A solid state module that converts input in polar form R, A to rectangular R Sin A and R Cos A. Dynamic Response: 450 conversions per second.	R: 20 mV to 10 volts into 100K ohms A: −10 to +10 volts into 100K ohms linear with angles from 0 to 360°	R Sin A and R Cos A into 2K ohms.	±10′	√	√	Module 0.82″ x 3.19″ x 3.44″
RECTANGULAR TO POLAR CONVERTER Series 695 Solid state device module that converts input in rectangular form X, Y to polar R, A. Dynamic Response: 450 conversions per second.	R cos A and R sin A into 100K ohms min. impedance. R may vary from 50 mV to 10 V.	R and A from less than 10 ohms to 2K ohms min. load.	±15′	√	√	Module 1.78″ x 3.19″ x 3.44″
MULTIPLEXER Series 2204-2208 4 or 8 dual channel buffered particularly suited for multiplexed synchro to either digital or DC systems.	10 sine θ and 10 cosine θ	±10 volts at 5 ma	±.025%	√	√	**2204** — 1.5″ x 1.5″ x .50″ **2208** — 2.7″ x. 1.5″ x .60″
COMPUTING DEMODULATORS Models 840 and 854 Fully isolated AC to DC proportional phase-sensitive bipolar output.	Model 840: 0 to 5 V_{RMS}. Model 854: 0 to 20 V_{RMS}. All models 400 Hz.	0 to ±4.3 VDC. 0 to ±10 VDC.	0.1% lin. 0.1% lin.	√ √	√ √	Model 840: 1.63″ x 1.0″ x 1.0″ Model 854: 1.63″ x 1.0″ x 1.0″

ANALOG MULTIPLIERS — COMPUTING GRADE

Model	350RP2	350MP4	380MP4	380CP5
3 DB BW	100 Hz	100 Hz	50 KHz	50 KHz
Size	.78x2.53x3.22	.58x2.03x2.28	.58x2.03x2.28	.78x3.19x3.44
Operating	−25 to	−55 to	−55 to	0 to
Input	+85°C	+85°C	+85°C	70°C
Impedance	100K, 50K	100K, 50K	10K ohms min.	10K ohms min.
Output V	±10	±10	±10	±10
Output MA	2	2	2	2
Accuracy%F.S.	0.25	0.25	0.25	0.25

MULTIPLEXED S/D, D/S AND SYNCHRO TO DC

MUX: Solid state multiplexed systems convert multichannel (up to 64) synchro and/or resolver angle information (60 or 400 Hz) into 14 bit binary and/or four decade BCD format. Also, 64 channels of 14 bit binary information can be multiplexed to drive 64 synchros directly.

Complete subsystems can be supplied.
WRITE FOR MULTIPLEXING BROCHURE.

VERNITECH

DIVISION OF VERNITRON CORPORATION

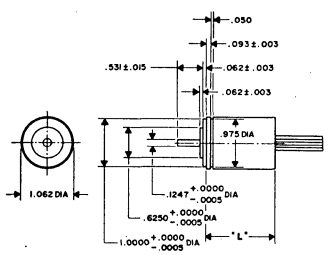
ABSOLUTE SHAFT ENCODERS

Type Number	Code	Full Count	Rev./ Full Count	Wt. (oz.)	Dia. (in.)	Lg. (in.)
VGE 11-403	Gray	2^8 (256)	1	3	1.062	0.835
VGE 11-442	Gray	2^{11} (2,048)	32	4	1.062	1.750
VGE 18-403	Gray	2^8 (256)	1	4	1.750	1.125
VGE 18-443	Gray	2^{12} (4,096)	16	6	1.750	2.125
VGE 18-450	Gray	2^{19} (524,288)	2048	9	1.750	3.125
VGE 31-407	Gray	2^{10} (1,024)	1	12	3.062	1.250
• VBE 11-204	Binary	2^8 (256)	1	3	1.062	0.835
• VBE 11-219	Binary	2^{13} (8,192)	32	4	1.062	1.750
• VBE 18-201	Binary	2^8 (256)	1	4	1.750	1.125
• VBE 18-216	Binary	2^{12} (4,096)	16	6	1.750	2.125
• VBE 18-237	Binary	2^{19} (524,288)	2048	9	1.750	3.125

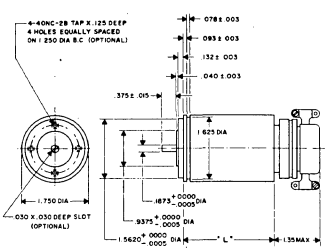
Type Number	Code	Full Count	Rev./ Full Count	Wt. (oz.)	Dia. (in.)	Lg. (in.)
VBE 18-250	Binary	2^7 (128)	1	6	1.750	2.375
VBE 18-260	Binary	2^{12} (4,096)	32	9	1.750	3.375
VBE 18-274	Binary	2^{19} (524,288)	4096	12	1.750	4.375
VBE 23-252	Binary	2^8 (256)	1	8	2.250	2.000
VBE 23-260	Binary	2^{12} (4,096)	16	12	2.250	2.750
VBE 23-274	Binary	2^{19} (524,288)	2048	16	2.250	3.750
VDE 23-301	BCD	0-359	1	8	2.250	2.000
VDE 23-302	BCD	0-3599	9	12	2.250	3.000
VDE 23-303	BCD	0-35999	90	16	2.250	4.125

• External logic required. Temperature Range: −55°C to +125°C.
Speed: 200 RPM maximum. Intermediate bit ranges available for all encoders.
Request catalog for full listing of standard products.

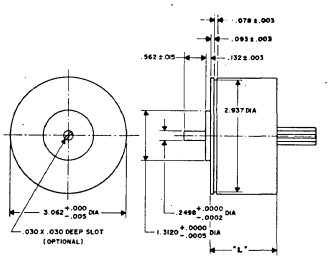
MECHANICAL CONFIGURATIONS



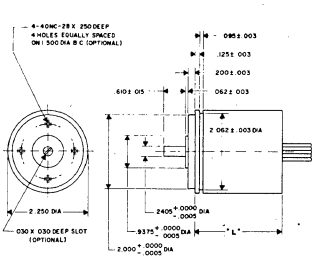
STANDARD SIZE 11 UNIT with Leads. "L"—See Chart.



STANDARD SIZE 18 UNIT with Connector. "L"—See Chart.



STANDARD SIZE 31 UNIT with Leads. "L"—See Chart.



STANDARD SIZE 23 UNIT with Leads. "L"—See Chart.

OUTPUT LOGICS:

I. Discrete
- A. Positive: Binary 1 = +5 to +15 VDC @ 5ma per bit. Binary 0 = Open Circuit.
- B. Negative: Binary 1 = −5 to −15 VDC @ 5ma per bit. Binary 0 = Open Circuit.

II. Integrated Circuits
- A. Binary 1 = +5 VDC from DTL type logic. Binary 0 = 0 VDC.

INCREMENTAL SHAFT ENCODERS

	Type Number	Cycles Per Rev.	Diameter (Inches)	Weight (Ounces)	Operating Speed (Max. RPM)	Operating Life (Revs. @ 200 RPM)	Useful Life (Revs.)	Starting Torque (GM-CM)	Moment of Inertia (GM-CM2)	Operating Current (MA)
SINGLE OUTPUT	VIE 11-601	64	1.062	3	1500	20 x 10^6	50 x 10^6	10	10	20
	VIE 11-603	100	1.062	3	1500	20 x 10^6	50 x 10^6	10	10	20
	VIE 23-602	200	2.290	6	1000	10 x 10^6	29 x 10^6	20	25	20
	VIE 23-603	256	2.290	6	1000	10 x 10^6	29 x 10^6	20	25	20
	VIE 31-602	1000	3.062	9	500	5 x 10^6	15 x 10^6	30	40	20
	VIE 31-603	1024	3.062	9	500	5 x 10^6	15 x 10^6	30	40	20
DUAL OUTPUT 90° PHASED	VIE 11-600	32	1.062	3	1500	20 x 10^6	50 x 10^6	10	10	10
	VIE 11-602	50	1.062	3	1500	20 x 10^6	50 x 10^6	10	10	10
	VIE 23-600	100	2.250	6	1000	10 x 10^6	29 x 10^6	20	25	10
	VIE 23-601	128	2.250	6	1000	10 x 10^6	29 x 10^6	20	25	10
	VIE 31-600	500	3.062	9	500	5 x 10^6	15 x 10^6	30	40	10
	VIE 31-601	512	3.062	9	500	5 x 10^6	15 x 10^6	30	40	10

NOTES: 1. Length of all units −1.5" max.
2. Accuracy ±.125 cycle.
3. Guaranteed noise free outputs.
4. Operating Temperature −0°C to +70°C.
5. Dustproof/humidity enclosures for industrial application.
6. Varied resolutions available.

VERNITECH
DIVISION OF VERNITRON CORPORATION
300 Marcus Boulevard, Deer Park, New York 11729 / (516) 586-5100, TWX: 510-227-6079

SEE Vol.1•381 & Vol.2•543, 2•669 FOR OTHER MOTORS, CONVERTERS, AND READOUTS

VERNITECH
DIVISION OF VERNITRON CORPORATION

NOW AVAILABLE FOR THE FIRST TIME, REPAIRABLE AND NON-REPAIRABLE SYNCHRO CONVERTER MODULES, PLUS CONVERTERS IN BOARD CONFIGURATION.

SYNCHRO/RESOLVER TO DIGITAL CONVERTERS

Hz	L-L Voltage	Resolution	Power Requirements	Size (Inches)	Model No.	Available Options
60	90	14 Bit Bin	±15 VDC; +5V; 115 VAC Ref.	2⅝ x 3⅛ x .82 (plus XFRMR)	VSD-609SM	1. Board Configuration
60	90	0-3599 BCD	±15 VDC; +5V; 115 VAC Ref.	5 x 3¾ x 1	VSD-609SM-D	2. Self Contained Power Supplies
400	11.8	14 Bit Bin	±15 VDC; +5V; 26 VAC Ref.	2⅝ x 3⅛ x .82	VSD-401SM	3. −55°C to +85°C Operating Temperature
400	11.8	0-3599 BCD	±15 VDC; +5V; 26 VAC Ref.	5 x 3¾ x 1	VSD-401SM-D	4. Serial Output
400	90	14 Bit Bin	±15 VDC; +5V; 115 VAC Ref.	2⅝ x 3⅛ x .82	VSD-409SM	5. ± BCD Output
400	90	0-3599 BCD	±15 VDC; +5V; 115 VAC Ref.	5 x 3¾ x 1	VSD-409SM-D	6. Multi-speed Conversion
						7. Multi-channel Conversion

ALL VERNITRON CONVERTERS WILL:
1. Operate over 0-70°C range.
2. Have a Digital Interface with DTL or TTL Compatible Logic.
3. Accuracy — ±4 minutes ±1.19
4. Track at 360°/second (400Hz), 180°/second (60Hz).
5. Be repairable in the field, if ever necessary.

DIGITAL TO SYNCHRO/RESOLVER CONVERTERS

Hz	Output Voltage	V.A. Output	Accuracy	Power Requirements	Size (inch)	Model No.	Available Options
60	90	2	±1 LSB	±15 VDC; +5 VDC; 115 VAC Ref.	5 x 4 x 2*	VDS-609SP-2	1. Modular Configuration
60	90	5	±1 LSB	±15 VDC; +5 VDC; 115 VAC Ref.	5 x 4 x 1**	VDS-609SP-5	2. Self Contained Power Supplies
400	11.8	2	±1 LSB	±15 VDC; +5 VDC; 26 VAC Ref.	5 x 4 x 2	VDS-401SP-2	3. −55°C to +85°C Operating Temperature
400	11.8	5	±1 LSB	±15 VDC; +5 VDC; 26 VAC Ref.	5 x 4 x 1**	VDS-401SP-5	4. Serial In ut
400	90	2	±1 LSB	±15 VDC; +5 VDC; 115 VAC Ref.	5 x 4 x 2*	VDS-409SP-2	5. Multi-channel Inputs
400	90	5	±1 LSB	±15 VDC; +5 VDC; 115 VAC Ref.	5 x 4 x 1**	VDS-409SP-5	

ALL VERNITRON CONVERTERS HAVE:
1. 12 Bit parallel binary coded angle input (MSB = 180°, . . .).
2. Digital interface compatible with DTL or TTL logic.
3. Field repairability, if ever necessary.
4. Storage Registers available at no extra cost.

* Transformers to be mounted externally.
** Transformers, power transistors, and heat sinks to be mounted externally. Consult factory for required volume.

SPECIAL CONVERTERS

Type Converter	Part Number	Description
Solid State Synchro Signal Amplifier	VSA-101	Input: 3 Wire Synchro Data, 90V L-L, 60 or 400 Hz; 115V Reference Output: 3 Wire Synchro Data, 90V L-L, 60 or 400 Hz Channels: Two, each completely isolated Accuracy: Plus/Minus 6 minutes of arc Size: Standard 19″ Rack (19″ x 6″ x 20″) Misc.: Self-contained Power Supplies; Short Circuit Protected; Automatic Cutoff of DC Supply if Overload exists; Overload Indicator
Synchro/Resolver to Linear DC Converter	VSDC-401-SP VSDC-409-SP VSDC-609-SP	All parameters identical to those of the Synchro/Resolver to Digital converters, except: 1) Accuracy — ±10′ at room temperature 2) Digital output also available in addition to DC 3) Output 0-10 VDC, 0-5 VDC, 0-±10 VDC, 0-±5 VDC
Synchro/Resolver to Sine-Cosine DC Converter	VSDC-401-SP-A VSDC-409-SP-A VSDC-609-SP-A	All parameters identical to those of the Synchro/Resolver to Digital converters, except: 1) Accuracy — ±10′ of arc at room temperature 2) Output ranges same as Synchro to DC above, except in sine-cosine form
Sine-Cosine DC to Synchro Converter	VDCD-401-SP-A VDCD-409-SP-A VDCD-609-SP-A	All parameters identical to those of the Digital to Synchro/Resolver converters, except: 1) Accuracy — ±10′ of arc at room temperature (Dependent upon load) 2) Input Levels 0-10 VDC, 0-5 VDC, 0-±10 VDC, 0-±5 VDC

STILL OTHER PACKAGES AVAILABLE AT VERNITECH:

DC TO SYNCHRO • STANDARD SERVO PACKAGES • SUB-SYSTEMS, WITH DISPLAYS AND POWER SUPPLIES
DIGITAL TO SHAFT POSITION CONVERTERS • UP-DOWN COUNTING SERVO PACKAGES • TORQSYN-ENCODER PACKAGES

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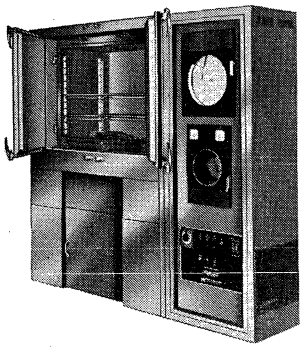
SEE Vol.1•380 & Vol.2•543, 2•669 FOR ENCODERS, READOUTS, AND MOTORS

BLUE M

TEMPERATURE CONTROLLED EQUIPMENT FOR CRITICAL RESEARCH/PRODUCTION WORK



FULL-RANGE TEMP./HUMIDITY CHAMBERS

Maximum capability cabinets to perform all current MIL humidity tests. Dual wet and dry bulb POWER-O-MATIC 60® Proportioning Control Systems assure absolute stability and reliability. Horizontal mechanical convection units feature programming, separate monitoring recorder, and built-in overtemperature protection. Range: −18°C. to +93°C. (±½°C.). Meets MIL-202D, Method 106C, Step 7A; automatically performs −10°C. dip without changing cams. Maintains R.H. ±½%. Chamber sizes: 5.8, 11, 27 and 64 cu. ft.

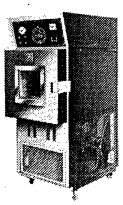
ALSO . . .

Full-Range Single Steady State Chambers

HUMID-FLOW™ Air-Cooled Chambers

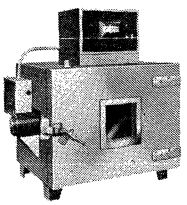
New −40°C. Extended Range Cabinets

New +150°C. Steady State Cabinets



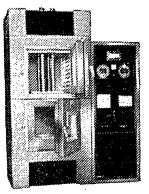
VERSA-RANGE® REFRIGERATED TEST CHAMBERS

Two versatile ranges: −100°F. to +400°F. and −40°F. to +200°F. Five chamber sizes — 3 to 64 cu. ft. Patented POWER-O-MATIC 60 Control for incomparably reliable performance. Also −40°F., −120°F. chest type units.



STABIL-THERM® LN_2 CHAMBERS

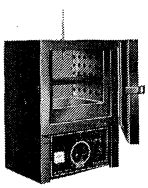
Front or top opening models. −185°C. to +200°C. with solid-state instrumentation. Similar units with CO_2 as coolant have −73°C. to +300°C. range. Quality construction throughout.



THERMAL SHOCK TEST CHAMBERS

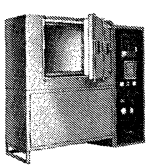
Dual Cabinets for MIL-STD-202D and 883; 3-Stage Cabinets for MIL-STD-202D, Method 102A, Preferred Conditions C and D; Versa-Whirl Baths for MIL-STD. 883, Method 1011, Conditions A to F. Also cycling units.

TYPICAL EXAMPLES OF AMERICA'S FINEST, MOST COMPLETE LINES OF OVENS AND FURNACES



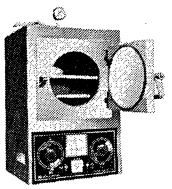
BURN-IN AND LIFE-TEST OVENS

Variety of types, sizes and ranges. POWER-O-MATIC 60 Control for unequalled reliability. Also Batch Ovens to 96 cu. ft. including new Class A units meeting recommendations of NFPA Bulletin 86A.



INERT GAS OVENS

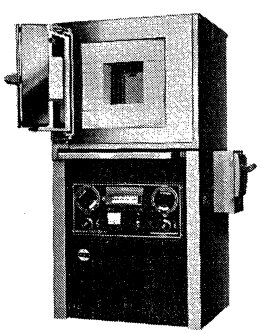
Complete line includes units with manual gas control on up to fully automated chambers with programming. Temperatures to +1200°F. Most have POWER-O-MATIC 60 Control; all have built-in overtemperature protection.



VACUUM OVENS

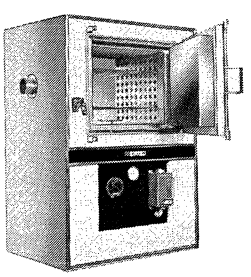
Wide choice of models including unique double-door units, most featuring patented POWER-O-MATIC 70® Solid - State Proportioning Control. Temperatures to +300°C. Typical vacuum rating to 50 microns or less.

HIGH TEMPERATURE CHAMBERS — OVENS TO +1300°F. (+704°C.) . . . FURNACES TO +2950°F. (+1620°C.)



Ultra-Temp Ovens, gravity and mechanical, with ranges to +1300°F. Feature new patented POWER-O-MATIC 80™ Solid-State Proportioning Control for true straight-line performance. Available with a variety of accessories including programming. Complete line of Furnaces includes new models with POWER-O-MATIC 80 Control for proportional performance at temperatures to +2950°F. All high temperature chambers have overtemperature protection standard.

FRICTION-AIRE™ — THE ELECTRIC OVEN WITH *NO* HEATING ELEMENTS — NOW U.L. LISTED FOR CLASS 1, GROUP D SERVICE!



Air turbulence is the only source of heat. Other models built to N.E. Code recommended practices for Class 1, Group D locations . . . others engineered for general-purpose applications of a critical nature. Various sizes . . . temperatures to +260°C. (+500°F.) . . . non-electric proportional controls. You can't buy a safer chamber!

FOR FULL DETAILS ON THESE PRODUCTS AND FOR INFORMATION ON OUR COMPLETE CONTROLLED TEMPERATURE CAPABILITY, WRITE:

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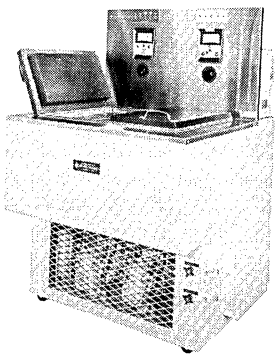
Corporate Headquarters: BLUE ISLAND, ILLINOIS 60406

ENVIRONMENTAL SIMULATION
TEMPERATURE (Hi-Lo) QUALITY CONTROL
ALTITUDE-HUMIDITY
PHYSICAL TESTING
ELECTRONIC THERMAL SHOCK

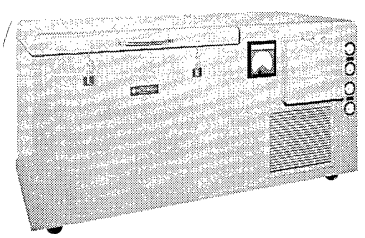
R/D TESTING

Model MB-2
2 Chbrs. 22″ x 12″ x 9″ D
"2A" —20 to +100°F.
"2B" —60 to + 60°F.
Immersion heaters; agitators



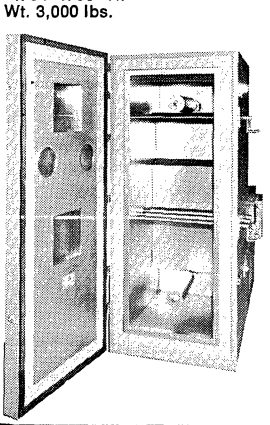
PROCESSING

Model T-120-10
Range: +70 to —140°F.
Chbr. 34″ x 24″ x 24″ D.
Ext: 80″ x 36″ x 40″ H.
Shipg. Wt. 2,000 lbs.



WIRE TESTING

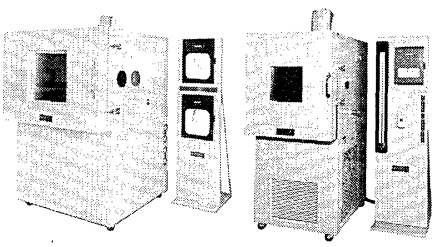
Model WU-100-24
Range: Ambient to —100°F.
Chbr. 24″ x 24″ x 72″ H.
2 Windows; 2 Arm ports
Multiple Mandrels
Ext. 36″ x 84″ x 88″ H.
Shipg. Wt. 3,000 lbs.



ENVIRONMENTAL SIMULATION

Model HU-120-12HC
Range: —100 to +500°F.
Humidity: 20 to 95% RH
Chbr. 24″ x 36″ x 24″ D.
Recording Controller
3900-W. heaters; air circulator; shelf; ports
Multipane window

Model AU-100-3HC
Range: —110 to +400°F.
Altitude: to 125,000 ft.
Chbr. 24″ x 20″ x 18″ D.
Indicating Controller
2600-W. air heaters
Multipane window
Ext. 32″ x 41″ x 72″ H.



equipment engineered to order

Equipment, custom-engineered for maximum product reliability, and efficient plant production is of special importance in many fields . . . heat treating, metallurgy, assembly and others.

Low temperature chambers for processing and storage are available to meet a wide range of specifications and unusual application requirements.

cryogenic processing equipment

Liquid Nitrogen equipment for industry must be engineered for efficiency and economy. The following features have been incorporated in the equipment illustrated.

Heavy Duty Construction: for maximum loading. Standard sizes for production requirements. Custom dimensions for special applications.

Versatility: immersion, vapor phase or spray headers operation.

Control Efficiency: manual fill or automatic operation.

Economy of Operation: Superior insulation and thermal/vapor barriers.

CINCINNATI SUB-ZERO PRODUCTS INC.

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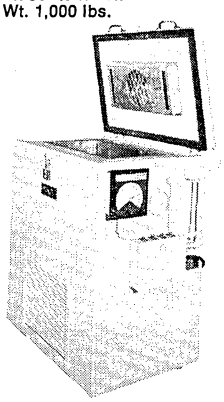
(513) 751-8810

In use all over the world

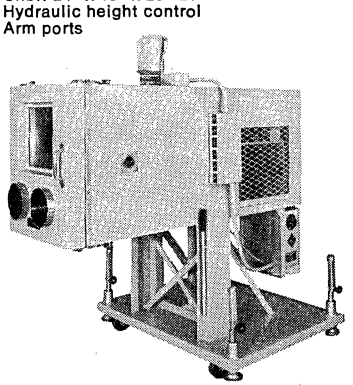
PRODUCTION CHILLING

Model V-150-5
Range: 0 to —150°F.
Chbr. 30″ x 18″ x 16″ D.
Ext. 42″ x 30″ x 47″ H.
Shipg. Wt. 1,000 lbs.



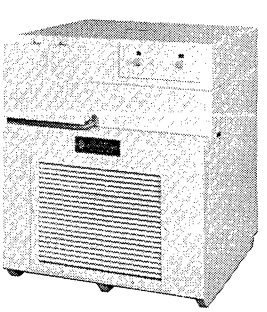
PHYSICAL TESTING

Model TT-120-5HC
Range: —120 to +500°F.
Chbr. 24″ x 18″ x 20″ D.
Hydraulic height control
Arm ports

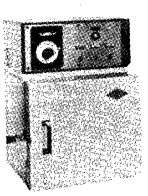


REMOTE SYSTEMS

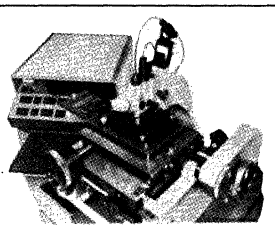
Model LC/200
Range: to —200°F.
Dual Cascade
To chill convection fluid
Exterior: 42″ x 32″ x 34″ H.



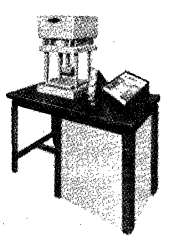
JADE MANUFACTURES



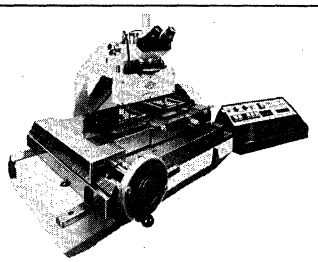
ENVIRONMENTAL CHAMBERS
Designed for quality...cost...delivery: the standards built into every Associated/Jade chamber often exceed everyday needs, enabling you to buy a lower priced standard instead of a custom special! CATALOG EEC.



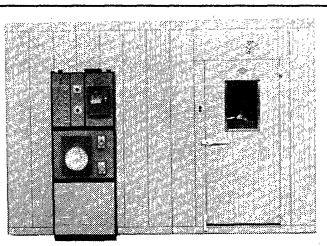
STEP & REPEAT CAMERAS
...in which extreme precision is an inherent part of the design; fully automated to produce sets of photomasks for ultra-precise manufacture of IC's, LSI's, transistors & other solid state devices. CATALOG ESR.



MECHANICAL THERMAL PULSE BONDERS
...for simultaneous multiple bonding of precision shape bonds. MTP systems provide higher production rates and yields & offer a variety of outstanding operating innovations as options. CATALOG EMTP.



REGISTRATION ANALYZERS
...for comparative analysis of photo masks, semiconductor wafers and other microminiature parts. Outstanding convenience and measurement options available. CATALOG ERA.



WALK-IN ROOMS
A complete Associated/Jade line incorporates, as standard, features unmatched in competitively priced rooms. Temperature ranges from −100°F to +180°F. Or custom specials built to your requirements. CATALOG EWR.

THE JADE CORP. ALSO MANUFACTURES THE WORLD'S MOST ADVANCED

MULTI-LEAD EDM EQUIPMENT
CONTACT PRINTERS
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AUTOMATIC TEST AND CONTROL EQUIPMENT

A. D. AUTOMATION PROGRAMMABLE TESTER A.D.A.P.T. 10K

A COMPLETELY AUTOMATIC PROGRAMMABLE SYSTEM FOR CHECKING CONTINUITY AND SHORT CIRCUITS. EXPANDABLE UP TO 10,000 WIRES OR CONNECTIONS IN MODULES OF 50.

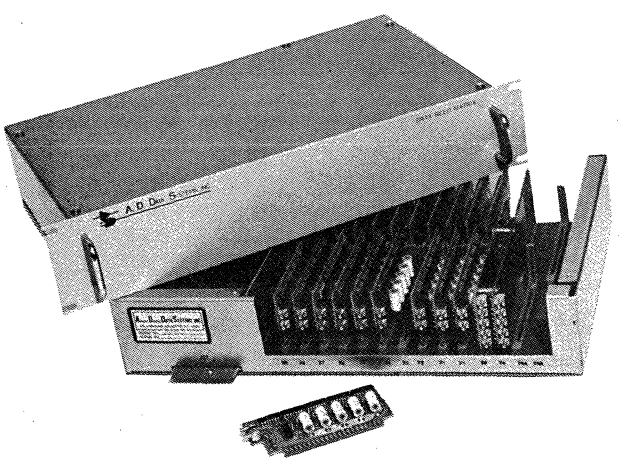
APPLICATIONS

- CABLES AND HARNESSES
- BACK PLANE WIRING
- FLEXIBLE PRINTED CABLES
- MULTILAYER CIRCUIT BOARDS
- MEMORY SYSTEMS

FEATURES

- SOLID STATE CONTROLS
- EXPANDABLE
- MODULAR CONCEPT
- SEALED RELAYS
- FAST 300 TESTS/SECOND
- HIGH RELIABILITY

REED RELAY MATRICES



REED RELAY MATRICES

For switching multiple path signals, using reed relays for signal switching and TTL compatible logic for controls.

Each path can be selected in nanoseconds from X, Y and select pulses which latch the control logic and the reed relay switch.

The switched path simulates a 50 ohm impedance coaxial line, terminated in 50 ohm connectors to give minimum signal distortion and crosstalk at frequencies exceeding 10 MHz.

Options include electrical readout of crosspoint selected.

TYPICAL APPLICATIONS

Controlled switching in automatic testing of integrated circuits, printed circuit modules, logic modules.

Routing of R.F. signals, telemetry signals.
Programming video signals.
Computer interface to automatic equipment.

Model 056-003 — 10 x 10 x 1 Matrix with Coax signal connectors.

Model 056-103 — 10 x 10 x 1 Matrix with Coax signal connectors and electrical readout of crosspoint selected.

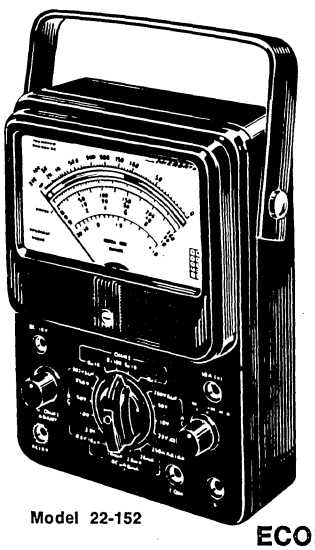
Model 056-006 — 10 x 10 x 2 Matrix.

Model 056-106 — 10 x 10 x 2 Matrix with crosspoint readout.

Model 056-009 — 10 x 10 x 3 Matrix.

Model 056-109 — 10 x 10 x 3 Matrix with crosspoint readout.

The ALLIED Brand . . . MICRONTA® Test Instruments



Model 22-152

100,000 OHMS/VOLT MULTITESTER

• 27 Ranges • Mirrored Scale • Battery/AC Supply

Model 22-152. Double-jeweled 4″ meter movement has ±2% accuracy. Silicon diode overload protection circuit. Battery/AC power supply for resistance scales. Ranges: DC Volts, 0-500 mV, 0-2.5-10-50-250-500-1000 V at 100,000 ohms/V sensitivity; AC Volts, 0-2-5-10-50-250-1000 at 12,500 ohms per volt sensitivity; DC Current, 0-10-25 μA, 0-2.5-25-250 mA, 0-10 A. Resistance, 0-20k, 200k, 0-2-20 megohms; Decibels, −20 to +62 in five ranges. Zero adjust control. Battery storage compartment. Precision crafted for years of reliable service. Complete with test leads, batteries and instructions. Size, 7 x 5¼ x 3¼″. Shpg. wt. 6 lbs.

910-4651 ..... **39.95**

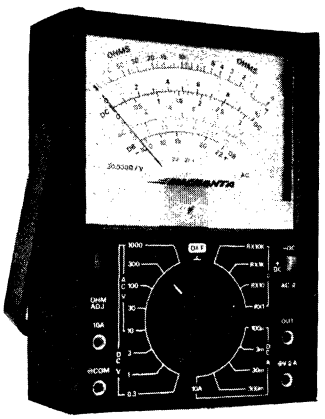
910-4652. Model 22-151 Carrying Case for Above. **5.95**

30,000 OHMS/VOLT MULTITESTER

• Polarity Switch • Mirrored Scale • 27 Ranges

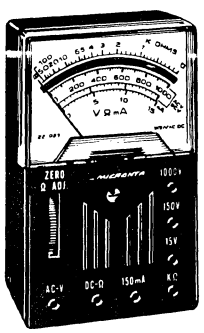
Model 22-203. Features 4″ meter movement with three-color mirrored scale. Polarity switch permits reversal without changing leads. Ranges: DC Volts, 0-0.3-1-3-10-30-100-300-1000 at 30,000 ohms/V sensitivity; AC Volts, 0-10-30-100-300-1000 at 10,000 ohms/V sensitivity; DC Current, 0-100 μA, 0-3-30-300 mA. Resistance, 0-1k-10k-1 meg-10 meg; Decibels, −10 to +62 in five ranges. Output jack. Ohms adjust control. Complete with test leads, batteries and instructions. Size, 6⅝ x 4⅞ x 1⅞″. Shpg. wt. 4 lbs.

910-4549 ..... **24.95**



Model 22-203

ECONOMY MULTITESTERS THAT REALLY PERFORM!



1000 OHMS/V 8-RANGE MULTITESTER

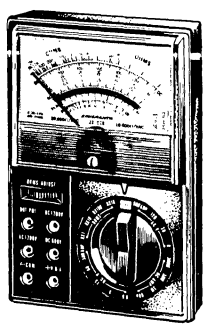
Model 22-027. Has easy-to-read two-color 2″ meter, pin jacks for all ranges. Ranges: AC/DC volts, 0-15-150-100; DC Current, 0-150 mA; Resistance, 0-100,000 ohms. Accuracy, ±3% full scale on DC ranges; ±4% on AC ranges. Zero adjustment. Mirrored scale eliminates parallax. 3½ x 2⅝ x 1¼″ bakelite case. With leads, battery. Shpg. wt. 1 lb.

910-4527 ..... **8.95**

20,000 OHMS/V 18-RANGE MULTITESTER

Model 22-201. Range/function switch includes off position. Meter has 3-color scales. Ranges: DC V, 0-5-10-25-125 at 20,000 ohms/V; AC V, 0-10-50-250-1000 at 10,000 ohms/V; DC Current, 0-50 μA, 0-250 mA. Resistance: 0-2k-20k-2 meg. Decibels, −20 to +62. Output jack. Overload protection circuit. Leads, battery. 5 x 3½ x 1⅜″. 1 lb.

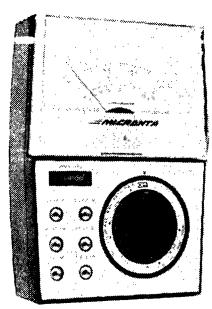
910-4546 ..... **12.95**



20,000 OHMS/V 25-RANGE MULTITESTER

Model 22-028. Features range switch with off position, 3-color meter with mirrored scale. Ranges: DC V, 0-0.6-3-15-60-300-600-1200 at 20,000 ohms/V; AC V, 0-6-30-120-600-1200 at 10,000 ohms/V; DC Current, 0-60 μA; 0-3-30-300 mA; Resistance: 0-5k-50k-500k-5 meg; Decibels: −20- to +63 in 5 ranges; Output jack. Leads, battery. 5x3¾x1½″. 1 lb.

910-4522 ..... **19.95**



20,000 OHMS/V 24-RANGE MULTITESTER

Model 22-202. Has range switch with off position, mirrored scale. Ranges: DC V, 0-0.6-3-15-60-300-600 at 20,000 ohms/V; AC V, 0-15-60-150-600-1200 at 10,000 ohms/V; DC Current, 0-60 μA, 0-3-30-300 mA; Resistance: 0-2k-20k-200k-2 meg; Decibels: −20 to +63. Output jack. Leads, battery. 5⅞ x 3⅛ 1½″. Shpg. wt. 1 lb.

910-4655 ..... **19.95**

ALLIED ELECTRONICS' CATALOG NOW AVAILABLE

A comprehensive buying guide to just about everything in industrial electronic parts and supplies. Compiled to meet the needs of industry, schools, institutions and government agencies, it's also the catalog for anyone looking for one dependable source for hard-to-get items . . . one or a thousand. Merchandise is grouped by sections and numerical cover margin tabs guide you quickly to the products you need. Write on company letterhead to: Allied Electronics, Dept. EEM, 2400 West Washington Blvd., Chicago, Ill. 60612.

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INSULATION TESTING INSTRUMENTS

ASSOCIATED RESEARCH, INC

Insulation Resistance Testers

Ranges from 100 to 10 million megohms at test potentials to 10 KV.

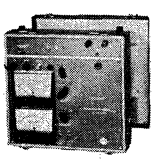
The MEG-CHEK® megohmmeter provides a wide selection of battery and line-powered instruments for accurate insulation resistance measurements of circuits, components, cables, motors, etc. They are direct reading and push button operated requiring no cranking or leveling.

Select from 17 models ranging from pocket-size to portable 10 KV with variable voltage. Some models combine megohm with ohm and AC-DC volt scales in one instrument. Five popular models are:

Model	DC Test Voltage	Max. Megohms	Features	Price
2001	500	100	Pocket-size	$ 99
2201	500	200	Includes 2K ohm and six AC-DC volt scales	165
2211	1000	2000	200 K ohm range	255
2850	500/50	10 Million	Constant test voltage through 6 decades	345
2955	0-2,500	50,000	Adjustable test voltage	890

Request MEG-CHEK Megohmmeter Bulletins by model number

Portable DC HYPOTS® to 200 KV



Output of the several portable DC HYPOTS is continuously variable from 0 to maximum with the voltage metered directly in the output. Leakage current measurements are on four range meters reading down to as low as 0.05 microamps. Features: 2% metering accuracies, electronic circuit protection, by-pass and metered return terminals, grounded steel cases, silicon rectifiers, plug-in high voltage leads, etc.

Model	Output Voltage	Output Current	Price
5205	0-5 KV	2.0	$ 550
5212	0-10 KV	2.0	675
5220	0-15 KV	2.0	735
5471	0-50 KV	5.0	2450
5321	0-100 KV	5.0	3115

Request Portable DC HYPOT Bulletins

Testing Manual Available

This 60 page collection of Bulletins covers specs, prices and applications of insulation resistance testers, AC HYPOT Juniors, portable and mobile DC test sets, corona and materials test equipment, kilovoltmeters, precision ohmmeter, current transformers, phase sequence indicators.

Request Manual 2900 on company letterhead

A-C HYPOT Jrs... to 10 KV, limited current

Portable a-c dielectric strength testers providing outputs continuously variable from 0-1500 V up to 10,000 V a-c. Use of neon breakdown and leakage current indicators in conjunction with collapsing field-type high voltage transformers assures rapid and safe production testing.

The leakage current indicator is adjustable from 0.3 to 3 ma. A 4½" kilovoltmeter provides high accuracy. Short-circuit current cannot exceed 18 ma.

Three popular models are:

Model	Output Voltage	Price
411	0-2,500	$190
404	0-4,000	195
422	0-10,000	315

HYPOT Jr. Automatic "Squawker" Models

Available with output voltages from 0-1500 volts to 0-6000 volts a-c. Similar to the standard HYPOT Jr. models but include an audible signal unit and external control terminals.

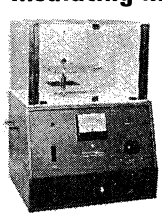
Request Bulletin 4-1.3

DC and Combined AC/DC HYPOT Jrs.

offer same features as described above, plus test potentials to 5 KV.

Request AC & DC HYPOT Jr. Bulletins

Insulating Materials Testers



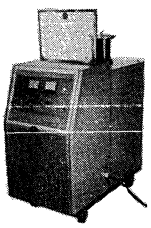
A full range of testers for solid and liquid insulating materials to 100 KV and higher is available. Due to the rapid progress of insulating materials and testing techniques, new equipment is added whenever required to meet ASTM, MIL and Federal test specifications.

Model 4501 Materials Testing HYPOT 0-35 KV at 2 KVA

This popular model meets dielectric strength testing requirements of Specification D-149, ASTM Standards on Electrical Insulation Materials. Output continuously variable from 0-35 KV a-c at 2 KVA (intermittent rating). Magnetic breaker trips when specimen breaks down. Output termination in jacks at center of the lucite cabinet top accepts the interchangeable ARI materials testing fixtures. Optional features: interlocked clear lucite test cage and selection of ARI plug-in materials testing fixtures, automatic rate of rise, dual sensitivity circuit breaker, etc.

Request Insulation Materials Tester Bulletin

High Voltage Test Equipment to 500 KV AC and 1,000 KV DC



A full range of instruments for extra high voltage dielectric strength testing. AC or DC potentials at capacities of up to 150 KVA or more. Control and measurement features include: automatic rate of voltage rise, memory circuit to record breakdown voltage, output current metering, separate low voltage control and high voltage test cabinets and many others.

ARI has over 30 years experience in the design and manufacture of heavy duty very high voltage test equipment. All instruments are ruggedly constructed and fully tested in our own high voltage laboratory.

Corona Testing Equipment

New instruments detect, display and measure corona caused by voids, surface or other conditions in the insulation sample or the equipment under test.

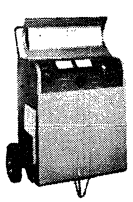
Instruments include: specially constructed corona-free HYPOT test set, a pickup network to extract the true corona signal and the corona detection display module. Detector also incorporates a calibrator to make quantitative corona measurements down to 0.1 picocoulombs.

These modules are available as individual units or as a complete integrated instrument. Standard models with test potentials of 10 to 100 KV AC include these two popular models:

Model	Output KV	KVA Capacity	Cabinet Style	Price
4074	10	0.25	Bench	$2250
4309	35	1.0	Console	3950

Request Bulletin 4-1.9.

Mobile HYPOTS . . . to 150 KV DC



Heavy-duty mobile test sets for determining insulation leakage and dielectric strength of cables, bushings, switch-gear, transformers, motors and generators.

Outputs continuously variable from 0 to 45 KV and on up to 150 KV, with ratings of 2.5, 5, 10 ma. at full voltage.

Features include: 4½" kilovoltmeter connected directly across the high voltage output; three-range 4½" microammeter electronically protected against overload; zero return interlock; connector for remote safety interlock; fast-acting magnetic circuit breaker in output to protect high voltage circuits and external load; thermal overload breaker to protect input circuits; long-life silicon high voltage rectifiers; metered return and bypass return terminals for measurement of load (leakage) or bypass (guard) currents.

Request Mobile DC HYPOT Bulletin 5-1.16

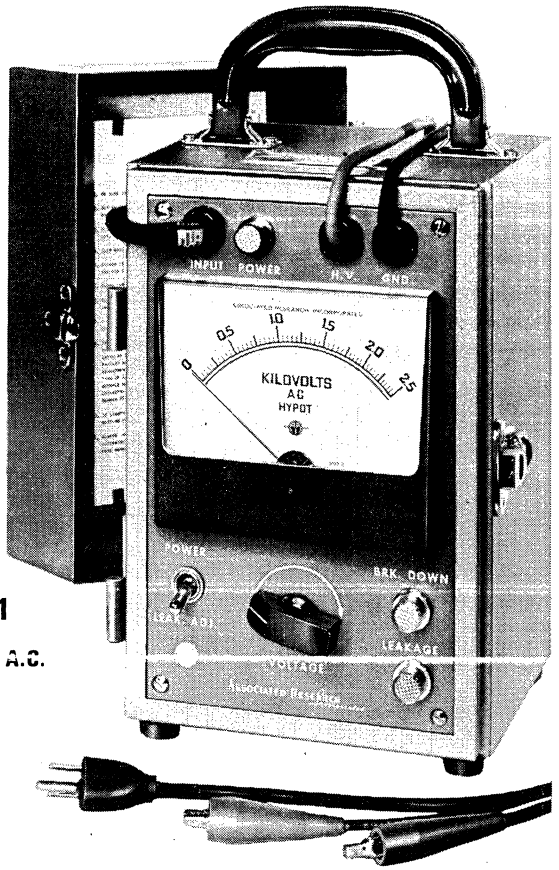
0025

ASSOCIATED RESEARCH, INC.
6125 WEST HOWARD STREET, CHICAGO, ILLINOIS 60648 • (312) 647-7850

INSULATION TESTING INSTRUMENTS

ASSOCIATED RESEARCH, INC.

HYPOT® Junior BREAKDOWN TESTERS



Model 411
(illustrated)
0-2500 volts A.C. output

only **$190**

make faster, safer AC dielectric strength tests of electronic parts and components, small tools, appliances, motors, transformers, etc.

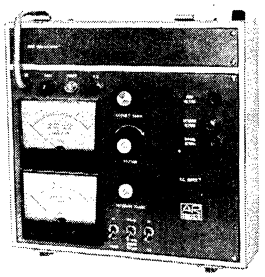
Simple to operate. Make breakdown, leakage and short tests to UL, CSA, ASTM, NEMA, IEEE, MIL and EASA standards. 115 vac, 50/60 cycle input. Continuously adjustable output. Included are: complete metering, controls, safety features, case with removable cover, test leads, line cord, instructions.

Visual Indicator Models . . . have neon "breakdown" light for breakdown, corona or arcing indication . . . and separate neon "leakage" light for leakage indication adjustable 0.3-3.0 Ma. 5 Models from 0-1500 to 0-10,000 volts output, priced from . . . . . **$185 to $315.**

Automatic "Squawker" models provide audible and visual test indications. 4 models from 0-1500 to 0-6000 volts output, priced from . . . . . **$285 to $325.**

Request Bulletin 4-1.3.

HYPOT® Juniors with leakage current metering



Two new models incorporate three range micro-ammeters and guard circuits. Both feature:

- low AC leakage current measurement
- external guard circuit to eliminate stray leakage current
- accuracy of ± 3% F.S. on voltage and current ranges

Model No.	Output Voltage	Leakage Current Ranges	Price
4006	0-0.75/1.5 KV	0-50/500/5000 microamps	$480.00
4030	0-2/4 KV	0-50/500/5000 microamps	$495.00

Request Bulletin 4-1.10.

MEGOHMMETER Model 2850

measures insulation resistance to 10 million megohms

only **$345**

Advanced features:

- **constant test voltage over full range**
- **no overload damage**
- **positive line-voltage control**
- **maximum guarding flexibility**
- **latest tube-miniaturization techniques**

Versatile, accurate, reliable. Dual test voltage . . . 500 vdc and 50 vdc. 24" total scale length . . . 1 to 10,000,000 megohms in 6 decades. 115 vac, 50/60 cycle input. Measures resistance on printed circuits, transistor and miniaturized circuit components, cables, motors, etc. Measures leakage resistance of capacitors. Measures grounded and ungrounded sections of three-terminal resistors.

Also available: Model 2851 with 100 vdc and 500 vdc dual test ranges . . . . . only **$355.**

Request Bulletin 2-1.4.

0026

ASSOCIATED RESEARCH, INC.
6125 WEST HOWARD STREET, CHICAGO, ILLINOIS 60648 • (312) 647-7850

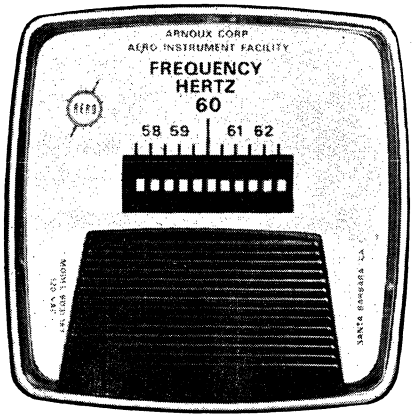
FREQUENCY METERS

OVER 25 YEARS OF CONTINUOUS PRODUCTION

VIBRATING REED METERS

The AERO Instrument Facility of Arnoux Corporation produces over 1000 different types and styles of Vibrating Reed Frequency Meters, with a proved history of usage spanning over 25 years. Unsurpassed for high performance and quality construction, all AERO Frequency Meters provide the inherent advantages of great accuracy (with 0.3% at 72°F, and within 0.1% on special order); long term stability (±75 ppm per degree F. from -60° to +180°); low power consumption; self-checking characteristics; high reliability; and extreme ruggedness. No adjustments are ever required on Vibrating Reed Frequency Meters. AERO meters are available with . . . . .

- **1.5 inch to 3.5 inch Round Cases**
- **Bakelite and Metal Construction**
- **Hermetic Sealing**
- **1 Reed to 11 Reeds**
- **Center Frequencies from 20 Hz to 400 Hz**
- **Voltages from 24 Vrms to 220 Vrms**
- **Running Time Indicators**
- **Combination Meters**

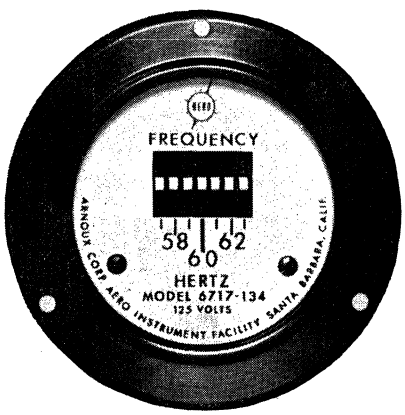


3.5 Inch Full View Meters

MODEL* NO.	CENTER FREQUENCY	FREQUENCY RANGE	NUMBER OF REEDS	REED INTERVAL	PRICE PER UNIT 1-24	25-49	50-99
2810.183	[50 Hz / 60 Hz]	48 to 52 Hz / 58 to 62 Hz]	10	1 Cycle	30.75	20.60	16.91
4059-183	400 Hz	380 to 420 Hz	9	5 Cycles	34.80	23.32	19.14
5D31-183	50 Hz	47.5 to 52.5 Hz	11	½ Cycle	30.60	20.50	16.83
5717-183	50 Hz	47 to 53 Hz	7	1 Cycle	28.55	19.13	15.70
6D31-183	60 Hz	57.5 to 62.5 Hz	11	½ Cycle	30.60	20.50	16.83
6511-183	60 Hz	55 to 65 Hz	11	1 Cycle	30.60	20.50	16.83
6717-183	60 Hz	57 to 63 Hz	7	1 Cycle	28.55	19.13	15.70
6815-183	60 Hz	58 to 62 Hz	5	1 Cycle	26.90	18.02	14.79

Mounting Data. Three equally-spaced mounting studs (No. 8-32) are permanently affixed to rear of meter face panel, on 3.16" diameter (single studs at top center). Meter case requires 2.18" diameter hole. Total depth from rear of face panel is 2.50", including two No. 10-32 electrical connection studs. Meter face panel is 3.50" square and approximately 0.4" deep.

*Model numbers specify non-hermetically sealed metal cases; 0.3% accuracy; standard voltage of 117 Vrms; and input resistance of 10,000 ohms.



3.5 Inch Round Meters

MODEL* NO.	CENTER FREQUENCY	FREQUENCY RANGE	NUMBER OF REEDS	REED INTERVAL	PRICE PER UNIT 1-24	25-49	50-99
2810-134	[50 Hz / 60 Hz]	48 to 52 Hz / 58 to 62 Hz]	10	1 Cycle	27.75	18.59	15.26
4059-134	400 Hz	380 to 420 Hz	9	5 Cycles	31.80	21.31	17.49
5D31-134	50 Hz	47.5 to 52.5 Hz	11	½ Cycle	27.60	18.49	15.18
5717-134	50 Hz	47 to 53 Hz	7	1 Cycle	25.55	17.12	14.05
6D31-134	60 Hz	57.5 to 62.5 Hz	11	½ Cycle	27.60	18.49	15.18
6511-134	60 Hz	55 to 65 Hz	11	1 Cycle	27.60	18.49	15.18
6717-134	60 Hz	57 to 63 Hz	7	1 Cycle	25.55	17.12	14.05
6815-134	60 Hz	58 to 62 Hz	5	1 Cycle	23.90	16.01	13.14

Mounting Data. Three equally-spaced mounting holes are through meter face panel on 3.16" diameter (single hole at top center). Holes accept No. 8-32 mounting hardware (supplied). Meter case requires 2.69" diameter hole. Total depth from rear of face panel is 2.31", including two No. 6-32 electrical connection studs. Meter face panel is 3.50" diameter and approximately 0.2" deep.

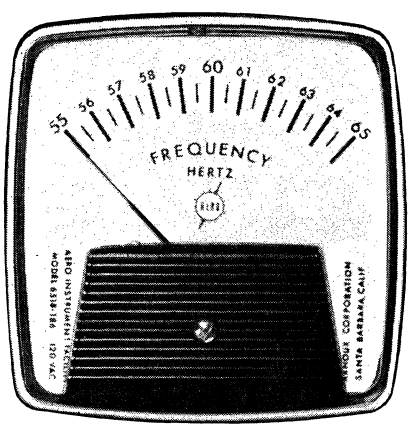
*Model numbers specify non-hermetically sealed bakelite cases; 0.3% accuracy; standard voltage of 117 Vrms; and input resistance of 10,000 ohms.

POINTER TYPE METERS

AERO's new line of Pointer-Type Meters feature advanced microminiature circuits for performing frequency-to-DC conversion with remarkable linearity and stability. These circuit innovations have now made pointer-type meters both economical and practical for production. Pointer-Type Meters are presently available in three frequency ranges, with accuracy and stability as great as 0.3 Hz in the 45 to 65 Hz ranges. The input voltage for all units is 115 ±15Vac, with power consumption approximately 2 watts. Operating temperature range is 0° to 150°F.

MODEL NO.	FREQUENCY RANGE	ACCURACY & STABILITY	PRICE PER UNIT 1-24	25-49	50-99
557P-183	45-55 Hz	0.3 Hz	48.50	32.50	26.68
657P-183	55-65 Hz	0.3 Hz	48.50	32.50	26.68
407P-183	380-420 Hz	2.0 Hz	48.50	32.50	26.68

Mounting Data
(Same as for 3.5 Inch Full View Meters. See above.)



All prices are net, FOB Factory, 8-1-71, subject to change.

Larger quantity prices on request.

Write for Our Catalog for Complete Data on Other Models and Styles of Aero Frequency Meters

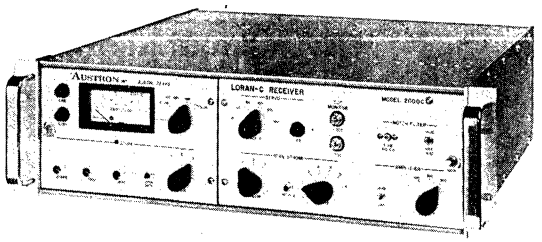
AERO INSTRUMENT FACILITY OF

ARNOUX

35 ANACAPA STREET
SANTA BARBARA, CALIFORNIA 93101
PHONE (805) 963-3476
CORPORATION

TIME/FREQUENCY INSTRUMENTATION

AUSTRON, Inc., offers a complete line of instruments for timing and frequency calibration and control. Designed for utilization of Loran C transmissions and/or atomic standards, AUSTRON instruments find applications in communication network synchronization, time synchronization, epoch timekeeping, frequency calibration and related fields. Typical instruments are the



MODEL 2000C LORAN RECEIVER

The Model 2000C receives and automatically phase tracks any Loran C or Loran D chain for timing and frequency calibration applications.

MODEL 3100 PHASELOCKED SYNTHESIZER SYSTEM

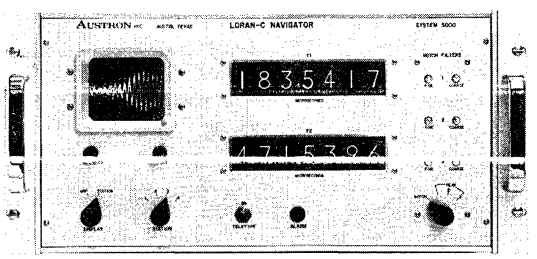
The Model 3100 Systems utilizes Loran C transmissions as a reference for synthesizing clock rate frequencies for communication network synchronization.

MODEL 2055A PHASE MICROSTEPPER

The Model 2055A accepts precision time base frequencies of 1 MHz or 5 MHz and is designed to provide selectable phase rate or frequency offset corrections.

NAVIGATION INSTRUMENTATION

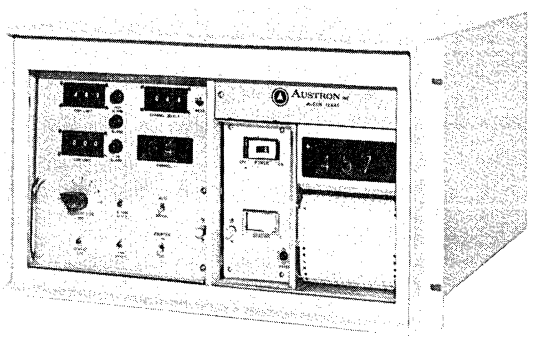
The AUSTRON Model 5000 and Model 5010 Loran Navigation Systems are designed specifically for marine applications where versatility and precise positioning accuracy are critical. The 5000/5010 hardware is mated to a mini-computer and thus provides an integrated hardware/software system capable of both Loran C or Loran A (optional) operation. Software options allow operation in either the normal hyperbolic mode or, with the addition of an atomic standard, the range-range mode. Additional software sub-routines enable cross chain navigation between different Loran chains, coordinate conversion, course correction computations and Loran D tracking.



The Model 5000 System, when operating in the Loran C mode, will typically provide fixes within 300 feet of a predetermined location on the earth's surface. Return-to-position accuracy is typically 100 feet or better. The Model 5010 System is designed specifically for integration with satellite navigation systems for provision of velocity up-date information during a satellite pass or for obtaining fix information between satellite passes.

DATA LOGGING INSTRUMENTATION

The AUSTRON Model DL-1200 and Model DL-2210 Digiloggers are complete input scanning analog to digital converting data acquisition instruments, with 12 column printer, which allows continuous, periodic, or demand logging of multiple analog inputs directly in engineering units. The Model DL-1200 accepts up to 50 analog inputs with the DL-2210 accepting up to 1000 inputs. Both instruments accommodate linear input voltages from 0 to 10 mv, 100 mv, 1 volt, or 10 volts full scale. Standard linearization and cold junction compensation circuitry is available for logging of thermocouple inputs directly in °C or °F. Input circuitry accommodating RTD's, strain gages, pressure transducers and other non-linear devices is also available.



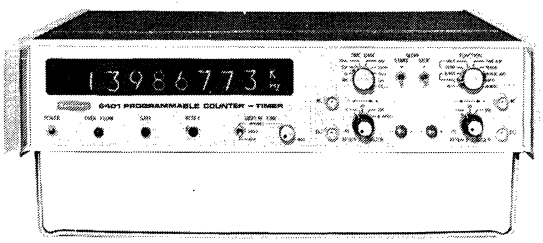
The AUSTRON Digiloggers find numerous applications in air and water pollution monitoring systems, process control, production testing and laboratory instrument monitoring.

AUSTRON
1915 KRAMER LANE
AUSTIN, TEXAS 78758
TELEPHONE (512) 836-3523

BERKELEY INSTRUMENTS INC.

INSTRUMENTATION

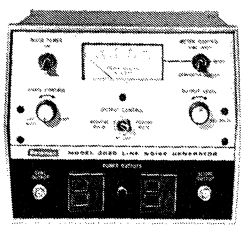
MODEL 6401/6401A UNIVERSAL COUNTER/TIMER



Model 6401 is a programmable 136 MHz counter/timer with two input channels, allows frequency ratio and time interval measurements between two signal sources. Either channel measures frequency, time interval, period, period average, and ratio. Inputs range: channel A, dc to 136 MHz; channel B, dc to 10 MHz. Accumulates random pulses as narrow as 4 ns width and separation. Trigger point monitor lamps visually indicate channel activity. Eight-digit display. Sensitivity: 100 mV rms. Provision for external recording. Frequency accuracy is 1 part in 10^8 for 24 hours. Operates at 120/240 Vac, 60 Hz.

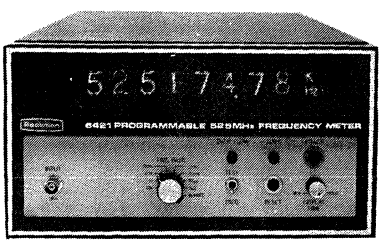
Model 6401A has the same specifications as 6401 with the added feature of 10 ns resolution on time interval and period measurements.

MODEL 3020 LINE NOISE GENERATOR



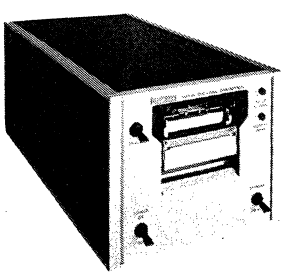
Line noise generator serves dual function: generates controlled line noise similar to rectifier or SCR noise on ac power lines, and measures noise up to 1 kW peak power. Operates from 120/240 V, 50-60 Hz, 60 W. Pulse amplitude continuously variable 0-600 V with rise time 1 μs. Positive or negative noise pulse positions manually adjustable through 360° of line cycle. Measures peak line or load noise. 1 μs width at $\pm$5%. Rejection more than 40 dB between line and load. Manual or automatic control provided.

MODEL 6421 FREQUENCY METER



Direct counting 525 MHz frequency meter with all operating functions contact closure programmable this unit can be used as a bench instrument or an integral part of an automatic measuring system. An optional battery pack is available if portable operation is required. Measures frequency from 10 Hz to 525 MHz: Sensitivity 50 mV rms Input impedance 1 MΩ shunted by 12 pf: Measurement rate 0.1 Sec to 10 Sec: Gate selection 1 MSec to 10 Sec in decade steps: Stability 1 part in 10^6 per year. Power 115/230 V 50-400 Mz.

MODEL 1454 DIGITAL PRINTER



- 21 BCD Column Capacity
- Flexible Input Format
- BCD Column Expansion Capability
- Decimal Point, Column Suppression, and Red Print Control

Universal 21 column digital printer that accepts data in 1248, 1224, 1242 BCD or ten line decimal codes. Standard BCD column capacity is 7, expandable in seven-column increments to a maximum of 21 BCD columns. Input levels can be specified at IC levels, transistor levels, or vacuum tube levels. Printing rate is 3 lines per second in black and 2.8 lines per second in red. Ribbon and paper tape can be replaced without disassembly. Power requirements are 115/230 VAC, 50 to 100 Hz, 60 W (fused).

Berkeley Instruments, Inc., also produces the finest electronic instrumentation for a variety of industrial applications. These include:

• Model 6200 Series Industrial Counters, Timers and Controllers • Model 998 Linear IC Tester • Model 999 Digital IC Tester

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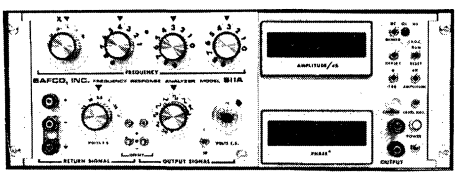
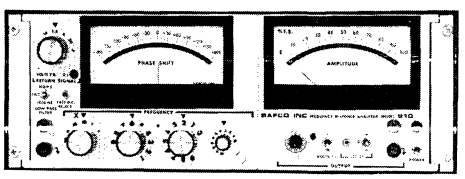
FREQUENCY RESPONSE ANALYZERS

BAFCO, INC. OFFERS A COMPLETE LINE OF FREQUENCY RESPONSE ANALYZERS AND ACCESSORIES INCLUDING SINGLE CHANNEL, DUAL CHANNEL (AND MULTIPLE CHANNEL); POINT-BY-POINT & SWEEP WITH DIRECT PLOT OF THE RESULTS; METER AND DIGITAL READOUT; TRACK OF AN EXTERNAL REFERENCE; EXTENDED SWEEP AND AUTOMATIC RANGING; COMPUTER AND RELAY PROGRAMMABLE. COMMON FEATURES:

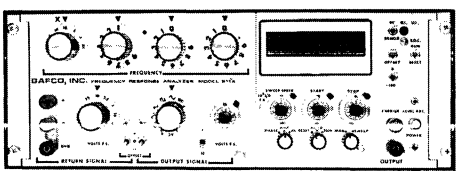
- Automatic high noise and harmonic rejection (40 db)
- Fast operation
- Calibrated, high current, low distortion test signal (with D.C. offset)
- Low cost, portable
- D.C. outputs direct reading in amplitude (ratio in db), phase, and frequency (log frequency) for remote readout and plotting.
- D.C. and carrier operation.



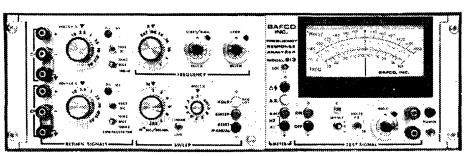
MODEL 911A-2D
SINGLE CHANNEL — 01.-10,000 Hz
DUAL DIGITAL READOUTS — AMPLITUDE RATIO (DB) & PHASE SHIFT



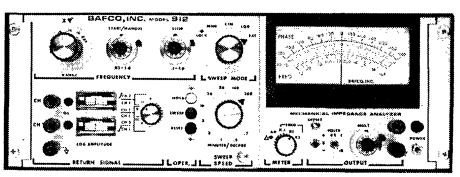
MODEL 910-B
SINGLE CHANNEL — 0.1-20,000 Hz
LOW COST — DUAL METER — CONTINUOUS READING



MODEL 911A-DS
SINGLE CHANNEL — .005-10,000 Hz
SWEEP & DIRECT PLOT OF AMPLITUDE RATIO & PHASE SHIFT VS. LOG FREQUENCY.



MODEL 913
TWO CHANNEL SWEEP — .005-10,000 Hz
DIRECT PLOT (ACROSS ANY TWO POINTS IN SYSTEM) OF AMPLITUDE RATIO (DB) & PHASE SHIFT VS. LOG FREQUENCY. REMOTE PROGRAMMABLE.



MODEL 912
MECHANICAL IMPEDANCE ANALYZER — 1-20,000 Hz. AUTOMATIC GAIN CONTROL OVER 60 DB DYNAMIC RANGE IN EACH CHANNEL. DIRECT PLOT OF MECHANICAL IMPEDANCE ON AMPLITUDE RATIO (DB) AND PHASE SHIFT VS. LOG FREQUENCY.

BAFCO, INC. welcomes your inquiry, and is pleased to assist you in selecting the model analyzer best suited to your frequency response measurement needs. Send for complete catalog of all models or Technical Publication 7172-1.

BAFCO INCORPORATED

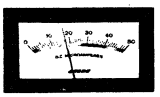
717 MEARNS ROAD
WARMINSTER, PENNSYLVANIA 18974
TEL.: (215) 674-1700 • TWX No. 510-665-6860

NEW Beede CERTRAK™ Panel Meters

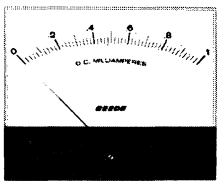
±1% or ±½% tracking certificate with each meter

Beede is the first panel-meter manufacturer to certify the tracking accuracy of its products. Each Certrak™ meter is shipped with an individually signed certificate of tracking accompanied with a computer printout of readings taken at every numbered scale division. Certificates of ±1% or ±½% tracking accuracy are available.

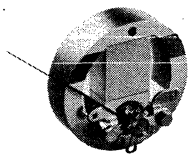
New shielded-bar taut-band movement. In conjunction with the new Certrak™ panel meters, Beede announces its new ultra-sensitive shielded-bar taut-band meter movement. All Beede panel meters containing this movement qualify under the Certrak 1% certification program. Sensitivities from 0-10μA to 0-25A are in stock for immediate shipment; stock voltmeters from 0-10mV to 0-300V. Case styles in stock: 3″ and 4″ Designer and Centurion, 6″ Universal.



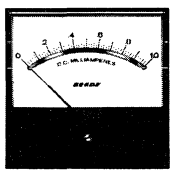
Centurion



Universal

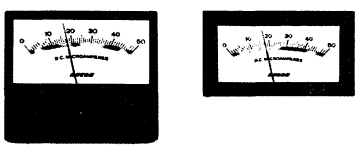


Shielded-bar taut-band movement

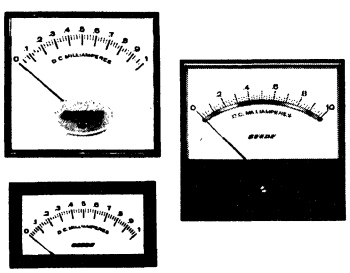


Designer

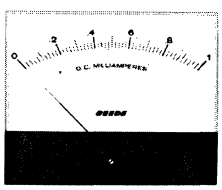
Other Beede Panel Meters



Centurion Line. 3″ and 4″ durable molded black phenolic with glass window for front-of-panel mounting; 4″ back-of-panel model. Illumination available in 4″ models.



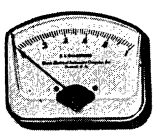
Designer Line. Clear picture-frame design with concave window in 2″, 3″, 4″, and 6″ widths for both front and back-of-panel mounting.



Universal Line. Large, highly visible meter cases in 6″ and 8″ widths for across-the-room reading.

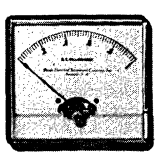
250° Line. Beede's very popular 250° movement for switchboard, automotive, marine applications available as meter movement only (see below) or in brass, chrome, or black lacquer case with glass front, 3″ and 6″ diameter.

Edgewise Line. Single or stacked double unit in one case, for applications demanding minimum panel space.



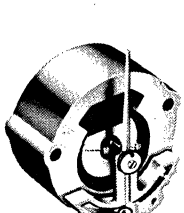
Panorama Line. 3″, 4″, 7″ cases for applications requiring soft curved lines to match instruments with similar features.

Traditional Line. Available in various rectangular and round phenolic cases.

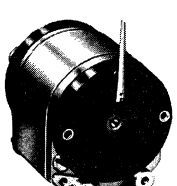


Clear Front Line. 1″, 2″, 3″, 4″ cases for general-purpose panel-meter applications.

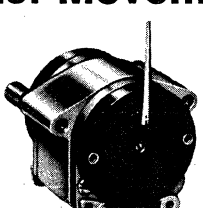
Beede Meter Movements



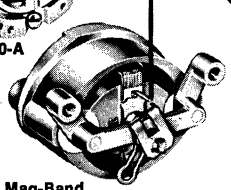
250-A



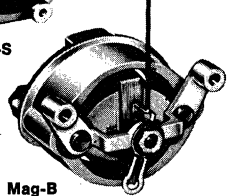
250-S



250-SR



Mag-Band taut-band



Mag-B Pivot-and-jewel

Precision d'Arsonval movements as used in the case styles shown above, or available for installation in customer's case.

Mag-Band Taut-Band. Self-shielded, high-torque, excellent balance, no drift. Maximum sensitivities: 0-10μA DC, 0-10mV DC ±1% or ±2% accuracy.

Mag-B Pivot-and-Jewel. Rugged, high-torque self-shielded movement. Max. sensitivities: 0-50μA DC, 0-20mv DC ±1% or ±2%.

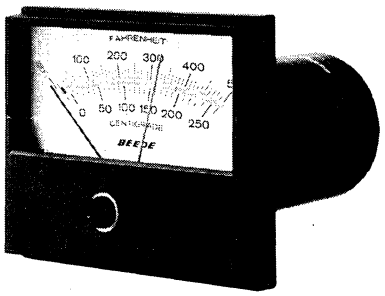
250°. A fine, sturdy, self-shielded 250° pivot-and-jewel movement, very popular in the automotive and marine fields.

CUSTOM METER DESIGN

Beede specializes in custom-designed meters to meet exacting customer requirements. And, to top off our in-depth knowledge of our customers' businesses, *we deliver as promised.*

BEEDE BEEDE ELECTRICAL INSTRUMENT CO., INC., Penacook, N. H. 03301
Phone (603) 753-6362: TWX 710-364-6977. Nationwide representation.

Pyrometers

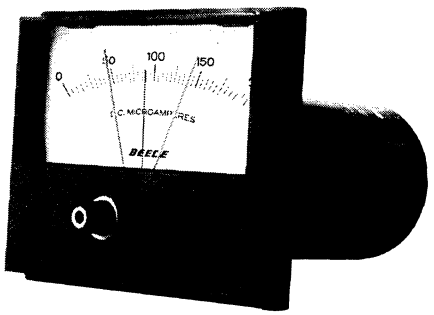


NEW Optemp™ pyrometer/meter relay. High-impedance input amplifier delivers high-power signal to meter movement, eliminating need for thermocouple lead-length adjustments and permitting the use of lower-cost light-gage t/c extension wire. Rugged high-torque pivot-and-jewel movement with non-contacting optical switching for fast response, inherent noise rejection, continuous indication.

Standard Optemp models suitable for Types J and K t/c's. Six stocked ranges from 0-300°F to 0-2500°F. Single or double set-point. Case width 3 or 4 in. All models have electrical cold-junction compensation, t/c break protection. Many options available, including integral bridge circuits enabling use of RTD or thermistor sensing of narrow temperature ranges.

Indicating pyrometers—As "prime source for temperature instrumentation," Beede offers, in addition to the controlling pyrometers described above, a complete range of indicating panel-meter pyrometers in a wide choice of case styles in widths from 2″ to 8″. Clear-reading mirror scales eliminate parallax error, and may show both Fahrenheit and Celsius units.

Meter Relays



The Beede non-contacting control-meter relay combines a high-torque d'Arsonval meter with an adjustable photoelectric sensor, switching circuit, and output switch. As the monitored variable passes the adjustable setpoint, an output relay is either energized or de-energized. Either one or two adjustable setpoints are available.

Beede's greatly simplified meter-relay design has significantly reduced the number of parts, resulting in price savings up to 50% without a sacrifice of quality features.

FEATURES

- **Optical, non-contacting control, continuous indication.**
- **Standard models available from stock.**
- **Wide variety of options (power supply, input and output, tamperproof setpoint controls, etc.) for inexpensive customizing.**
- **Available as single complete unit, or with separate control, or optical element only.**
- **Inherently fail-safe.**
- **AC or DC power input.**
- **Direct-drive set pointers.**
- **Bulb life in excess of 10 years.**
- **Meter movement and/or dial custom-designed to your specifications if required.**
- **Meter permanently free of static influence.**
- **Attractive, modern "Centurion" case, 3″ or 4″ wide; 4″ model available also for behind-panel mounting.**

SPECIFICATIONS

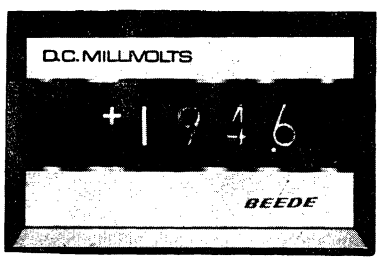
Accuracy ±2% or ±1%
ON-OFF operation or latching with manual reset
Output: 5 amp (resistive load) DPDT relay for each set point. Solid State Output available
Standard Deadband is 0.5%
Power Requirements 105 to 130 Volts AC.
Other AC and DC power inputs available
Ambient Temperature 40°F to 165°F is standard

MOVEMENTS

MAG-BAND TAUT BAND
0-10μA DC minimum range
MAG-B PIVOT AND JEWEL
0-50μA DC minimum range

Beede Digital Panel Meters

. . . many "special" features in standard catalog models



The basic Beede DPM is a completely packaged unit, including power supply, requiring only signal and line connections for immediate use as a deluxe component of advanced equipment. Many of the standard models fit into existing instrument circuits which have previously used pointer-type panel meters, without the necessity for circuit modification.

Beede DPMs have 3½-digit Nixie™ display (1999 maximum readout) with automatic polarity indicator and selectable decimal-point position. All are enclosed in a rugged, dust-proof diecast aluminum case with terminal connections sealed against tampering or damage. Rear terminals for signal and power available two ways: either as a minimum number of screw connectors for easy installation by unsophisticated workers; or as two extended soldering strips offering many additional functions including BCD (binary-coded decimal) output for driving printers and other equipment.

Standard catalog models stocked for immediate delivery are designed for direct current in readout ranges as low as 0-19.99μA up to 0-1.999A, or for DC voltage in ranges from 0-199.9mV to 0-1000V. AC voltmeters are also available.

Many standard Beede DPMs contain features generally regarded as "special" elsewhere throughout the industry. Such features as suppressed or elevated ranges, low-voltage amplification, multi-range display, resistance operation, DPM setpoint, linearized reading of non-linear signal, indicator lights, variable or one-time sampling, etc. are cataloged in Bulletin DM-2 for ready availability with minimum wait on either large- or small-quantity orders.

As with any Beede panel meter, the front-panel appearance may be customized to the user's requirements: readout may appear in any engineering units (rpm, gal/hr, etc.), and decorative colors of bezel and face mask behind glass window may be specified, as may customer's logo.

SPECIFICATIONS:

Accuracy ±0.1% of reading ± one digit. This accuracy will be maintained over a temperature range of 20°F for 60 days without adjustment. Temperature coefficient: 0.004%/°F.
Temperature Range 14°F to 140°F operating. —20°F to 185°F storage.
Input—Isolated to ±300V DC or AC (peak) when used single-ended, to ±3.5V DC or AC (peak) when differential input or BCD output is utilized.
Optional Input Arrangements—Current Source for Resistance Measurement. Ratiometric Input.
Speed—2 conversions/second (Standard). Other speeds available.
Resolution and Display—Three digits plus "1" over-range. Unit accurate to full 100% over-range. Automatic polarity indication. Three least significant digits extinguish for reading above 100% over-range. NIXIE™ display ½ inch nominal character height. Three decimal point positions selected by grounding connector pins. Hold and/or blanking capability furnished as standard.
Choice of terminal arrangements—Type A units, intended for measurement and readout only, have a minimum number of #6-32 screw terminals for a-c power, d-c signal, plus hold and blanking, all conveniently located and plainly marked to aid inexperienced assembly workers in making a fast, perfect installation. Type B units, intended for multiple functions including BCD (binary coded decimal) output, have two 30-pin solder-type edge connectors plus three solder terminals for analog input.
BCD output—Three BCD 8-4-2-1 digits plus "1" over-range digit totaling 13 lines. Logic levels: Standard TTL/DTL practice.
Power requirements—105 to 125 VAC, 47 to 63Hz, 3.5 watts nominal. Contact Beede for other input voltages and frequencies.
Mechanical Specifications—Die-cast aluminum, dust-sealed case. Die-cast aluminum front bezel with glass window and aluminum decorative mask. Amber polarizing filter. Captive front pulls out and swings to side for access to zero and span adjustments, and panel clamping arrangement. Front may be completely removed. Steel terminal board cover, screw fastened. Space available in case for customer specified accessory components.

Also available as options: plastic window; red or neutral polarizing filter; shorter behind-panel depth dimension.

Mounting—Panel mounting is standard. Installable and removable from the front of the panel with leads connected. Rugged clamping arrangement designed for panels up to ⅜ inch thick. Mounting arrangement for heavier panels, conduit mount and yoke mount with stand available as options.

BEEDE BEEDE ELECTRICAL INSTRUMENT CO., INC., Penacook, N. H. 03301
Phone (603) 753-6362: TWX 710-364-6977. Nationwide representation.

5629

BIRD *Quality Instruments for RF Power Measurement*

50 ohms nominal

THRULINE® RF DIRECTIONAL WATTMETERS

MODEL	CONNECTORS	PLUG-IN ELEMENTS FREQUENCY (MHz)	POWER RANGES (Watts)	U.S. PRICE
43	QC (1)	For CW, FM and TV (black level)		$100
4311	QC (1)	For Peak, Pulse, SSB, AM, TV, CW and FM		575
Order one or more elements with your Thruline Wattmeter to suit your frequency and power ranges.		2-30	50, 100, 250, 500, 1000, 2500, 5000	35 each
		25-60, 50-125, 100-250, 200-500, 400-1000	5, 10, 25, 50, 100, 250, 500, 1000	32 each
		Elements, low power (1, 2.5W) narrow band		50
		Elements, 950-1260MHz (1, 2.5, 5, 10, 25, etc. to 5000W)		75
		Elements, high frequency to 2300MHz (1, 2.5, 5, 10,25W)		75
		Elements, peak only to 10kW, 25-1000MHz in five bands		75
		Low Pass Filters, cutoff 76, 160 or 400MHz, QC Conn.		45
		CC-1 Cowhide Carrying Case for 43, 4311		20
		EC-1 Element Case for 12 spares		12
4310	QC (1)	For Peak, Pulse, SSB, AM and TV		249
		Elements (4310) Choices from 50W-10kW, 2-1260MHz		50
4330	QC (1)	Milliwatt version of Model 43 (200/800mW)		145
		Elements (4330) 60-2300MHz in narrow bands, 60-950/950-2300		60/80
4370	QC (1)	25-500MHz	1-500W	475
4111	UHF, N, BNC	25-175MHz	150/15W	135
4112	N, UHF, BNC	2- 30MHz	200/20W	135
4113	N, UHF, BNC	2- 30MHz	1000/100W	135
4114	N, UHF, BNC	400-512MHz	50/5W	135
4115	N. UHF, BNC	100-225MHz	50/5W	135
		Mini-Monitor® Pocket Meter		
4501	7/8 EIA Fl.	Rigid Line Wattmeter		135
		Uses Elements listed for Model 43		see above
4712	1⅝ EIA Fl.	Rigid Line Wattmeter		206
		Elements (4712) Choices from 25W-25kW 2-1000MHz		50
460	3⅛ EIA Fl.	Rigid Line Wattmeter		235
4805	3⅛ Unfl.	Rigid Line Wattmeter		166
		Elements (460, 4805) Choices from 1-100kW, 2-1000MHz		50
4902	6⅛ EIA Fl.	Rigid Line Wattmeter		600
		Elements (4902) Choices from 2.5-250kW, 2-1000MHz		50
4521	QC (1)	Panel-mounted, one meter-one socket		115
4522	QC (1)	Panel-mounted, one meter-two sockets		160
4526	QC (1)	Panel-mounted, two meters-two sockets		200
3122	QC (1)	Special meter: simultaneous forward/reflected power and VSWR, panel mtd. two sockets.		225
		These four models use Elements listed for Model 43		see above
4320/21		Amplifiers for adding PEAK READ to CW Thrulines		300

WATTCHER® RF POWER MONITOR/ALARM

MODEL		U.S. PRICE
3127/28	Fwd/refl. Wattmeter. Has alarm or Xmitter shut-off with high VSWR. Requires Line Section, Elements, etc. Choices from 0.45 to 2300MHz, 1W to 250kW.	$ 425

TERMALINE® HI-POWER RF CALORIMETERS

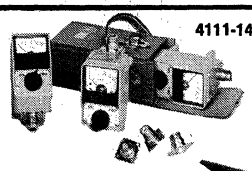
MODEL	POWER	FREQ. (GHz)	VSWR @ 1GHz	ACCURACY	U.S. PRICE
6020/23	1kW	dc-3.5	1.1	±1.3% to ±3%	$ 895
6070/71	5kW	dc-2	1.1	±1.5% to ±3%	1275
6032	10kW	dc-1.4	1.1	±1.5% to ±3%	1850
6042/6542	15kW	dc-1.5	1.1	± 1% to ±2%	2350
6052/6552	25kW	dc-1.5	1.1	± 1% to ±2%	2950
6062/6562	50kW	dc-1.5	1.1	± .5% to ±1.5%	3550

TERMALINE® RF ABSORPTION WATTMETERS

MODEL	POWER SCALES	FREQUENCY (MHz)	CONNECTOR	U.S. PRICE
6254	25, 50, 100, 250, 500mW, 1 or 2W	30-500	BNC/F	$ 140
611 †	0-15/60W	30-500	N/F	190
61 †	0-.5/80W (19 choices)	30-500	N/F	220
6154	0-5/15/50/150W	25-1000	N/F	265
67 †	0-25/100/500W	30-500	QC (1)	360
694	0-1000W	2-30	QC (1)	400
6835	0-120/600/1200W	30-500	QC (1)	550
Water-cooled:				
67C †	0-100/500/2500W	30-500	QC (1)	400
† Special calibration 500-1000MHz available at time of order.				25

COAXWITCH® COAXIAL SELECTOR SWITCHES

MODEL	FUNCTION	U.S. PRICE	MODEL	FUNCTION	U.S. PRICE
7422	1P2T	$85	718	1P8T	$100
7441	1P3T	85	7181	1P10T	135
7431	1P4T	85	72-2	2P2T	90
74	1P6T	85	72-R	2P-Rev	90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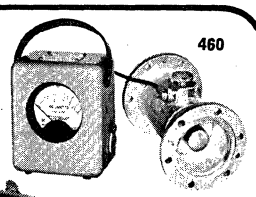
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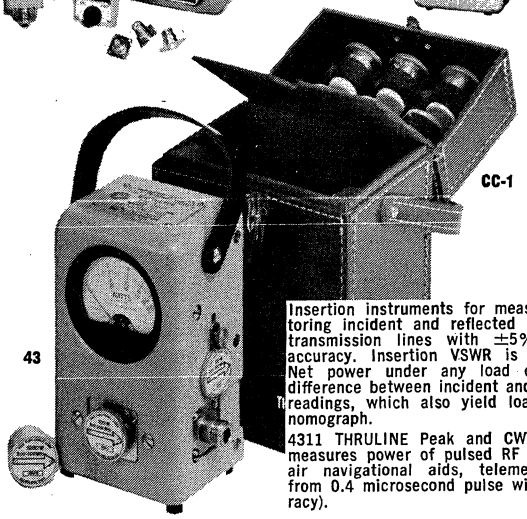
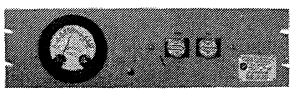
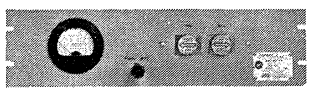

CC-1

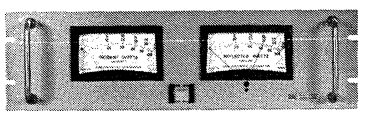
43

Insertion instruments for measuring and monitoring incident and reflected power in coaxial transmission lines with ±5% of full scale accuracy. Insertion VSWR is less than 1.05. Net power under any load condition is the difference between incident and reflected power readings, which also yield load VSWR from a nomograph.

4311 THRULINE Peak and CW Wattmeter also measures power of pulsed RF systems such as air navigational aids, telemetry, radar, etc. from 0.4 microsecond pulse width (±8% accuracy).


3122 VSWR + Wattmeter


4521 Panel-mounted "43" type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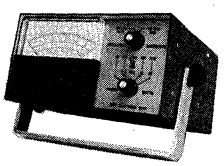
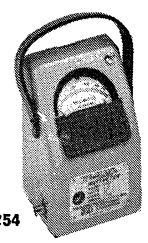
NEW


4370 Multirange Broadband Wattmeter, self-contained elements.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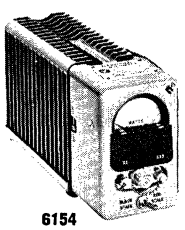
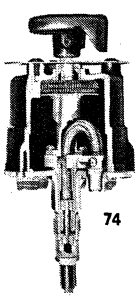

6154

Direct reading instruments for absorbing and measuring RF power. The load section of the TERMALINE Wattmeter serves as a dummy load. The indicating meter is calibrated to read RF power directly in watts with ±5% of full scale accuracy (to 500 MHz).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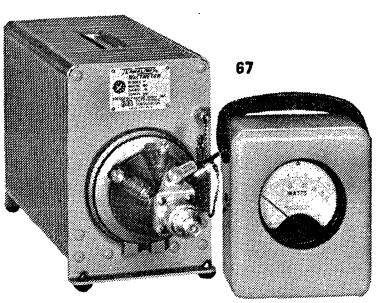
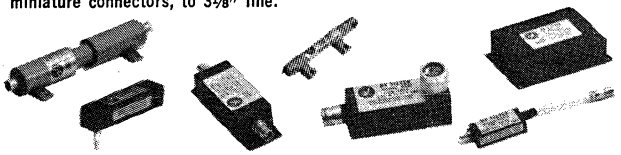

67

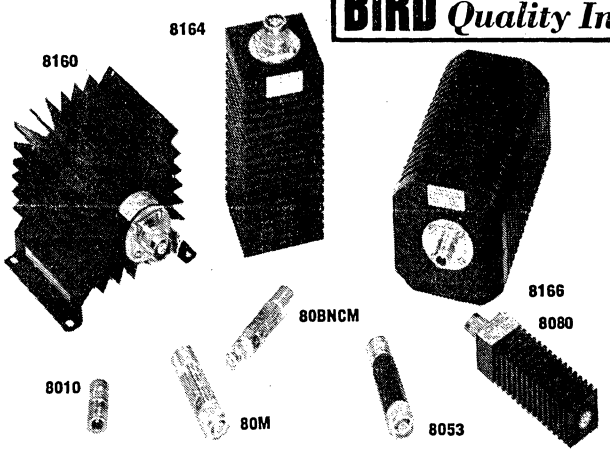
COAXIAL RF FILTERS

Custom engineered or field-proven designs. High rejection attenuation filters available with Low-pass cut-off from 16 to 2700MHz (about fifty designs at 400MHz). Hi-pass cut-off frequencies from 30 to 1000MHz, Band-pass as narrow as 5% of center frequency. Sizes from ¼ cubic inches, with subminiature connectors, to 3⅛" line.

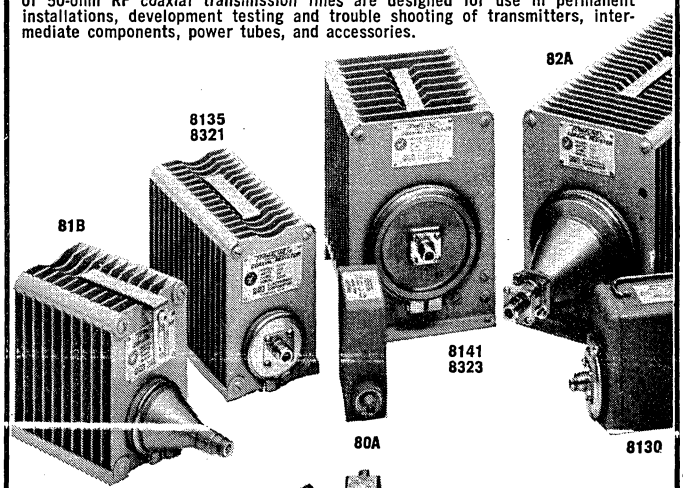


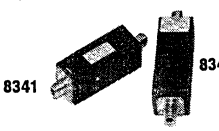
50 ohms nominal

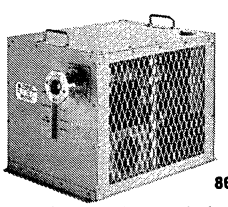
BIRD *Quality Instruments for RF Power Measurement*



TERMALINE RF Coaxial Load Resistors for accurate, non-radiating termination of 50-ohm RF coaxial transmission lines are designed for use in permanent installations, development testing and trouble shooting of transmitters, intermediate components, power tubes, and accessories.







No external water supply is needed for the new 10kW Self-Cooling MODULOAD™ RF Load Resistor Module. In a scant three cubic feet of space, the integral heat-exchanger permits continuous 10kW dissipation in 5° to 45°C ambients (−20° to +20°C with anti-freeze).

NEW

Aircooled **8785** Load (shown with 460 Line section).

No Fans — No Water

TERMALINE® RF COAXIAL LOAD RESISTORS

Air Cooled, Dry Dielectric

MODEL	POWER	FREQ.	VSWR @ 1GHz	CONNECTOR	U.S. PRICE
8010, 8011	2W	0-4GHz	1.04	N/F, N/M	$ 25
8015, 8016	2W	0-4GHz	1.04	TNC/M, TNC/F	27
80F, 80M	5W	0-4GHz	1.1	N/F, N/M	25
80CF, 80CM	5W	0-4GHz	1.1	C/F, C/M	30
80 BNC/F, -/M	5W	0-4GHz	1.1	BNC/F, BNC/M	30
8052, 8053	10W	0-4GHz	1.1	N/F, N/M	35
8080	25W	0-3.5GHz	1.1	QC (3)	45
8085	50W	0-3.5GHz	1.1	QC (3)	65
8160	100W	0-2.5GHz	1.1	QC (3)	115
8164	100W	0-2.5GHz	1.1	QC (1)	105
8166	150W	0-2.5GHz	1.1	QC (1)	120
8072	300W*	0-2.5GHz	1.1	SQC (1)	150

* When bolted to heat sink.

Air Cooled, Liquid Dielectric

80A	20W	0-3.5GHz	1.1	N/F	30
8130	50W	0-4GHz	1.1	QC (1)	50
81B	80W	0-4GHz	1.1	N/F	70
8135	150W	0-4GHz	1.1	QC (1)	75
8141	250W	0-2.5GHz	1.1	QC (1)	110
8201	500W	0-2.5GHz	1.1	QC (1)	165
82A	500W	0-3.5GHz	1.1	QC (1)	185
8401	600W	0-3GHz	1.1	QC (1)	169
8251	1000W	0-2.5GHz	1.1	QC (2)	280
8833	1000W	0-2.5GHz	1.1	QC (2)	365
8890**	2500W	0-2GHz	1.1	QC (2)	460
8891**	2500W	0-2GHz	1.1	3⅛ EIA Fl.	485
8892**	2500W	0-2GHz	1.1	1⅝ EIA Fl.	470
8785	5000W	0-1.5GHz	1.1	3⅛ Fl. or Unfl.	1295
** BA-88 Blower for doubling power (intermittent duty)					275
** Overtemperature Thermoswitch					30

Water Cooled, Air Dielectric

8710	1kW	0-3.5GHz	1.1	N/M or F	$ 200
8701	3kW	0-1.5GHz	1.1	⅞ EIA Fl.	250
8720	5kW	0-2GHz	1.1	1⅝ EIA Fl.	325
8736	10kW	0-1.4GHz	1.1	1⅝ EIA Fl.	950
8742/8542	15kW	0-1.5GHz	1.1	3⅛ EIA Fl.	1400
8752/8552	25kW	0-1.5GHz	1.1	3⅛ EIA Fl.	2000
8762/8562	50kW	0-1.5GHz	1.1	3⅛ EIA Fl.	2600
6770 Dolly for mounting 10kW to 50kW Loads.					125

MODULOAD™ Self-Cooled Load Systems

8632	10kW	0-1.4GHz	1.1	3⅛ EIA Fl.	2350
8641/2	20kW	0-1.3GHz	1.1	3⅛ EIA Fl.	3300

TENULINE® ATTENUATORS

MODEL	POWER	FREQUENCY	VSWR	ATTEN.	CONNECTOR	U.S. PRICE
8340-060, -100, -200	25W	0-500MHz to 1000MHz	1.1 1.15	6dB 10, 20dB	QC (1) in, (1) out	$100
8341-060, -100, -200	*40W	0-500MHz to 1000MHz	1.1 1.15	6dB 10, 20dB	QC (1) in, (1) out	95
8343-060	100W	0-500MHz to 1000MHz	1.1 1.15	6dB	QC (1) in, (1) out	165
8321	50W	0-500MHz	1.1	30dB	QC (1) in, (1) out	145
8323	100W	0-500MHz	1.1	30dB	QC (1) in, (1) out	165
8322	200W	0-500MHz	1.1	30dB	QC (1) in, (1) out	225
8325	500W	0-500MHz	1.1	30dB	QC (1) in, (1) out	400
8327**	1000W	0-500MHz	1.1	30dB	QC (2) in, (1) out	500
8329**	2000W	0-500MHz	1.1	30dB	QC (2) in, (1) out	600
BA-88 Blower for 4000W int. duty (8329).					—	275
* When bolted to heat sink.		** Overtemperature Thermoswitch				30

QC-TYPE CONNECTORS (Quick Change) Adaptable to particular TERMALINE, THRULINE, and TENULINE units, these connectors may be quickly changed in the field. Connector types available are: Female or male BNC, TNC, N, C, SC, HN, LC, UHF, LT, ⅞" and 1⅝" EIA Flanged.

Prices are subject to changes without notice. F.O.B. Cleveland, Ohio. Normally supplied: (1) Female N, (2) Female LC, (3) Male N.

OTHER BIRD INSTRUMENTS THRULINE® RF DIRECTIONAL POWER SENSORS • SENTRILINE® FILTER-COUPLERS COAXIAL RF FILTERS • NEW: VSWR/WATTMETERS •

Canada & New York State: Syracuse, N. Y.: 207 E. Jefferson St. (315) 422-0494
San Francisco, Cal.: Bird Electronic (415) 568-1110 • Lancaster, Pa.: 56 North Duke (717) 394-3735
Ojai, Cal.: 1188 E Ojai Ave. (805) 646-7255

BIRD ELECTRONIC CORPORATION
30303 Aurora Road / Cleveland (Solon), Ohio 44139 / Phone (216) 248-1200
TWX: 810-427-2687 / Cable: BIRDELEC

BECO

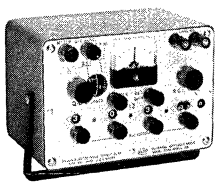
Brown Electro-Measurement Corporation

BECO BRIDGES

*"THE FINEST IN THE WORLD"

***BECO BRIDGES REPRESENT THE HIGHEST STATE - OF - THE - ART BRIDGE DESIGNS AVAILABLE IN THE WORLD TODAY. All BECO Bridges Feature:**

- No calculating, direct digital readout
- Automatic floating decimal display
- Automatic mode and magnitude display
- Higher accuracy
- Ultra-fast null meter response
- External generator or detector not required on any range
- Completely portable — battery operated



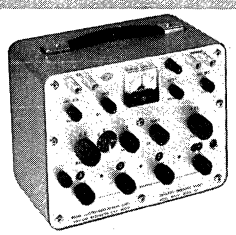
Model 303A
Full Scale (R) Accuracy 0.25%
Measures RCLDQ
Price: Available July, 1973

MINI-PORTABLE UNIVERSAL IMPEDANCE BRIDGE

7 Ranges each:
R(0-12MΩ) C(0-1200μfd) L(0-1200H)
Full scale resolution of 0.001%
5 decade readout
D(0-1.05) Q(0-1000)
battery operated

Briefcase Size! 4.38" x 5.25" x 6.38"

Detector: Both AC and DC built in
Generator Output: DC and 1kHz.
Weight: 4.5 lbs.



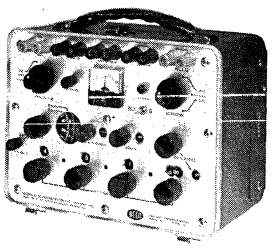
Model 307A
Full Scale (R) Accuracy 0.25%
Measures RCLGDQ
Price: $495.00

PORTABLE UNIVERSAL IMPEDANCE BRIDGE

7 Ranges each:
R(0-12MΩ) C(0-1200μfd) L(0-1200H) G(0-1.2℧)
Full scale resolution of 0.001%
5 decade readout
D(0-1.05) Q(0-1000)
battery operated

Size: 9.0" x 7.0" x 7.0"
Weight: 8 lbs.

Detector: Both AC and DC built in
Generator Output: DC and 1kHz.

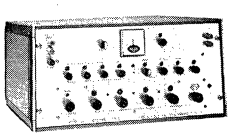


Model No.	Full Scale (R) Accuracy	Measures	Price
315A	0.05%	RCLDQ	$545
320A	0.05%	RCLGDQ	595
325A	0.025%	RCLGDQ	695

PORTABLE UNIVERSAL IMPEDANCE BRIDGES

7 Ranges each:
R(0-12MΩ) C(0-1200μfd) L(0-1200H) G(0-1.2℧)
Full scale resolution of 0.001%
5 decade readout
D(0-1.05) Q(0-1000)
Battery-operated (powerline option)
Detector: Both AC and DC built in
Generator Output: DC and 1 kHz
Size: 10.5" x 7.75" x 8.5"
Weight: 10.5 lbs.

Model 380A
Full Scale (R) Accuracy 0.01%
Measures RCLGDQ
Price: Available July, 1973



RCLG STANDARDIZING BRIDGE

7 Ranges each:
R(0-12MΩ) C(0-1200μfd) L(0-1200H) G(0-1.2℧)
Full scale resolution of 0.0001%
6 decade readout
D(0-1.00) Q(0-1000)
3 decade digital readout
Direct reading at 5 frequencies:
100, 120, 400, 1k, 10kHz
Detector sensitivities for AC and DC operation designed to cover all ranges
Ni-Cad batteries and AC charger built in
Size: 9.53" x 20.05" x 17.9"
Weight: 28½ lbs.

ACCESSORIES FOR BRIDGES

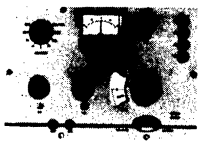
Electronic Null Detector: Model 711B $195.00
Test Jig Adaptor, Model 1903A 79.00
AC Power Pack with Ni-Cad Batteries,
Model 1501A 125.00

NOTE: The above specifications are accurate, but not complete. Please write or call BECO for complete details and chart comparing BECO bridges and those of other manufacturers.

Brown Electro-Measurement Corporation
11060 - 118th Place Northeast • Kirkland, Washington 98033 U.S.A. • phone (206) 822-6092

Electrical Testing, Precision Measuring Instruments and Systems

POTENTIOMETERS



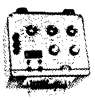
Precision Portable 72-3110

Portable 72-310

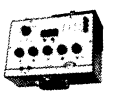
Cat. No.	Ranges	Limit of Error	Price
72-310	0-11.1 0-111 mV	0.05% + 5μV	$365.00
72-312	0-0.182 0-1.82	0.05% + 5μV	355.00
72-314	−11 to + 111 mV	0.05% + 20μV	370.00
72-316	Any single Range −300° to + 3000°	0.2% of span	325.00
72-318	Any two ranges	0.2% of span	405.00
72-3110	−11.1 to + 111.1 mV	±0.03% + 2μV without RJC ±0.03% + 4μV with RJC	645.00
72-3112	−0.0111 to + 0.1611 V	±0.03% + 2μV	
	−0.111 to + 1.611V	±0.03% + 20μV	725.00

For information on above instruments request Bulletin 72-63

PORTABLE WHEATSTONE BRIDGES

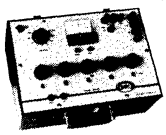


72-430 Price: $295.00
Range: 0.1Ω to 11MΩ
Limit of Error: ±0.1%
Det. Sens. 8μV Div.
Model 72-432 has capability of Varley and Murray Loop tests.



72-434 Price: $785.00
Range: 0.1Ω to 11MΩ
Limit of Error: ±(0.03% to 0.0005Ω)
Det. Sens. 0.5μV Div.
Bench and Rack Models Available

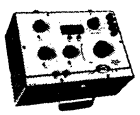
HIGH PRECISION KELVIN BRIDGE



72-439
Price: $825.00

7 Ranges 0.01μΩ to 1111.1Ω
Limit of Error: ±(0.03% of reading + 0.03μΩ) Det. Sens. 0.5μV Div. Features 5-dial in-line readout. Compact Kelvin Bridges also available—$305.00.

RESISTANCE TEMPERATURE BRIDGE



72-490 Price: $775.00
Range: 0 to 1111.1Ω
Limit of Error:
± (0.03% of reading + 0.0025Ω)

VERSAPOT® CALIBRATOR/POTENTIOMETER

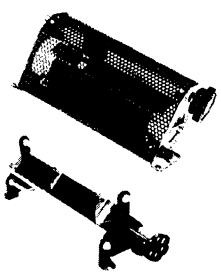
72-311 Price: $775.00
Replaces 5 instruments! Has 12 ranges: 9 measuring and 3 generating. Measuring range: −11 to + 111 mV with comp. run-up box. Measuring ranges: 1 to 1.111 V, 1.1 to 11.1 V, −11 to + 111 mA. Generating: −11 to + 111 mV, 0 to 1110 Ω.
Request Bulletin 72-311

For information on above instruments request Bulletin 72-73

CABLE FAULT LOCATING EQUIPMENT

Terminal equipment includes famed Megger® testers, also Radar sets, low-voltage bridge. Thumpers cover ranges from 15 kV 16 μF to 25 kV 4 μF. Detector/Tracers include electromagnetic, acoustic, and Earth Gradient types. Request Bulletin 653.

BIDDLE RHEOSTATS



Lubri-tact and carbon pile rheostats. Seventy-six standardized ratings available in 8", 10", 16" and 20" sizes. A variety of special non-inductive, double and graded types and Compression Carbon Rheostats also available. Write for Bulletin 413.

DC DIELECTRIC TEST SETS

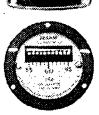
A wide variety of outputs for reliable acceptance/proof tests—for all types of electrical insulation systems: 5 kV and 15 kV portable, rack, and bench sets; 40 kV mobile field units; 50/100/150 kV modular sets; lightweight 60 kV field sets with stabilized voltage supply. Also 110 kV and 160 kV "dry type" sets. Request Bulletin 223.

FRAHM® RESONANT REED FREQUENCY METERS

Bulletin 323

2½", with metal case.

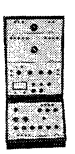
3½", GE style case



3½", Plastic case.

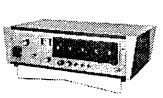
RESISTANCE STANDARDS
Resistance values 1 ohm to 1 megohm.
Accuracy: 0.001% Certified directly to N.B.S.
Request Bulletin 71-53

SOLID STATE NULL DETECTOR
A 4μV per division zero center meter driven by a solid state high gain differential amplifier, powered by two mercury batteries.
Bulletin 72-83



LABORATORY AND CALIBRATION INSTRUMENTS
Voltage, current and resistance measuring instruments. Available as single modules or complete measuring systems. Request Bulletin 713

CORONA MEASURING EQUIPMENT
A fully programmable Corona Test set keyed to digital print out.
Request Bulletin 663



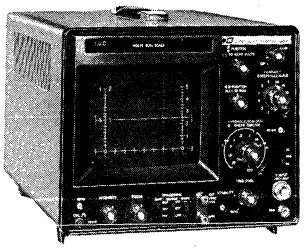
MEASURING, LIMIT TESTING, TRIM CONTROL INSTRUMENTS
Wide-range semi-automatic models with accuracy and stability of lab potentiometers; speed, simplicity, and convenience of digital voltmeter and multimeters.
Request Fire 733

247

JAMES G. BIDDLE CO.
PLYMOUTH MEETING, PENNSYLVANIA 19462
(215) 646-9200

B&K Precision Test Equipment

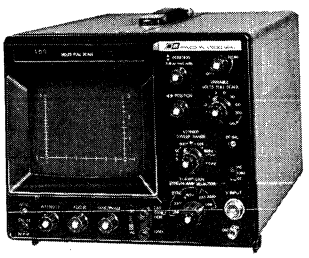
B & K OSCILLOSCOPES WITH EXCLUSIVE CALI-BRAIN® FEATURE



Model 1465 with Triggered Sweep

CALI-BRAIN–another B & K first! Special CRT screen has 2 scales, one on each side; selecting your vertical attenuator range automatically lights up the correct scale and produces a digital readout of full scale volts above the screen. To read peak-to-peak volts faster and more accurately, here's all you do: (1) Get pattern on screen; (2) pull out CALI-BRAIN knob (vertical position control); this collapses the horizontal sweep and shifts the resulting vertical line to the proper scale; (3) position the compressed waveform on the base line; (4) read the peak-to-peak volts directly off the screen! 100% solid-state. 10 MHz bandwidth, triggered sweep, automatic sync. With tilt stand. 9x10x17". For 105-125 VAC, 50-60 Hz. Wt., 27 lbs.

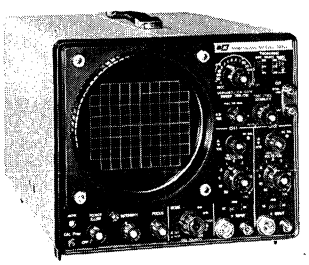
B & K Model 1465. With probe ..... **Net: $379.95**
PR-16 DUAL 10:1/DIRECT PROBE ..... **Net: $ 14.95**
PR-20 PROBE. Same, but with spring-loaded tip ..... **Net: $ 19.95**



Model 1440 with Recurrent Sweep

The 1440 is the only other scope on the market that has B&K's new, patented CALI-BRAIN feature (described in full at left, in the 1465 description). It also has 10 MHz bandwidth and front-panel Vectorscope capability. For applications not requiring triggered sweep, the 1440 is an outstanding scope for use in service shops, schools, labs and industry. Has the time-saving TV-H and TV-V positions on the sweep selector, with pre-set 30 Hz and 7875 Hz sweep frequencies for synchronization of the horizontal and vertical TV signals. With dual 10:1/DIRECT probe, Mylar Vector overlay and tilt stand for eye-level viewing. Size: 9 x 10 x 17" deep. For 105-125 VAC, 50-60 Hz. 3-wire line cord. Wt., 27 lbs.

B & K Model 1440. With probe ..... **Net: $299.95**

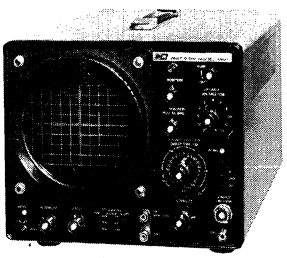


Model 1470 Dual-Trace Scope

Features dual display of waveforms, their sum or difference, for fast easy comparison, etc. Fully automatic and triggered sweep. DC to 10 MHz bandwidth; 10 millivolts/cm to 20 volts/cm vertical sensitivity, divided into 11 calibrated ranges. Operating modes: Ch. 1 only; Ch. 2 only; alternate; chopping (140 KHz); Ch. 2 invert or normal (push-push-switch). TV sync Separator; 5X magnification; all solid state. With Mylar Vector overlay and tilt stand. Size: 9x10x17". For 105-125 VAC, 50-60 Hz. 3-wire line cord. Wt., 28 lbs.

B & K Model 1470. Less probes (2 required) ..... **Net: $529.95**

PR-16 DUAL 10:1/DIRECT PROBE ..... **Net: $ 14.95**
PR-20 PROBE. Same, with spring-loaded tip ..... **Net: $ 19.95**

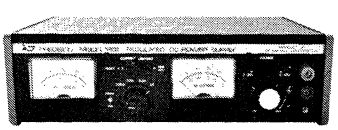


Model 1460 Triggered Sweep Deluxe Scope

Fully automatic triggered sweep. View the entire composite TV signal or any portion thereof, including the VITS and "back porch" of the horizontal sync pulse–all in perfect sync. Special sync separator circuit operates in all 19 triggered sweep positions, including TV-H and TV-V positions; switch back and forth from 2 horizontal lines to 2 vertical fields–with no other adjustments! DC to 10 MHz bandwidth; 10 millivolts/cm sensitivity displays smallest signal levels. DC amplifier. Has 1, 2, 5 steps on calibrated vertical attenuator. Front-panel Vectorscope capability. Mylar vector overlay and tilt stand. Size, 9x10x17". For 105-125 VAC, 50-60 Hz. Wt., 27 lbs.

B & K Model 1460. Less probe ..... **Net: $399.95**
PR-16 DUAL 10:1/DIRECT PROBE ..... **Net: $ 14.95**
PR-20 PROBE. Same, with spring-loaded tip ..... **Net: $ 19.95**

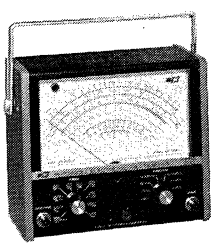
NEW! Model 1601 0-50 VDC Regulated Power Supply



The 1601 offers a number of unique features that make it a highly versatile, easy-to-use power supply; meets the needs of labs, production lines, schools and servicing. Fail-safe overload protection: when an overload occurs, the power supply shuts down, the volt meter and ammeter go to zero, and the overload indicator lights up.

When the overload cause is removed, all you do is press the reset button on the front panel. Recovery time from direct short to rated 2 A load, 7 mSEC. Output voltage is 0-50, continuously variable, permitting easy adjustment of the precise output needed. Current output, 0-2 amps, in 5 ranges. **Load Regulation:** 0.1% max., 0.03% min., 0.5% typical. **Line Regulation:** 0.2% typical. **Ripple:** 5 mV, peak-to-peak. **Size:** 3½" x 14" x 10". Shpg. wt., 15 lbs.

B & K Model 1601 0-50 VDC POWER SUPPLY. Net: **$159.95**



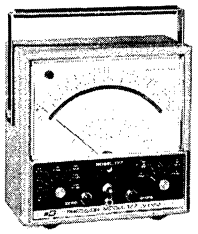
NEW! Solid-State F.E.T. Electronic Multimeter Model 290

Latest "State - of - the - art" F.E.T. Multimeter . . . 74 ranges for every test need. . . . Hi-Lo power ohms ranges; 15 megohm input impedance for minimum circuit loading. 7" meter with 6⅝" scale Arc. 50 mV full-scale sensitivity on both AC and DC. 50 uA current range. Rx 1/10 ohm range with 1 ohm center scale. Full protection for meter, F.E.T. input, circuits. 1% precision multipliers and shunts. Full AC operation with zener-regulated power supplies. Size: 7¼" x 8" x 3⅝". Shpg. wt., 6¼ lbs.

Model 290 F.E.T. ELECTRONIC MULTIMETER with PR-21 probe and instruction manual ..... Net: **$139.95**

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N.Y. STATE CALL COLLECT (516) 294-0990)

Precision Test Equipment B&K

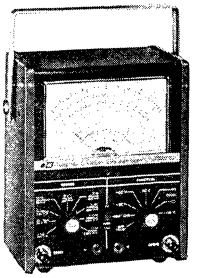


Model 177 30-Range VTVM

Highly versatile, rugged, "old-stand-by" vacuum tube voltmeter, with built-in DC supply—no ohms battery required. Has 30 ranges: DC/AC/RMS volts; resistance. Separate peak-to-peak and RMS scales. Special calibration on low AC ranges. Large 7", mirrored, 100-microamp meter. Input resistance, 11 megohms. Accuracy 3% on DC, 5% on AC. Supplied with B & K PR-43 high-impact Cycolac, DC/AC/Ohms test probe, with switch. 7-1/8x7¼x3-5/8". Wt., 8 lbs.

B & K Model 177 ..... Net: $99.95
AV-1A RF PROBE. Extends freq. range to 250 MHz. 1 lb. . Net: $ 7.95
AV-2A HIGH-VOLTAGE PROBE. Extends DCV range to 60,000 volts. Wt., 1 lb. ..... Net: $14.95

Model 277 Solid-State Electronic Multimeter



Has 7 low-power and 7 high-power ohms ranges—valuable when checking ohms in semiconductor or IC circuits. 36 additional ranges for measuring AC and DC volts, DC current and dB. Has 1 microamp DC current range for sensitive semiconductor leakage testing. Also has .1 volt AC/DC volts scale, for measuring transistor bias. 100% solid state. FET input, current and resistance circuits overload-protected. Size, 7½x7-7/8x3-5/8". With PR-21 probe; has switchable 100K ohm isolating resistor. Less batteries. Shpg. wt., 5 lbs.

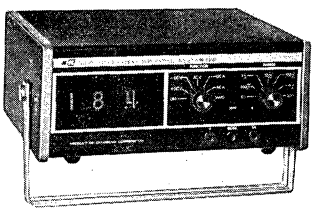
Model 277 ..... Net: **$99.95**

NEW! Model 120P 20,000 Ohms/Volt VOM

Accurate, rugged and versatile, the 120P reads DC volts and current with 0.25 volt and 50 microamp low-range scales; AC RMS volts, output volts, dB, and ohms. Resettable, electronic overload protection circuit prevents accidental destruction of instrument, shunts, multipliers, meter, pointer and sensitive rectifier. 31 ranges in all. TRANSIT position on range switch. Easy-access battery, fuse compartment. With leads, batteries. 5¼x7x3-1/8". Shpg. wt., 4 lbs.

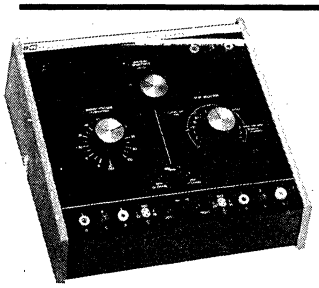
Model 120P ..... Net: **$74.95**

Model 281 Solid-State Digital VOM



For speed, accuracy and stability, it's the 281 Digital Multimeter! Virtually eliminates reading errors. Has 100% overrange capability, with positive overrange indication. Also indicates wrong polarity. Large, 2½ digit display with automatically positioned decimal point. 10 megohms input impedance. DC accuracy, 1%. Reads DC and AC volts, DC current, AC current and ohms. PR-21 probe with switchable 100K ohm resistor. 3½x7x9". For 105-125 VAC. Shpg. wt., 5 lbs.

Model 281 ..... Net: $169.95

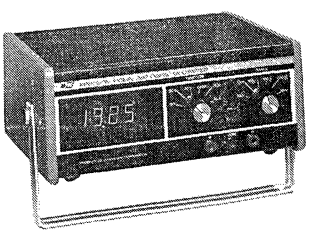


Model 501-A Solid-State Device Curve Tracer

The 501-A is to solid-state devices what the mutual conductance tube tester is to vacuum tubes. It's the best way to analyze semiconductors: by displaying their curves on the screen of an auxiliary scope. Measures gain (beta); leakage, breakdown voltage (non-destructive), output admittance, etc. Tests J-FET's, MOS-FET's, signal and power bipolar transistors, UJT's, diodes, Triacs, SCR's, diodes. Electronic current limiting—no IR drops to affect curves. With FP-3 probe for in-circuit testing. 4x10x9½". For 105-125 VAC, 60 Hz. 6 lbs.

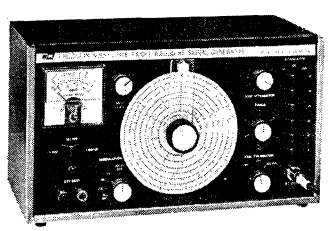
Model 501-A ..... Net: **$139.95**

NEW! 3½-Digit Digital Multimeter Model 282



An outstanding "high-value buy" for all VOM applications. . . . For high speed, accurate multimeter readings, all solid state, high-resolution digital VOM. 0.5% Accuracy on DC. Featuring 3½ Digits; with 100% overrange, reads to 1999. Positive-out-of-range indication. It is supplied with the PR-21 probe, which has a switchable 100 K ohm isolation resistor. Large-digit, jitter-free numerical display; full overload protection. Size: 3½" x 7" x 9". Shpg. wt., 5 lbs.

Model 282 DIGITAL MULTIMETER
with PR-21 probe ..... Net: **$199.95**

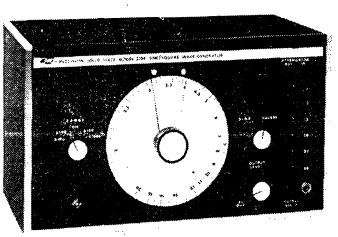


Model E200D Wide-Range RF Generator

100% solid-state circuitry; calibrated meter monitors RF level and % modulation; zener-regulated power supply. 100 KHz to 54 MHz on fundamentals, 54-216 MHz on harmonics. Outputs: Unmodulated RF; modulated RF; externally modulated RF; 400 Hz audio. Accuracy of better than 0.1% possible with internal crystal calibration. For trap, bandpass coil alignment; FM/AM receiver alignment; stage-by-stage amplifier gain tests; signal tracing. 110-130 VAC, 50-60 Hz. 16 lbs.

B & K-Precision Model E200D ..... Net: $199.95

Model E310B Sine/Square Wave Generator



Latest version of the industry standard. For service shops testing hi-fi equipment; for schools, labs, industry. Now features solid-state circuitry: F.E.T. in oscillator, all-silicon transistors. Step attenuation of both sine and square wave outputs. Extended ranges; constant-voltage output. Fully shielded. Easy-to-read 5" dial with 12:1 gear ratio drive. Size: 12-3/4 x 7¼x8". For 110-130 VAC, 50-60 Hz. Shpg. wt., 11 lbs.

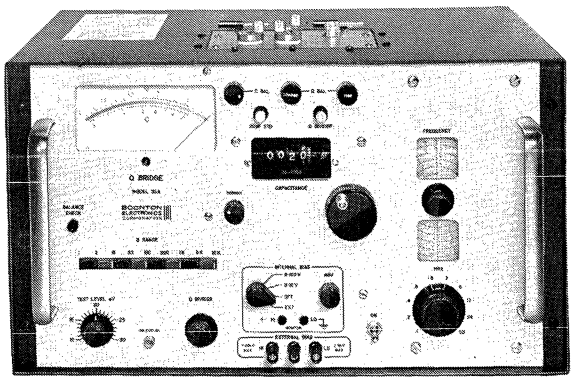
B & K-Precision Model E310B ..... Net: $129.95

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

BOONTON ELECTRONICS CORPORATION

ROUTE 287 AT SMITH ROAD
PARSIPPANY, N. J. 07054 USA
TEL: (201) 887-5110 / TWX: 710-986-8241

RF BRIDGES



MODEL 35A

Q BRIDGE — 100 kHz TO 50 MHz

This unusual, non-resonant, three-terminal bridge measures capacitance and its Q directly over a wide frequency range to Q values as high as 10,000. The low test signal level may be set by a calibrated front panel control, and complete facilities for dc biasing the test component are provided. Measurements of a variety of capacitors and solid state devices such as high Q varactors, diodes, and ceramic and monolithic capacitors are now possible.

SPECIFICATIONS

Q: 5 to 10,000; accuracy, generally ±10% to ±30%.
Capacitance: 20 to 1000 pF; accuracy, generally ±0.5% to ±2%.
Test Signal: Frequency, 100 kHz to 50 MHz; level, 10-30 mV rms.
Range Extensions: 2 to 20 pF; 200 to 10,000 pF.
DC Bias: Internal, 0-100 V; external, 0-200 V.

MODEL 33 SERIES

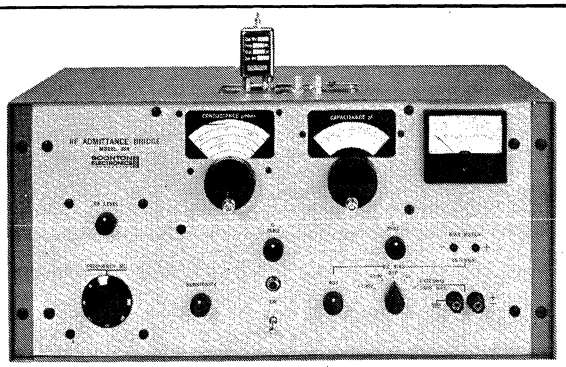
RF ADMITTANCE BRIDGES — 1 MHz TO 100 MHz

These bridges measure two-terminal parallel capacitance and conductance from 1 to 100 MHz. Seven crystal-controlled test frequencies of 1, 5, 10, 20, 30, 50, and 100 MHz are supplied as standard on all versions. Other frequencies between 1 and 100 MHz can be provided to special order. Good resolution of low conductance values makes loss measurements possible on many high Q diodes, varactors, and capacitors. The bridge balances accurately with the low test levels required for measurements on most solid state devices. Internal and external dc bias are standard on all models.

SPECIFICATIONS

MODEL 33A/1
Capacitance: 0-150 pF (30 pF at 100 MHz); resolution, 0.02 pF; basic accuracy, ±0.3%.
Conductance: 0-25 mmhos; resolution, 0.5 μmho; basic accuracy, ±2%.

MODEL 33B/1
Capacitance: 0-150 pF (30 pF at 100 MHz); resolution, 0.02 pF; basic accuracy, ±0.3%.
Conductance: 0-5 mmhos; resolution, 0.1 μmho; basic accuracy, ±2%.



MODEL 33C/1
Capacitance: 0-15 pF; resolution, 0.002 pF; basic accuracy, ±1%.
Conductance: 0-25 mmhos; resolution, 0.5 μmho; basic accuracy, ±2%.

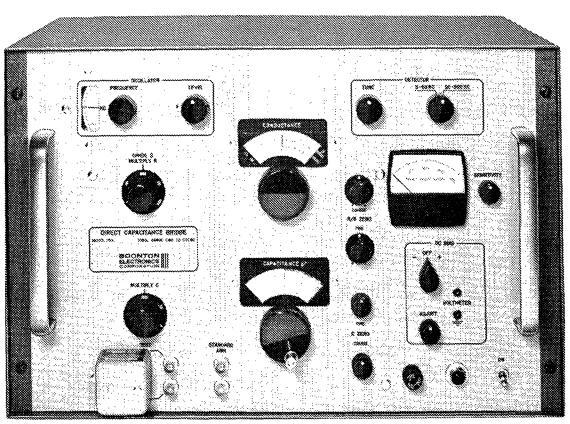
MODEL 33D/1
Capacitance: 0-15 pF; resolution, 0.002 pF; basic accuracy, ±1%.
Conductance: 0-5 mmhos; resolution, 0.1 μmho, basic accuracy, ±2%.

Capacitance Range Extensions: Accessories available for measuring higher values of capacitance at frequencies up to 30 MHz for Model 33A/1 and to 20 MHz for Model 33B/1.

CAPACITANCE BRIDGES

MODEL 75C

CAPACITANCE BRIDGE — 5 kHz TO 500 kHz



The Model 75C is a precise, high resolution bridge which makes direct reading measurements of capacitance, conductance, and parallel resistance over a frequency range that is continuously adjustable from 5 kHz to 500 kHz.

Because this is a three-terminal instrument, remote measurements may be made via shielded cables, and the specimen may be mounted in a test fixture or in an environmental chamber without incurring errors resulting from stray capacitance from either side of the test to ground. In addition to the test connections, the standard arm of the bridge is also accessible through front panel BNC connectors, permitting use of external capacitors for differential or comparison measurements.

SPECIFICATIONS

Capacitance: 0 to 1000 pF; basic accuracy, ±0.25%; resolution, 0.0002 pF max.
Conductance: 0 to 1000 μmhos; basic accuracy, ±10%; resolution,, 0.001 μmho max.
Test Signal: Internally supplied; continuously adjustable in frequency from 5 kHz to 500 kHz; level adjustable from 1 mV to 3 V rms.
DC Bias:
Model 75C: Internal only; −5 to +110 V, adjustable.
Model 75C-S23: Internal; −5 V to +110 V, adjustable. External; to ±400 V.

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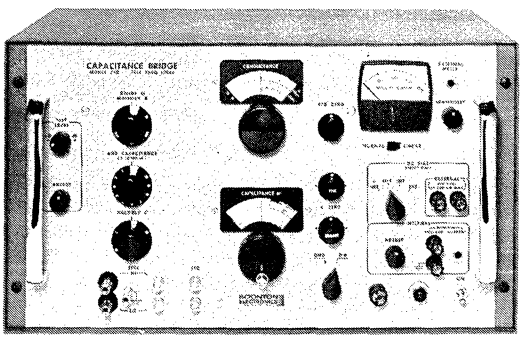
MODEL 74D

CAPACITANCE BRIDGE — 100 kHz



Extremely accurate measurements of a broad range of capacitance values may be made on this 100 kHz bridge. Test signal level is adjustable down to low values for semiconductor testing. 3-terminal arrangement permits use of remote test jig without errors owing to cable capacitance to ground. 2-terminal operation also provided. A linear detector mode for limit operation permits simple go/no-go testing.

SPECIFICATIONS

Capacitance: 0 to 110,000 pF; basic accuracy, ±0.1%; resolution, 0.0002 pF max.
Conductance: 0 to 1000 μmhos, basic accuracy, ±5%; resolution, 0.001 μmho max.
Test Signal: 100 kHz; level continuously adjustable from 1 mV to 4 V rms.
DC Bias: Internal, −7 V to +110 V; external, up to ±400 V.
Detector: Normal, AGC mode. Linear; no AGC, deflection proportional to bridge unbalance in pF. May be set from 0.002 pF fs to 4000 pF fs.

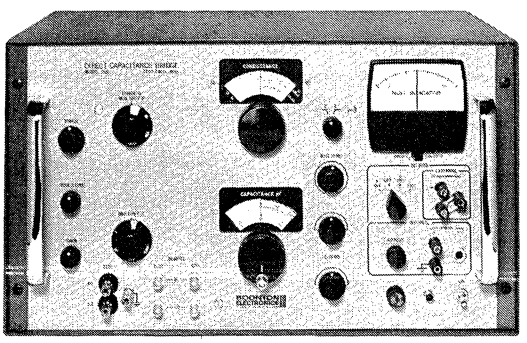
MODEL 75D

CAPACITANCE BRIDGE — 1 MHz

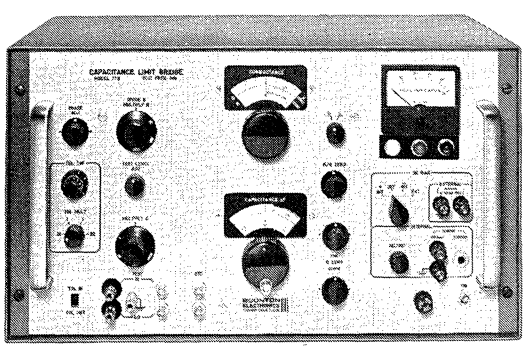
This bridge provides 3-terminal measurements of capacitance and conductance allowing remote connection without errors due to stray capacitance to ground. When measuring the higher capacitance values remotely, the effects of cable inductance may be negated by use of the Test Terminal Extender Model 71-6A. Makes 2-terminal grounded measurements using Adapter Model 75-7A. Inductance is read by conversion from equivalent capacitance measurement. The null detector is extremely sensitive yet shows balance direction from the most extreme off-range setting. An additional differential detector mode allows capacitance or inductance sorting of components. Internal and external dc bias.

SPECIFICATIONS

Capacitance: 0 to 1000 pF; basic accuracy, ±0.25%; resolution, 0.00005 pF max.
Conductance: 0 to 1000 μmhos; basic accuracy, ±5%; resolution, 0.01 μmho max.
Inductance: 25 μH to 25 mH; basic accuracy, ±0.25%.



Test Signal: 1 MHz, crystal controlled; level adjustable from 1 mV to 250 mV.
Dual External DC Bias: HI to GND and/or LO to GND; differential, ±400 V max.
Internal DC Bias: HI to LO; −6 to +150 V.



MODEL 77B

CAPACITANCE LIMIT BRIDGE — 1 MHz

Performs automatic, high-speed, dual or single limit tests, or conventional manual measurements of capacitance or inductance. In automatic mode, test is insensitive to specimen loss. "High," "Low," or "Go" test decisions are indicated by front panel lamps as well as by continuity closures for actuation of material handling equipment. 3-terminal arrangement permits remote measurements at the end of coaxial cables without incurring error due to cable capacitance to ground. When measuring the higher capacitance values, the effects of cable inductance may be negated by use of the Capacitance Test Terminal Extender Model 71-6A. Two-terminal grounded measurements possible with 77-7A Adapter. Nominal capacitance values are set by the main capacitance balance dial in conjunction with its multiplier switch. A multi-turn control and range switch are used to program the desired tolerance. Operates with low test level. Built-in dc bias supply; provision for external bias.

SPECIFICATIONS

Capacitance: Automatic mode, 0 to 1000 pF with 0.001 pF resolution max.; Manual mode, 0 to 1000 pF with 0.00005 pF resolution max.; basic accuracy, ±0.25%.
Inductance: Manual or automatic, 25 μH to 25 mH; basic accuracy, ±0.25%.
Tolerance Limits: Programmable at front panel controls from ±0.0005 pF to ±200 pF; basic accuracy, ±0.25% of limit setting.
Test Time: Approx. 50 ms.
Conductance: (Manual only) 0 to 1000 μmhos; basic accuracy, ±5%; resolution, 0.01 μmho max.
Test Signal: 1 MHz crystal controlled; level adjustable from 250 mV to 15 mV rms for Automatic mode, to 1 mV rms for Manual.
Decision Output: Green, red, and amber panel lamps indicating "Go," "High," and "Low," respectively; continuity contacts available at rear panel in conformance with test decisions.
DC Bias: Internal, continuously adjustable from −6 V to +150 V; external, to ±400 V.

MODEL 77B-S1

CAPACITANCE LIMIT BRIDGE — 100 kHz

Essentially similar to Model 77B. Has basic capacitance/inductance accuracy of ±0.1%. Operates with internally supplied 100 kHz crystal controlled test signal. Capacitance range, automatic or manual, is 0.001 pF to 1000 pF. Inductance range, 2.5 mH to 250 mH. Otherwise specifications are as shown for Model 77B.

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CAPACITANCE METERS

MODEL 72 SERIES

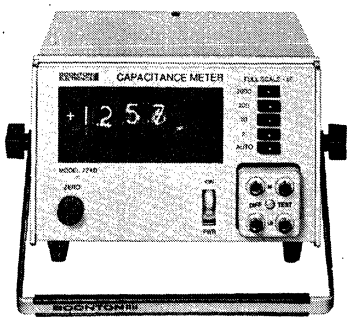
CAPACITANCE METERS — 1 MHz

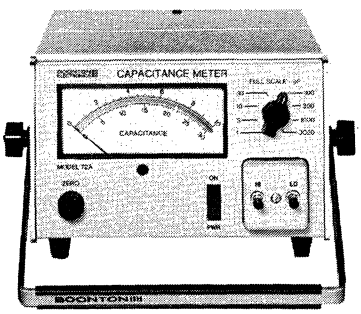
The Model 72 Series of solid-state capacitance meters provide rapid, accurate, three-terminal and differential measurements of capacitance over a wide range. They are particularly well suited to measurements of semiconductor devices because of the low test level employed (15 mV rms), and the provision for application of dc bias to the test.

The phase-sensitive detection system used allows the capacitance of even low Q devices (as low as Q = 1) to be measured with little reduction in accuracy. Range switching is accomplished by a combination of logic-controlled reed relays and diodes. Range selection is by front panel switch or remote logic-level inputs.

Both models provide a highly linear, high-speed, dc analog voltage output corresponding to the meter or display indication. In addition, the 72AD has BCD outputs, TTL compatible. Autoranging of this model is available as an option.

Adapters are supplied for coaxial-cable connection to a remote test fixture, and for direct attachment of wire lead components. As a three-terminal instrument, the Model 72 is relatively insensitive to the cable shunt capacitance from either side of the test to ground.





DIGITAL MODEL 72AD

Capacitance Ranges: 1.999, 19.99, 199.9, 1999 pF fs.

Accuracy:

Range fs	Q > 5	Q = 1 to 5
2 pF	±(0.25% rdg +0.5% fs)	±(0.5% rdg +0.5% fs)
20 pF, 200 pF	±(0.25% rdg +0.2% fs)	±(0.5% rdg +0.2% fs)
2000 pF	±(0.4% rdg +0.2% fs)	±(2.0% rdg +0.2% fs)

Display: Nixie-type, 3½ digits; display period 250 ms; encode period 10 ms.
Data Outputs: 8, 4, 2, 1 code, digit parallel. Programming lines are used to indicate range, logic 0 true.
Commands: Logic 0 selects range (4 lines); manual disable; autorange enable; encode hold, encode trigger.
Logic Levels: Logic 1, > +3 V; logic 0, < +0.3 V.
DC Output: 2 V ±0.5% for fs all ranges; linearity ±(0.1% rdg. +0.005% fs) source resistance, 1000Ω. Response time < 0.5 ms for full accuracy.
Test Signal: 1 MHz, crystal-controlled; 15 mV rms.
DC Bias: External dc bias may be applied to the test via rear terminals or programming connector.
HI to GND: ±200 V max. **LO to GND:** ±400 V max.
LO to HI: ±600 V max. (floating supply only).
Option: Autoranging. Automatically upranges at 1999, downranges at 180. Ranging time: 100 ms per range. To order use suffix -01.

ANALOG MODEL 72A

Capacitance Ranges: 1, 3, 10, 30, 100, 300, 1000, 3000 pF fs.

Accuracy:

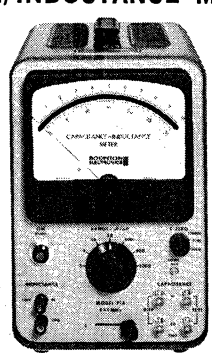
Range fs	Q > 5	Q = 1 to 5
1 pF	±(0.5% rdg +1.0% fs)	±(1.0% rdg +1.0% fs)
3 pF to 3000 pF	±(0.5% rdg +0.5% fs)	±(1.0% rdg +0.5% fs)

Resolution: 0.5% fs for each range.
Meter: 4½ inch taut-band type; two linear scales, 0 to 10 (0.1 per division) and 0 to 30 (0.5 per division).
Commands: Logic 0 selects range (8 lines); manual disable
Logic Levels: Logic 1, > +3 V; logic 0, < +0.3 V.
DC Output: 1 V ±0.5% for fs (1 series ranges); 3 V ±0.5% for fs (3 series ranges).
Linearity: ±(0.1% rdg. +0.01% fs).
Response Time: 0.5 ms for full accuracy.
Test Signal: 1 MHz, crystal-controlled; 15 mV rms.
DC Bias: External dc bias may be applied to the test via rear terminals or programming connector.
HI to GND: ±200 V max. **LO to GND:** ±400 V max.
LO to HI: ±600 V max. (floating supply only).

CAPACITANCE/INDUCTANCE METERS

MODEL 71A

CAPACITANCE/INDUCTANCE METER — 1 MHz



Quick, convenient, direct reading, 3-terminal measurements of capacitance and 2-terminal measurements of inductance. Internally supplied 1 MHz test signal. Operates with low test signal level, permitting semiconductor tests. Linear meter scales. Provision for dc bias. Linear dc output proportional to capacitance or inductance reading for display on dvm, x-y plotter, etc.

SPECIFICATIONS

Capacitance: 1 pF to 1000 pF fs in 7 ranges; basic accuracy, ±0.5% rdg. ±0.5% fs; resolution, 0.25% fs.
Inductance: 1 μH to 1 mH fs in 7 ranges; basic accuracy, ±0.5% rdg. ±0.5% fs; (measurements down to 1 nH with 71-10A Adapters).
Test Signal: Frequency, 1 MHz; level, 15 mV rms for capacitance measurements, < 1 mV for inductance measurements.
Q: Specified accuracies apply for test specimens having Q's of 3 or more; lower with readjustment.
DC Bias: Externally supplied up to ±200 V; (±600 V to special order).
DC Analog Output: 0 to 100 mV or 300 mV fs depending on range numerics; also > 1 V fs for loads > 10 MΩ; linearity, 0.1% of reading; response time, < 10 ms; (1 ms to special order).

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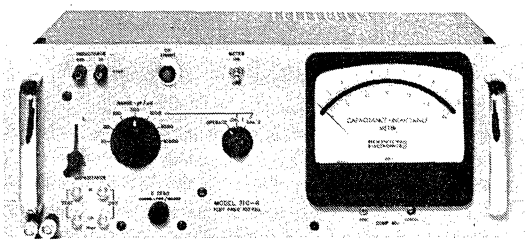
MODEL 71CR

CAPACITANCE/INDUCTANCE METER — 100 kHz



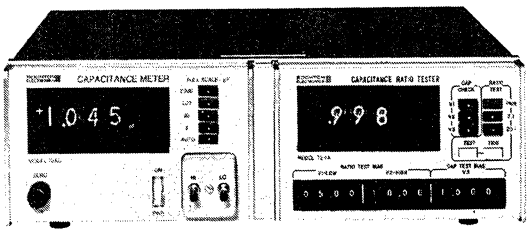
Quick, convenient, direct reading, 3-terminal measurements of capacitance or 2-terminal measurements of inductance. Internally supplied 100 kHz test signal. Operates with low test signal level, permitting semiconductor tests. Linear meter scales. Provision for dc bias. Linear dc output proportional to capacitance or inductance reading for display on dvm, x-y plotter, for data logging or, with suitable voltage comparator, for go/no-go testing. Internal 1000 pF standard.

SPECIFICATIONS

Capacitance: 10 pF to .01 μF fs in 7 ranges; basic accuracy, ±0.5% rdg. ±0.5% fs; resolution, 0.25% fs.
Inductance: 10 μH to 10 mH fs in 7 ranges; basic accuracy ±0.5% rdg. ±0.5% fs; resolution, 0.25% fs.
Test Signal: Frequency, 100 kHz; level, 15 mV rms for capacitance measurements, < 1 mV for inductance measurements.
Q: Specified accuracies apply for test specimens having Q's of 3 or more; lower with readjustment.
DC Bias: Externally supplied up to ±200 V.
DC Analog Output: 0 to 100 mV or 300 mV fs depending on range numerics; also > 1 V fs for loads > 10 MΩ; linearity, 0.1% of reading; response time, 20 ms.

CAPACITANCE RATIO METER

MODEL 172A



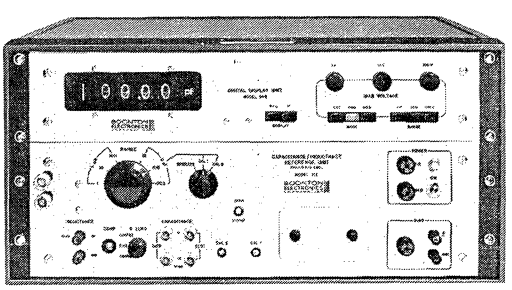
Measures capacitance ratio and capacitance value at accurately preset bias levels. Within 0.5 s results are displayed on two 3½ digit readouts. All functions, ranges, and bias voltages are externally programmable. BCD outputs are provided for ratio and capacitance.

SPECIFICATIONS

Capacitance Ranges: 1.999, 19.99, 199.9, 1999 pF fs.
Capacitance Accuracy: See Model 72AD Capacitance Meter specifications.
Ratio Ranges: 1.999:1 and 19.99:1 fs.
Ratio Accuracy: (Ratio/20)% +0.025 (C_r/C_2)% ±1 digit
Where: C_r = full scale of the capacitance range on which the higher capacitance (C_1) is measured.
C_2 = smaller capacitance value measured.
Test Signal: 1 MHz crystal-controlled, 15 mV rms.
Displays: Ratio and capacitance. Nixie-type; 3½ digits.
Measurement time: < 500 ms.
DC Bias
Full Scale: 1.999, 19.99, 199.9 volts.
Accuracy: ±(0.03% rdg. +100 μV).

MODEL 700C

DIGITAL CAPACITANCE/INDUCTANCE METER — 1 MHz



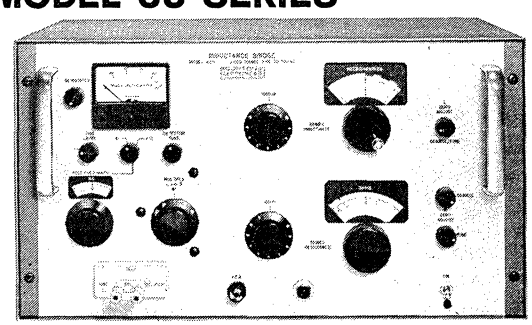
Direct-reading 3-terminal measurements of capacitance and 2-terminal measurements of inductance are made substantially independent of the loss of the test sample. The 4½ digit Nixie-type readout has a display period of 200 ms and 40% overrange. BCD outputs are provided for printer or computer interface. The highly stabilized internal dc bias supply allows three independently settable voltages to be selected as required. An internal 100 pF standard is provided.

SPECIFICATIONS

Capacitance: 10, 100, and 1000 pF fs (+40% overrange); basic accuracy, ±0.25% rdg. ±0.05% fs.
Inductance: 1, 10, and 100 μH fs (+40% overrange); basic accuracy, ±0.5% rdg. ±0.5% fs.
Test Signal: Frequency, 1 MHz; level, 15 mV rms for capacitance measurements, < 1 mV for inductance.
Readout: 4½ digit; TTL compatible BCD outputs; display period, 200 ms; integration time, 1/15 s.
DC Bias: Internal, 0 to ±1.4 V; 0 to ±14 V; 0 to ±140 V. Regulation, 0.05%, 10 mA max. External, ±200 V. Bias voltage monitored on digital readout; accuracy, ±0.1 rdg. ±2 counts.

INDUCTANCE BRIDGES

MODEL 63 SERIES



These unique bridges provide direct-reading measurements of series inductance down to unusually low values with fractional percentage accuracy over broad frequency ranges. Series resistance is also directly measured. Each bridge is complete with built-in oscillator and detector. Test current does not change during balance.

SPECIFICATIONS

MODEL 63H
Inductance: 0.2 nH to 110 mH; basic accuracy, ±0.25%.
Series Resistance: 0.2 mΩ to 11 kΩ; basic accuracy, ±3%.
Test Signal: Frequency, 5 to 500 kHz; level, 3 V rms max.

MODEL 63L
Inductance: 20 nH to 11 H; basic accuracy, ±0.25%.
Series Resistance: 10 mΩ to 110 kΩ; basic accuracy, ±3%.
Test Signal: Frequency, 0.4 to 40 kHz; level, 5.5 V rms max.

MODEL 63M
Inductance: 2 nH to 1.1 H; basic accuracy, ±0.25%.
Series Resistance: 2 mΩ to 110 kΩ; basic accuracy, ±3%.
Test Signal: Frequency, 1 to 100 kHz; level, 5.5 V rms max.

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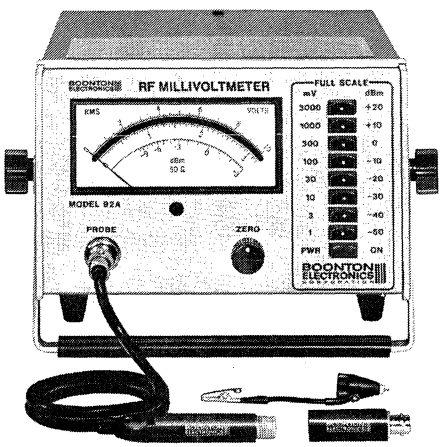
RF MILLIVOLTMETERS

MODEL 92 SERIES

These three programmable rf millivoltmeters offer an unrivaled choice of features and options to satisfy almost any application. Analog and digital readout versions are available. A dBm display with 0.01 dB resolution is optional on Model 92BD.

All are equipped with linear dc output, and BCD outputs are included as standard on the digital version.

Full remote control is standard on all models and autoranging is optional on the Model 92BD.



ANALOG MODEL 92A

Voltage Range: 200 μV to 3 V (300 V up to 700 MHz with divider). Useful indications down to 100 μV.
Frequency Range: 10 kHz to 1.2 GHz (uncalibrated response to approximately 8 GHz).
Accuracy:

	1% fs plus			
300 mV to 3 V	1% rdg.	1% rdg.	3% rdg.	10% rdg.
200 μV to 300* mV	2% rdg.			7% rdg.
*Below 1 mV add 1% fs.	10 kHz	50 kHz	150 MHz	700 MHz	1.2 GHz

Remote Control: External closure or PNP transistor to ground selects each range. Speed, 100 ms per range change.
DC Output: 0 to 10 V proportional to rf input voltage.
Options: Logic-level programming, many scale variations, rear input.

BATTERY MODEL 92AB

Battery Use/Charge Time: 16 h use for 14 h charge.
All other specs. and options are the same as For Model 92A.

DIGITAL MODEL 92BD

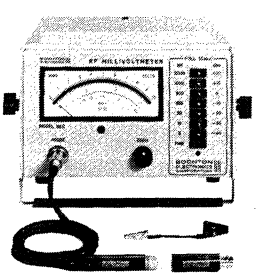
Voltage Range: 200 μV to 3 V (300 V up to 700 MHz with divider).
Accuracy:

	1% fs plus			
300 mV to 3 V	1% rdg.	1% rdg.	3% rdg.	10% rdg.
200 μV to 300* mV	2% rdg.			7% rdg.
*Below 1 mV add 1% fs.	10 kHz	50 kHz	150 MHz	700 MHz	1.2 GHz

Display: 4 digit LED, reads 1000 fs for "10" ranges and 3000 fs for "3" ranges. Display period 200 ms; encode period 75 ms. Vertically-mounted edge-meter to right of display is calibrated in dBm, 50Ω.
Data Outputs: 1-2-4-8 BCD (serial) information. 1-2-4 binary coded range information. Overrange, underrange, encode complete.
Remote Control: All functions and ranges commanded with logic zero referred to ground.
Logic Levels: Logic 1, > +3.0 V; logic 0, < +0.7 V.
Options: Autoranging, digital dBm readout (0.01 dB resolution), rear input.
All other specifications are the same as Model 92A.

MODEL 92C

Delivers substantially the same quality performance as the 92A but at a lower price. Economy has been achieved, not by lowering quality, but by eliminating some of the specialized features of the more expensive instruments (programmability, analog output, the seldom-needed lowest range) and by working to a more modest accuracy specification.



Voltage Range: 500 μV to 3 V (300 V up to 700 MHz with divider).
Frequency Range: 10 kHz to 1.2 GHz (uncalibrated response to approximately 8 GHz).
Accuracy:

	2% fs plus			
300 mV to 3 V	1% rdg.	1% rdg.	3% rdg.	10% rdg.
500 μV to 300 mV	2% rdg.			7% rdg.
	10 kHz	50 kHz	150 MHz	700 MHz	1.2 GHz

ACCESSORIES

FURNISHED (ALL MODELS)

RF Probe with low noise cable and connector	91-12F
50Ω BNC Adapter; 1 kHz to 600 MHz	91-8B*
Removable Probe Tip with grounding clip lead	91-13B

AVAILABLE

Low Frequency Probe: -1 kHz to 250 MHz	91-4C
Unterminated BNC Adapter	91-6C
100:1 Voltage Divider: 50 kHz to 700 MHz	91-7C
Type N Tee Connector: 1 kHz to 1.2 GHz	91-14A*
Type N 50Ω termination (use with 91-14A)	91-15A*
Unterminated Type N Adapter	91-16A
Storage container for accessories	91-18A
Accessory Kit: Model 91-6C Unterminated BNC Adapter Model 91-7C 100:1 Voltage Divider Model 91-14A 50Ω Tee Adapter Model 91-15A 50Ω Termination Model 91-18A Storage Case	91-24A*
Rack-mounting kit (mounts left or right)	92-1A
Dual Rack-mounting kit	92-1B

*Available in 75Ω versions (usable to 300 MHz).

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BOONTON ELECTRONICS CORPORATION

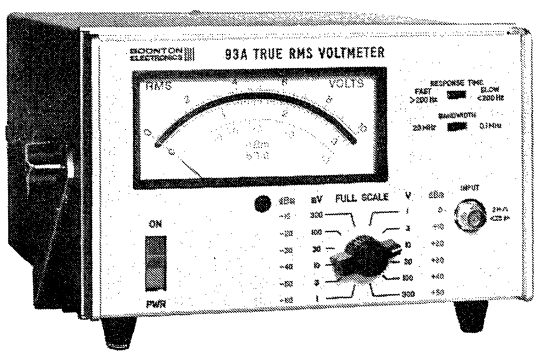
ROUTE 287 AT SMITH ROAD
PARSIPPANY, N. J. 07054 USA
TEL: (201) 887-5110 / TWX: 710-986-8241

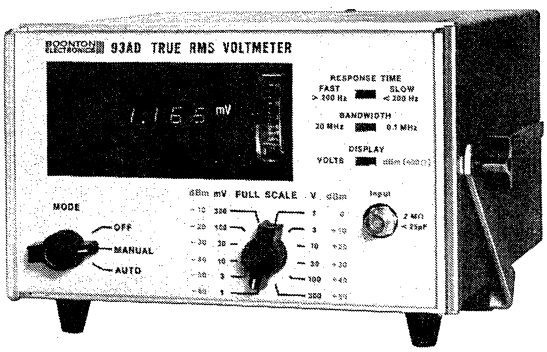
TRUE RMS VOLTMETERS

MODEL 93 SERIES

The ideal choices for accurate digital or analog measurements on distorted sine-waves, complex waveforms, pulse trains, and noise. Both units have full remote control and linear dc output for converter applications. The digital version offers additional accuracy, coded outputs, and automatic ranging plus a dBm display with 0.01 dB resolution. Bandwidth is a full 10 Hz to 20 MHz for both models even on the most sensitive 1 mV fs range.

The 93A and 93AD both cover twelve AC voltage ranges from 1 mV full-scale to 300 V full-scale. The 1 mV full-scale range provides unmatched sensitivity for low-level applications—100 μV in the case of the 93A, 300 μV for the 93AD. This sensitivity is often required to measure the low rms level of noise and of low duty cycle pulse trains.





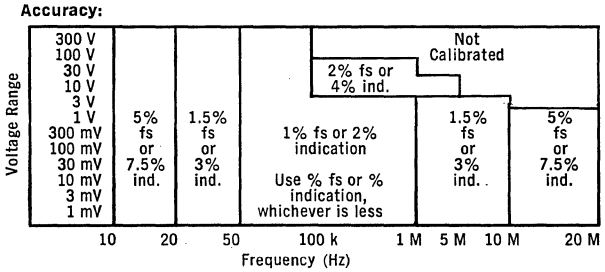
ANALOG MODEL 93A

Voltage Range: 1 mV to 300 V fs, in 12 switched ranges. (100 μV lowest measurable level.)

dBm Range: −68 dBm to +52 dBm (600Ω ref.).

Selectable Frequency Range: 10 Hz to 20 MHz or 10 Hz to 100 kHz.

Accuracy:



Indicator: 4½″ mirror-backed meter, three scales, volts and dBm (600Ω ref.).

Response: RMS, calibrated in rms, for sine, complex, pulse, or random waveforms.

Response Time: Fast: > 200 Hz, 1 sec. Slow: < 200 Hz, 4 sec.

Crest Factor: 6 at full scale; 18 at down scale.

Input: Impedance: 2 MΩ, < 25 pF. Equivalent noise: < 35 μV.

DC Analog Output: +10 V for full scale on "1" series ranges; +9.5 V for full-scale on "3" series ranges (10 V for 3.16). Source resistance 5Ω approx.; maximum loading 1 mA at fs.

Remote Control: All functions and ranges commanded with logic zero referred to ground.

Options:
-08 Rear signal input.
-09 50Ω dB reference (−57 dBm to +63 dBm).
-10 75Ω dB reference (−58 dBm to +62 dBm).

Accessory:
93-1A High-impedance probe. Input impedance 10 MΩ, < 11.5 pF; attenuation 10x.

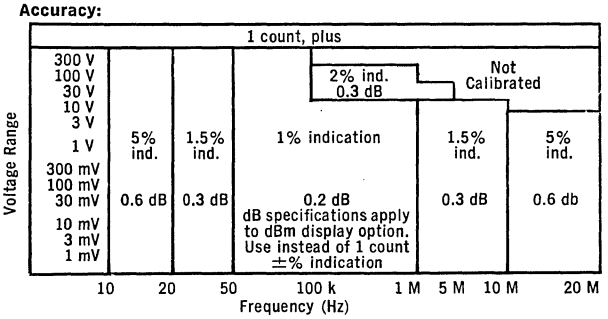
DIGITAL MODEL 93AD

Voltage Range: 1 mV to 300 V rms fs, in 12 switched ranges. (300 μV lowest calibrated level.)

dB Range: 120 dB; resolution, 0.01 dB (optional).

Selectable Frequency Range: 10 Hz to 20 MHz or 10 Hz to 100 kHz.

Accuracy:



Display: LED digital display, 3 digits +1. (4 digits for dBm.) Decimal point, units (V, mV, dB), under- and over-range, polarity (dBm only) also indicated. Analog edgemeter, calibrated over 12 dB range.

Response: RMS, calibrated in rms, for sine, complex, pulse, or random waveforms.

Response Time: Fast: > 200 Hz, 1 sec. Slow: < 200 Hz, 4 sec.

Crest Factor: 6 at full scale; 18 at down scale.

Input: Impedance: 2 MΩ, < 25 pF. Equivalent noise: < 35 μV.

Outputs: BCD 8, 4, 2, 1 for display (serial), range and mode information; Analog: +10 V for full scale.

Remote Control: All functions and ranges commanded with logic zero referred to ground.

Options:
-01 Autoranging. Selects correct range for the voltage applied.
-08 Rear signal-input
-09 50Ω dBm display (−57 dBm to +63 dBm).
-10 75Ω dBm display (−58 dBm to +62 dBm).
-15 600Ω dBm display (−68 dBm to +52 dBm).

Accessory:
93-1A High-impedance probe. Input impedance 10 MΩ, < 11.5 pF; attenuation 10x.

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

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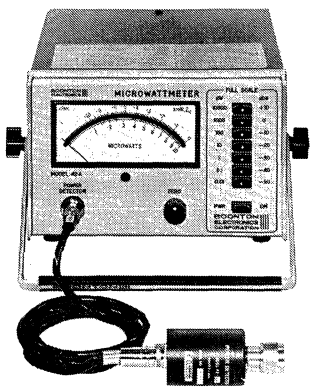
RF POWER METERS

MODEL 42 SERIES

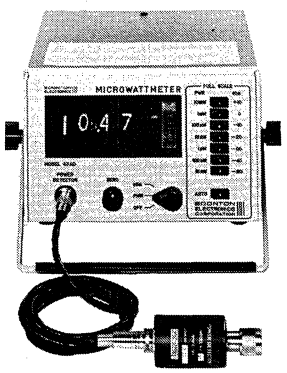
The new Model 42A and 42AD Microwattmeters are exceptionally sensitive programmable 200 kHz to 18 GHz power meters that virtually eliminate zero drift and temperature stability problems.

Long-term absolute accuracy of the combined instrument and power detector is specified to allow the power meter to be used without frequent calibration checks.



MODEL 42A
Analog Version:
4½" taut-band meter; two scales, power and dBm; dc output.

Options for Model 42A
02 Logic-level programming
08 Rear signal input
11 Reverse scales (dBm lower)



MODEL 42AD
Digital Version:
3½ digit power readout plus vertical edgemeter for analog readout of dBm. Display period 250 ms; encode period 10 ms. BCD outputs: linear dc output.

Options for Model 42AD
01 Autoranging
02 Logic-level programming
08 Rear signal-input
08 dBm/power readout

SPECIFICATIONS

Power Range: 1 nW to 10 mW (−60 to +10 dBm).
Full-Scale Ranges: Seven, 10 nW fs to 10 mW fs.
Frequency Range: 200 kHz to 18 GHz.
Accuracy: Instrument with Model 41-4E Power Detector.

	0.1% fs plus*		
10 nW to 10 mW (−50 to 10 +dBm)	0.2 dB	0.4 dB	0.6 dB

	1% fs plus		
1 nw to 10 nW (−60 to −50 dBm)	0.4 dB	0.5 dB	0.8 dB

200 kHz — 4 GHz — 12.4 GHz — 18 GHz

Stability: Zero, 1 nW/h max.; temperature, typically 0.007 dB/°C.
Programming: Closure or PNP transistor to ground selects range. Speed, 100 ms per range change.

*0.5% fs on Model 42A.

POWER DETECTORS

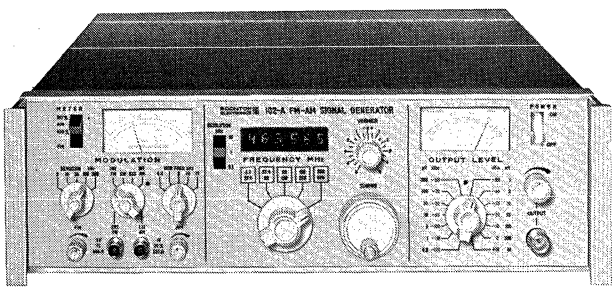
41-4A	200 kHz — 7 GHz, 50Ω input	Connector: Precision type "N" standard, APC-7, optional
41-4B	200 kHz — 12.4 GHz, 50Ω input	
41-4C	200 kHz — 1 GHz, 75Ω input	
41-4E	200 kHz — 18 GHz, 50Ω input	

Specifications subject to change without notice. Printed in USA.

SIGNAL GENERATOR

MODEL 102A

FM/AM — 4.3 TO 520 MHz



The 102A FM/AM Signal Generator includes the most-wanted generator features in a single solid-state unit, at a reasonable price. Excellent stability is obtained by deriving the output frequencies from an unswitched, inductance-tuned VFO with mixing, dividing, and multiplying techniques, using PIN-diode electronic bandswitching and band-pass filters. The 6-digit LED frequency display can be switched for 100 Hz, 1 kHz, or 10 kHz resolution; this, together with a smooth dial drive and electronic vernier control, makes precise frequency setting simple.

Both FM and AM are characterized by wide range, low distortion and phase shift and accurate true-peak monitoring. This gives the 102A broad application in the mobile radio, entertainment, navigational-aids, telemetry, components, and communications fields.

SPECIFICATIONS

FREQUENCY —
Range: 4.3 to 520 MHz in five bands (1, lowest; 5, highest).
Accuracy: ±(100 Hz +3 ppm).
Stability: Bands 2-5; drift < 20 ppm/10 min. after 1 hr. (Typically < 10 ppm/10 min. after 2 hr.) Band 1; drift < 1.5 kHz/10 min. after 1 hr.
Residual FM: Bands 2-5; < 0.25 ppm peak, (20 kHz-15 kHz bandwidth) Band 1: <20 Hz peak.
Display: Six-digit LED; resolution selectable 100 Hz, 1 kHz, 10 kHz.

RF OUTPUT —
Power Level: −130 dBm to +13 dBm.
Attenuator: 13 steps, 10 dB/step, plus variable 13 dB.
Accuracy: ±(1.0 dB +0.10 dB/10 dB step), (Max. ±2 dB).
Leveling: ±0.5 dB max. variation across each band.
Spurious Output: > 30 dB down.
Impedance: 50Ω; VSWR < 1.5:1 at levels below 0 dBm.

FREQUENCY MODULATION —
Deviation: 0-300 kHz peak, calibrated. (> 1 MHz peak uncalibrated).
Range: 3 kHz fs to 300 kHz fs in five ranges.
Accuracy: ±10% fs.
Bandwidth: DC to 200 kHz.
Distortion: Bands, 3, 4, 5; < 1% THD at 100 kHz peak dev. Bands 1, 2; < 2% THD at 100 kHz peak dev.

AMPLITUDE MODULATION —
Percent: 0 to 100.
Calibrated Ranges: 30%, 100% fs.
Bandwidth: DC to 20 kHz.
Distortion: (at 1 kHz rate) < 1% THD at 30% AM; <2% THD at 70% AM; (typically < 3% THD at 90% AM).

INTERNAL MODULATION —
Frequencies: 400 Hz, 1 kHz, 3 kHz, 10 kHz, 19 kHz.
Accuracy: ±3%.
Distortion: 0.3%.
Simultaneous Modulation: External FM, internal AM; Internal FM, external AM; External FM, external AM.

Options:
-01 Modulation and rf output connections on rear.
-02 Special modulation frequencies 20 Hz-100 kHz.
-03 Demodulated AM output.
-04 Fused rf output, 0.8 W.

CALIFORNIA INSTRUMENTS

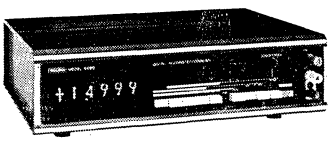
DMM/COUNTERS, DPMS MONITOR OSCILLOSCOPES

California Instruments was the originator of the digital multimeter which incorporates a frequency counting function, and of the 7-channel oscilloscope for monitoring multi-track analog tape recording. Other products include Digital Panel Meters, AC power sources, line Correctors and oscilloscopes.

DIGITAL MULTIMETERS/COUNTERS

MODEL 8420 (4½ Digit)

- 18 ranges with overrange
- AC volts
- DC volts
- Resistance
- Frequency
- BCD options and syncrocount



MODEL 8421 (4½ Digit)

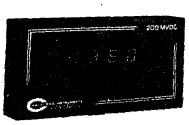
- 18 ranges with 100% overrange
- Autoranging of all functions
- AC volts
- DC volts
- Resistance
- Frequency
- BCD options and Syncrocount

MODEL 8310 (3½ Digit)

- 30 ranges with 100% overrange
- High CMR and NMR
- AC volt and current
- DC volt and current
- Resistance to 200 Megohms
- Autoranging
- Auto Zero
- Dual slope integration

DIGITAL PANEL METERS

MODEL 8330 (3½ Digit)
MODEL 8440 (4½ Digit)

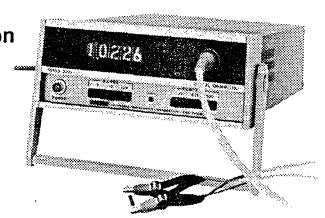


- up to 100% overrange
- Programmable
- Bipolar
- BCD outputs
- Wide temperature operating range
- Small, Rugged, compact

DIGITAL OHMMETERS

LOW LEVEL, WIDE RANGE MODEL 8303

- One OHM full scale with nine ranges to 100 megohms
- 100 micro ohm resolution
- Four wire kelvin input
- Accuracy to ±0.02%
- Analog voltage output
- BCD options

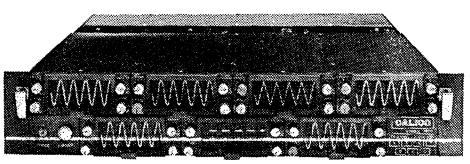


MONITOR OSCILLOSCOPES

MODEL 7500

Used for Analog Tape Recorder Monitoring, Vibration Monitoring and Medical applications.

- Seven channel display
- Fourteen Independent inputs
- DC to 10 MHz
- 3½" high rack mount
- 50 mv full scale sensitivity



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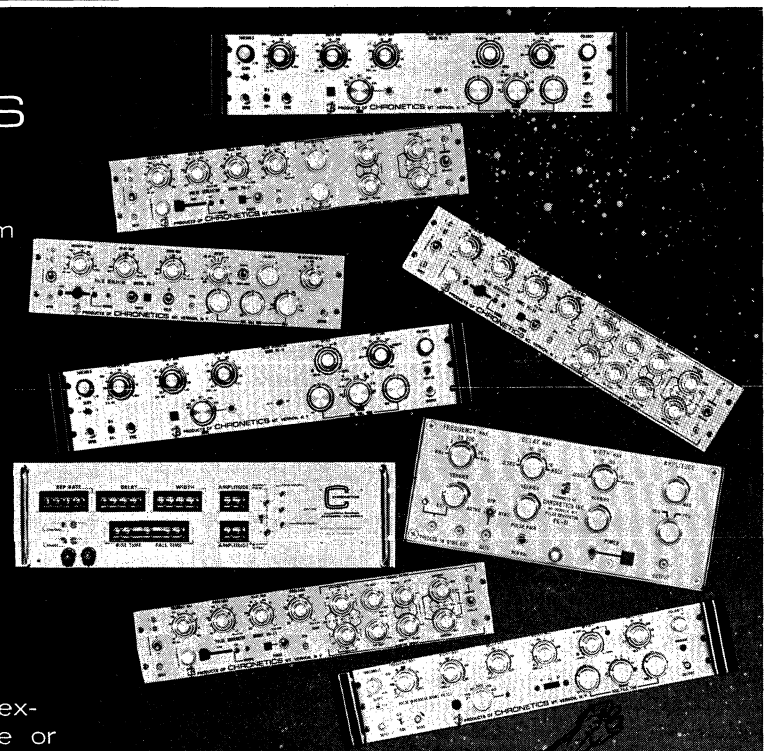
SEE Vol.1•646 & 1•647 IN SECTION 4000 FOR OTHER CALIFORNIA INSTRUMENTS PRODUCTS

CHRONETICS



Advanced Pulse Generators from CHRONETICS: The most versatile, sophisticated, high performance pulsers in the field. State of the art circuit design, meticulous construction for reliable quality. Performance and flexibility second to none. Thirteen standard models for virtually every need.

Repetition rates from 0.1 Hz to 100 MHz, output amplitudes from 0 to ±100 volts or ±2A, rise/fall-times of less than 2 ns, wide dynamic ranges, high duty cycles, bipolar outputs, etc. are all available on standard instruments.

Chronetics' Pulse Generators are exceptionally flexible. All provide single or double pulses of either polarity, single-shot, pulse bursts. Bipolar outputs and current/voltage modes are available. Usually prf, amplitude, risetime and falltime, width, delay and DC-offset are independently and continuously variable.

"Total Pulse Control" and price/performance engineering make CHRONETICS' Pulse Generators the best buys in the field. Prices begin as low as $395* for the compact, rugged, high-performance PG-11A. Sales/Service is on a world-wide basis with field offices near you.

CHRONETICS' ADVANCED PULSE GENERATORS

MODEL	CLOCK PRF	AMPLITUDE[2]	Z OUT	RISE/FALL TIME	PULSE DURATION	PULSE DELAY	DUTY CYCLE (MAX)	DC OFFSET
PG-10	0.1 Hz-50 MHz	5 mV-5V + or −	50 ohms or 1K, min.	< 5 ns	15 ns-1 sec	15 ns-1 sec	To 100%	± 2V ±40 mA
PG-11A	<10 Hz-> 50 MHz	0-15V + or −	8 ohms	<5 ns	15 ns-10 ms	20 ns-10 ms	85%	
PG-12	0.1 Hz-50 MHz	100 mV-10V + or −	50 ohms	< 5 ns-1 sec[4]	10 ns-1 sec[4]	15 ns-1 sec	To 100%	± 10V
PG-13B	1 Hz-25 MHz	100 mV-100V + or −	50 ohms or 1K, min.	<10 ns-50 ms[4]	10 ns-500 ms[4]	15 ns-500 ms	10% @ 2A 50% @ 1A 100% @ < 0.5A	±5V ±100 mA
PG-14	1 Hz-50 MHz	100 mV-20V + or −	50 ohms or 10K, min.	2 ns-50 ms[4]	<5 ns-500 ms	10 ns-500 ms	To 100%	±5V ±100 mA
PG-16	1 Hz-100 MHz	100 mV-20V + or −	50 ohms or 10K, min.	2 ns-50 ms[4]	<5 ns-500 ms[4]	10 ns-500 ms	To 100%	±5V ±100 mA
PG-32A	0.1 Hz-10 MHz 20 MHz Max.[1]	20 mV-20V[3] + and − 2 Channels	50 ohms or 500 ohms	5 ns-1 sec[4]	< 30 ns-1 sec[4]	50 ns-1 sec	To 100%	To 10V To 400 mA
1012P[6]	10 Hz-9.99 MHz 20 MHz Max.[1]	0-9.9V[2] + or −	50 ohms	5 ns-9.9 ms	40 ns-9.9 ms	25 ns-9.99 ms	85%	±9.9V

*F.O.B. MT. VERNON, N.Y., DOMESTIC

1 Effective PRF in double pulse mode
2 Max. Range into 50-ohm loads
3 Separate or combined (bipolar) channels; same polarity on Special Order
4 Variable linearly -Separate control of Rise and Fall Times
5 Independent control Pulse 1 / Pulse 2 (double pulse mode)
6 Fully programmable

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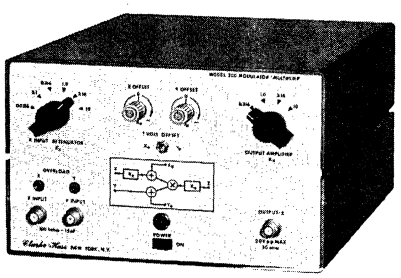
3 in 1

MULTIPLIER MODULATOR AMPLIFIER

The Model 200 is a unique, ready-to-use four quadrant multiplier with self-contained power supply, wide band power amplifier, (50 ohm, 20 V pp), input amplifiers (100 kohm, 20 pF), input and output attenuators, dc offset controls, calibrated dc for gain settings and individual overload indicators for each channel.



as a MULTIPLIER the maximum error on either channel is less than 1% of full scale. Identical channel amplifiers minimize channel phase and gain deviations. Less than 2 nsec. difference in channel delays.

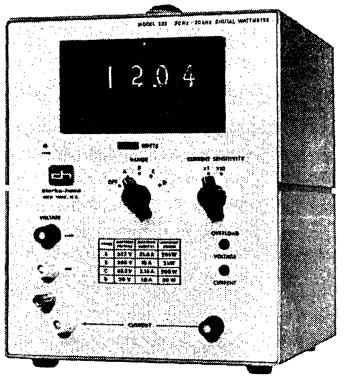
as a MODULATOR the Model 200 will provide 98% AM MODULATION with carriers up to 8 MHz and 99.5% AM MODULATION below 4 MHz. As a SUPPRESSED CARRIER MODULATOR, carrier suppression below 40 dB is achieved from dc to above 4 MHz.

as a gain controlled AMPLIFIER the Model 200 allows amplitude programming of any oscillator, signal generator, or FM generator. Provides 40 dB of voltage gain with less than 1% distortion from dc to over 2 MHz.

as a WATTMETER use voltage and current probes to read instantaneous power in switching circuits or average power in noise measurements.

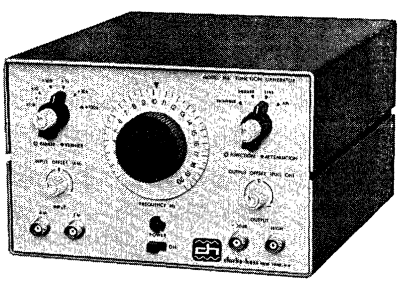
Price: $455.00

unique instrumentation



WIDEBAND WATTMETER

20Hz – 20 kHz; 2W – 20kW, full scale. Up to 31 A/630 V. down to 100 mA/20 V. Accuracy 1%, any connection. Power Factors 0-1. Easy to connect and to read. BCD output available. x10 power expansion for low power factor use available as option. Model 235. Price $2495.00.



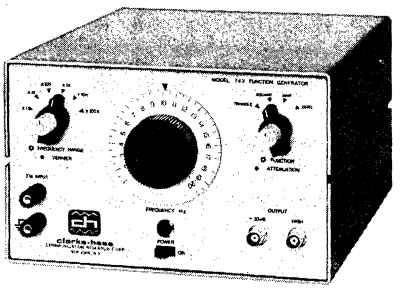
AM/FM/TONE BURST/PHASE LOCK SYNC

Model 748
FUNCTION GENERATOR

All of the features of the Model 743 plus a high quality, broad band multiplier to produce amplitude modulation or voltage control of the sine wave output. Separate control of multiplier input dc offset (% modulation) and of output signal amplitude. Output dc offset control. Rear panel square and sine wave reference signals. Simultaneous or separate AM / FM / Tone Burst and/or Carrier Sync. Suppressed carrier modulation with at least 40 dB carrier suppression up to 4 MHz.

Price $515.00.

function generators

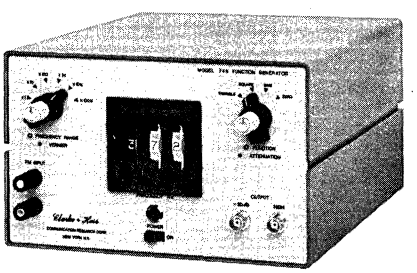


Model 743
DIAL CONTROLLED

Sine, Square, Triangle, Tone Burst, Phase Lock Synchronization, Wide Range, low distortion VCF and/or FM. 1 Hz to 2 MHz dial controlled. Sweeps to twice upper dial frequency. Uncalibrated frequencies from 1 mHz to 1 Hz through Low Frequency Expand Switch. Sine Wave Distortion –46 dB. Extremely constant amplitude response. Price: $365.00

Model 750
INTERNAL SWEEP

All the features of the Model 743 plus an internal sweep oscillator with ramp periods from more than 200 seconds down to 1 millisecond. Calibrated sweep widths from twice full scale to less than 0.1% of full scale for all six ranges. Price: $475



Model 745
DIGITALLY CONTROLLED

Outmodes all pushbutton oscillators. Digitally settable from 0.01 Hz to 1.1 MHz. Typical resettability is 0.1%. Three digit thumbwheel switch frequency control. Except for frequency accuracy, range, and resettablity, other characteristics are similar to Model 743. Overall frequency accuracy ±0.4% of reading ±2 digits.

Price: $475.00

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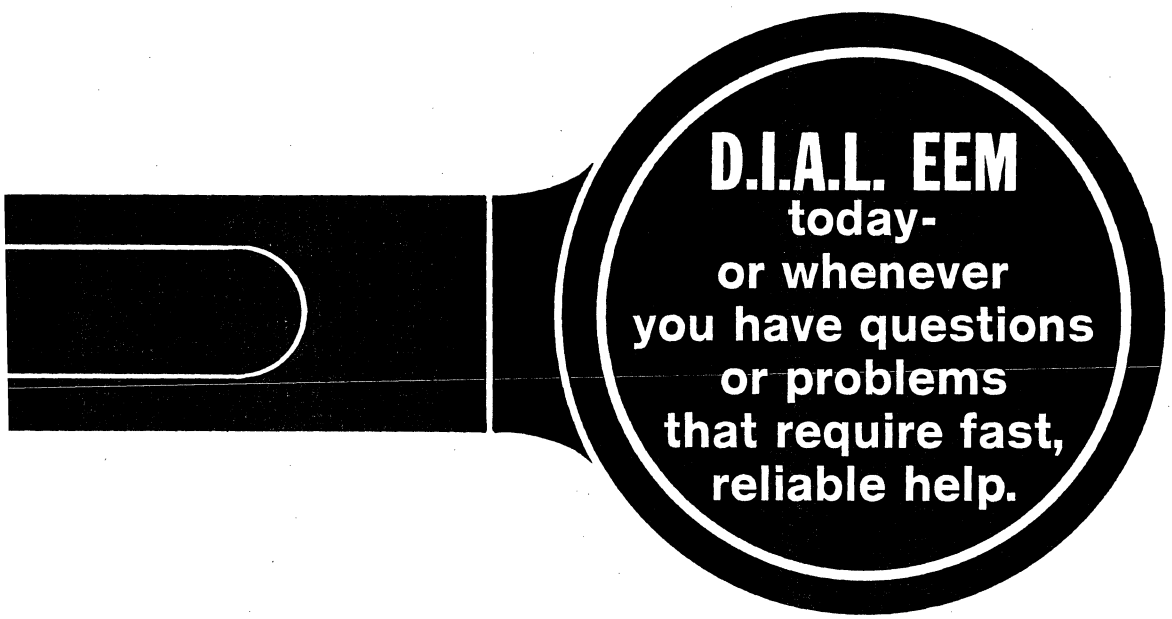

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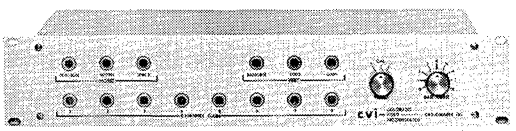
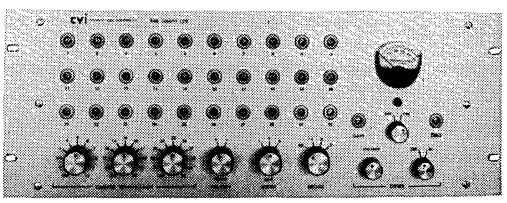


Bar Graph 101

A device accepting 8 negative going signal inputs and converting these into a vertical "Bar" pattern as seen on the screen of a standard TV monitor. Requires external sync. Rack mount, 3½" high, solid state.

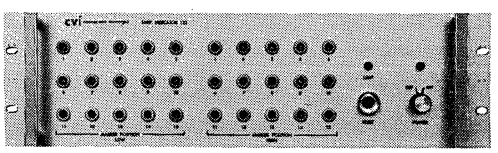
$1250.



Bar Graph 120

Accepts 30 negative going input signals and produces a horizontal bar display with better than 1% accuracy. Has individual channel markers, zero suppression, decade expansion, and other features. Requires external sync. Rack mount, 7" high, solid state.

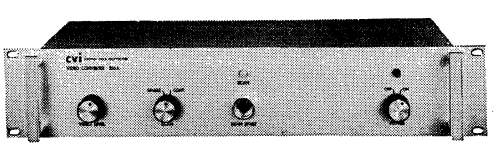
$4200.



Limit Indicator 122

A device producing 15 separate "high" and 15 separate "low" vertical markers with automatic alarm when video falls outside of predetermined limits. Requires external sync. Rack mount, 5¼" high, solid state.

$3500.



Video Converter 201-A

A unit which accepts a standard "real time" television input signal and uses high speed sampling to produce a "slow-scan TV" output signal for computer data reduction or other forms of video processing. Conversion accuracy is excellent, with negligible grey scale distortion. Rack mount, 3½" high, solid state.

$1950.

Video Converter 220-A

Companion unit to the 201-A. Utilizes a magnetic disc memory together with high speed pulse circuits to convert "slow-scan" video or properly formated computer data to standard 525 line TV rates. Has automatic erase and indefinite image storage capabilities. Options include color reproduction and selective record/erase. Rack mount, 7" high, solid state circuitry.

$5000.

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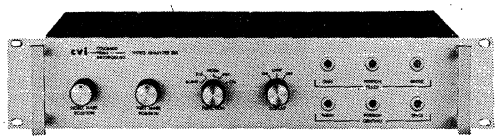
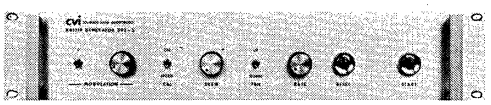


Video Analyser **301**

An instrument displaying "vertically line-selected" TV waveforms directly on the screen of a normal TV monitor. 1/1 waveform/ picture ratio simplifies identification of individual picture elements. Display also includes an electronic reference grating and H and V markers. Requires external sync. Rack mount, 3½" high, solid state.

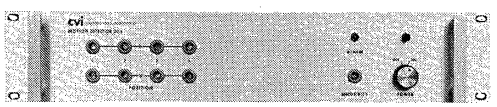
$875.



Raster Generator **302-5**

A unit designed to couple the models 302 or 321 to a conventional X-Y Plotter to provide 128 line "pseudo topographic" images from TV signals. Rack mount, 3½" high, solid state.

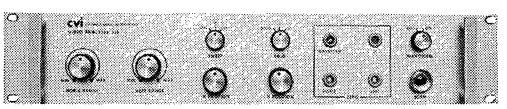
$950.



Motion Detector **304**

A device sampling four independent points in a TV scene and producing an alarm when a change in brightness occurs at any of the sampling points. Operates with standard, composite, video signals. Rack mount, 3½" high, solid state.

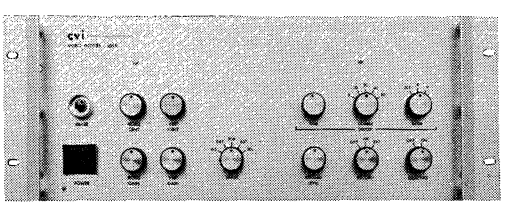
$1250.



Video Analyser **321**

Laboratory version of the 301. Incorporates additional circuitry to allow chart recording of "line selected video waveforms, X-Y coordinate indication, noise analysis, computer data input, and other features. Requires external sync. Rack mount, 3½" high, solid state.

$2500.



Video Plotter **401-A**

An instrument which converts low frequency data to video format with indefinite signal storage via a wide band magnetic disc memory. Features include internal time base, electronic reference grating, multimode recording, grey scale reproduction, and selective erase. Generates own sync. Rack mount, 7" high, solid state circuitry.

$4000.

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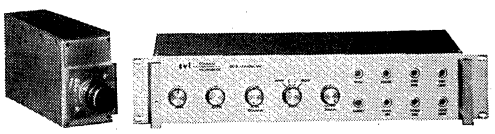
Video Memory **404-B**

A wide band magnetic disc recorder accepting properly formatted computer output signals for conversion to standard 525 line TV rates. Incorporates four separate read/write/erase channels for generation of multiple displays or synthetic color. Also produces H and V timing pulses for synchronization of auxiliary equipment. Rack mount, 8¾" high, solid state circuitry.

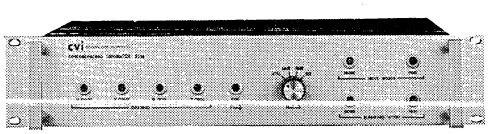
$6000.



Data Camera **501**

A Vidicon camera intended for laboratory use. Features both "real time" and "slow-scan" video outputs for computer data reduction. Requires external sync. Control chassis is rack mount, 3½" high, solid state.

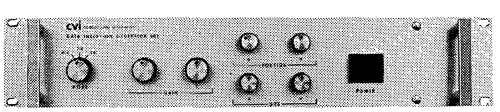
$3500.



Sync Generator **601-B**

A unit intended for laboratory use when either standard or non-standard TV scan rates are required. Uses micrologic binary counters with adjustable feedback paths. Drive and blanking pulses are variable width, but sync is not EIA format. Incorporates dot/bar generator for test purposes. Rack mount, 3½" high, solid state.

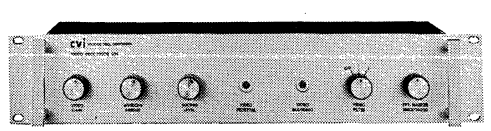
$1025.



Data Insertion Generator **603**

Combines the functions of a 2 channel video mixer, special effects generator, and video pointer. Moveable oblong is positionable to any point in TV raster and is variable in size over a wide range. Oblong acts as the internal "key" in special effects mode, and also generates a white "box" outline or solid square for marking purposes. Requires external sync. Rack mount, 3½" high, solid state.

$1250.



Video Processor **604**

An instrument which modifies the grey scale of a video input signal by selecting and amplifying a variable width "slice." Also incorporates variable brightness control, sync adding, and marker adding functions. Requires external sync. Rack mount, 3½" high, solid state.

$950.

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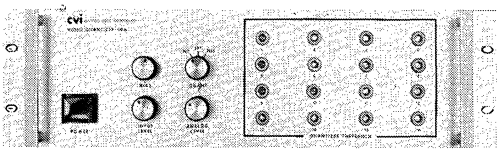
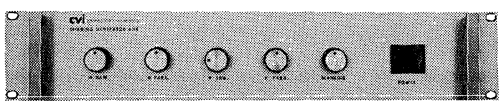
Video Quantizer **606**



A device which allows the processing of a video input signal into 16 separate amplitude levels. Operates with tape, camera, or disc inputs and allows radical grey scale alterations or the generation of complex synthetic color signals. Rack mount, 5¼" high, solid state.

$3500.

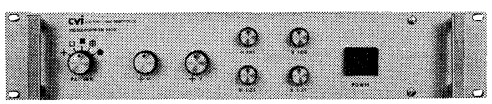
Shading Generator **608**



Generates H and V sawtooth and parabolic waveforms of variable amplitude and polarity to provide compensation of brightness errors in video input signals. May also be used to drive external dynamic correction circuitry. Requires external sync. Rack mount, 3½" high, solid state.

$950.

Video Pointer **610-C**



A voltage positionable marking device producing a set of cross-hairs, solid oblong, "box" outline, or a combination of these. Rack mount, 3½" high, solid state. Requires external sync.

$1950.

OTHER CVI INSTRUMENTS

Video Analyser **302**

Similar to model 321, but does not have internal time base or field selection and incorporates variable H and V sample widths.

$1950.

Sync Stripper **302-2**

A small, self-powered device accepting standard, composite, video signals and producing H drive, V drive, and composite sync outputs for operation of peripheral equipment.

$200.

Data Camera **501A**

Identical to model 501, but without sampling bandwidth compression circuits.

$2500.

Sync Generator **601C**

Generates gated erase and sync pulses for re-recording memory disc sync tracks in the field.

$950.

Video Quantizer **606A**

8-channel studio version of the 606, has built-in programming patch panel.

$2500.

Video Target Diameter Analyser **611**

A device that may be used for TV pupillometry or other application where continuous measurements of the height of a moderate or high contrast video subject are required.

$1950.

Video Test Generator **615A**

Provides greyscale, multiburst, window, grating, and dot patterns for equipment checkout.

$1500.

X-Y Indicator **621**

Reduces spatial coordinates of data in a TV image to X and Y D.C. voltages. Uses crosshair or dot to locate data.

$1500.

Video Detector **630**

A unit designed for detection of instantaneous positive or negative video peaks. Gating and control circuits are provided.

$1500.

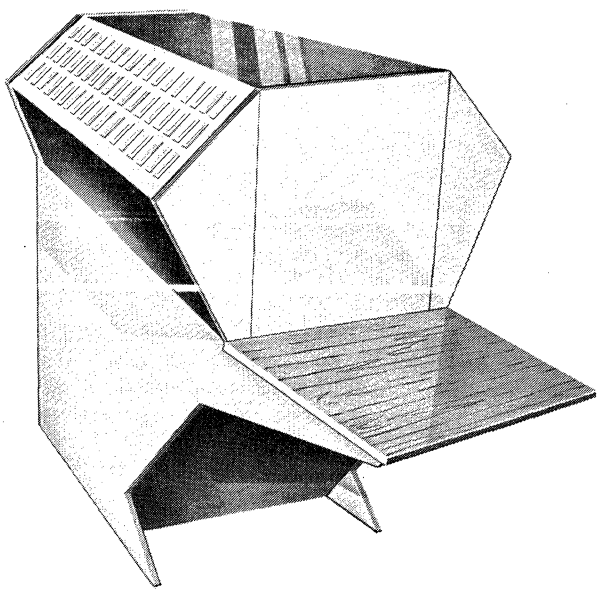
COUNTERSCAN SYSTEMS

HIGH DENSITY CABLE ANALYZER
MULTI-CONDUCTOR ELECTRICAL TESTER
MULTIPLE CIRCUIT WIRE CHECKER

Now for the first time, you can get a wire checker that has followed the state of the art. Once programmed, all you need to do to test different cables, harnesses, backplanes, PW boards, etc., is to press a program select button. No mess with putting on reels of tape, cards, or hooking up other peripheral equipment. This machine is completely self-contained, and even includes a built-in special purpose computer. Programs are stored in electrically reprogrammable MOS LSI ROM's and the first program is supplied FREE with the machine. The program content can consist of anything of your choosing.

Machine capacities available from 240 points to 384,000 points, in 240 point increments.

Super-sophisticated electronic circuitry utilizes LSI CMOS technology almost exclusively. Advanced packaging techniques reduce internal volume by 87%. Choice of various test frequencies and test voltages is continuously available and is part of the program. Any pin connection to the device under test may be used as an input or output.



Shown above is the 25,920 point Wire Checker. The sophisticated human engineering aspects can readily be seen; i.e., access to panel connectors, desk top and seating arrangement. Smaller capacity models are table-top units. All units are controlled exclusively with a small table-top keyboard.

SPECIFICATIONS

1. The entire operation of the machine is programmable, including all test variables, pass/fail criteria, cable nomenclature (and programmable even from wire to wire), and all wire and pin number connections. The wire checker can accomplish the following tests:

(a) Checks for continuity between any two points or between one point and any number of other points, up to machine capacity.

(b) Checks for shorts between any points or between one point and any number of other points, up to machine capacity.

(c) Checks insulation resistance (impedance) between any points or between any one point and all other points (option).

(d) Will perform a Hi-Pot Test between any one or more points to any other points including the frame, other conductors, etc. (option).

2. Machine will operate in full automatic and manual modes of testing.

3. The machine is operated via a small table-top keyboard which contains all operating controls. The keyboard contains a FIFO memory and thereby allows instructions to be entered at any data rate. All controls are touch type push-button switches and are so arranged for maximum efficiency, ease of operation, and viewing. The controls are easily understood and the keyboard easily operated by non-technical personnel.

4. A display of the input-output connection points being tested is continuously presented on a multi-digit liquid crystal display.

5. The 240 point unit can accomplish a complete test in less than a second. The 384,000 point unit will test in less than 10 minutes.

6. The extensive switching functions are accomplished using high-speed LSI CMOS multiplexers.

7. Continuity and Short-Check test voltages and test frequencies are both programmable between 0 to 10 volts and DC to 1 Mcps.

8. ROM memories sufficient to store the programs up to the capacity of the machine are supplied with each unit sold.

9. Calibration of the unit can be accomplished in about 20 minutes.

10. The unit is completely self-cooling. Power input is 117 plus or minus 5 volts AC 60 cps. The unit will present a load of approximately 2 amps for the 240 point unit and approximately 18 amps for the 384,000 point unit. Primary power protection is provided. Line filters are provided to reduce conducted interference.

11. Machine capacities through 2400 points are the very latest design table-top units, with an associated keyboard. Capacities of 2640 points and greater are desk-top consoles containing exceptional human engineering factors and appearance.

12. A complete warranty package is included with each unit. A complete inventory of spare parts is maintained by Counterscan Systems.

13. Complete documentation is supplied with each unit.

14. Training and operation instructions are provided to the customer's satisfaction at no cost.

15. The testers are furnished complete in every detail and ready to operate. Prices for the basic models range from $2800 complete for the 240 point unit and up. Deliveries vary from "on the shelf" and up. Complete prices and delivery information for all models and options available on request.

16. Options: (a) Noiseless High Speed Printer (c) Hi-Pot Test
(b) Programming (d) Insulation Test

We can supply interfacing cables. Also we can incorporate into the machine the mating connectors of the device under test. Final acceptance is at the buyers location.

ADDITIONAL COUNTERSCAN PRODUCTS

PROGRAMMER for PROMS and other reprogrammable ROMS includes the erase function, keyboard entry.

SWITCH MODULE capability to switch any one of 240 input points to either of two busses, and then accomplish the same with another input point and hold simultaneously. Includes latching and decoding.

MULTIPLEXER 480 channel multiplexer includes decoding and latching for the selected point.

KEYBOARD serial and parallel entry and asynchronous and synchronous operation. Special functions only does not include the entire ASC code, only part.

DIRECT ALL INQUIRIES TO:
COUNTERSCAN SYSTEMS P.O. BOX 536 • SUTTON, NEBRASKA 68979 • CALL COLLECT (402) 773-3875
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N.Y. STATE CALL COLLECT (516) 294-0990)

CURTIS

ANALOG ELAPSED TIME INDICATORS

... Smallest size, lowest cost, AC or DC, any voltage

How they work — The patented Curtis Ampere Hour Meter is basically a mercury microcoulometer fabricated from precision bore, glass capillary tubing filled with two columns of mercury separated by a small electrolyte gap. Application of pure or pulsed DC signals to electrodes inserted in the mercury causes mercury at the anode to be electrochemically transferred across the gap to the cathode at a time rate proportional to the current. The gap moves along the tube length as a function of the current-time integral. A constant-current supply provides a precision timing device.

TYPICAL APPLICATIONS

Warranty — Low-cost meters for warranty of equipment based on both actual usage, and calendar period.

Reliability Engineering — Provides mean-time-to-failure or sub-system replacement time without costly, unreliable logging.

Test Equipment Utilization & Calibration — Provides calibration on actual hours of use with savings up to 50% compared to calendar-basis programs. Substantial savings in capital investments can be realized with accurate utilization data on test instruments, tools and equipment.

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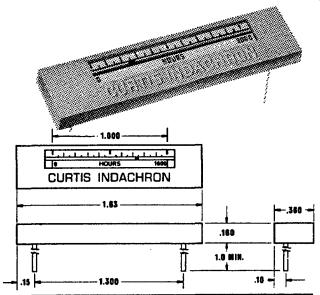
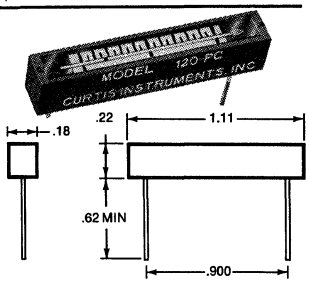
L Series Curtis Indachron™
Used on OEM equipment as a very low-cost means of validating warranties and for P.M. scheduling. Under $2.00 each in production quantities. AC and DC Models. Various time scales and electrical ratings. Can be mounted on printed circuit cards or direct to chassis with adhesive strips.



120-PC Series
Radial leads for installation directly on printed circuit cards for "mean-time-to-failure" or preventative maintenance scheduling. Can be instrumented from available DC voltages for any time scale by use of series resistor. Full scale of .65 inches = 4.16 milliamp-hours.

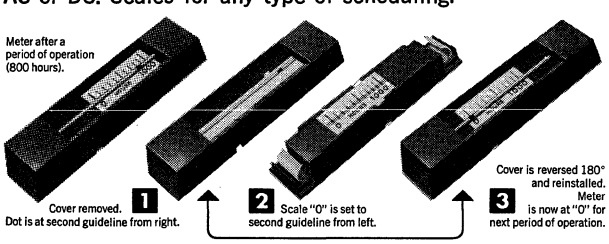


620 PC, 620N Series, MIL Type

The Curtis MIL type analog timers are made in two configurations. The 620N Series meet MS90386, and are now available in 5V and 15V, as well as 28V DC and 115V AC models. The 5V and 15V units directly answer the long felt need for an elapsed time meter than can be powered **directly** from voltages available within the box, precluding the necessity of special wiring for the ETI. The units also provide dramatic economies over the older electromechanical types. The 28V DC version provides for internal regulation over the complete aircraft power range, and the 115V AC device is truly insensitive to variation in line frequency.

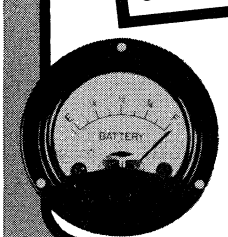
The 620 PC Series meets the MS-3311 (AS) and was specifically designed for repairable modules and subassemblies, is very low cost and installs directly on PC boards.

CP-3 Series
New low cost monitor for P/M scheduling and other applications requiring a simple means of reset to zero in the field. AC or DC. Scales for any type of scheduling.



ANALOG COUNTERS
When operated by well defined pulses such as digital logic signals, any Curtis INDACHRON™ can be calibrated to provide direct indication of accumulated number of pulses with virtually any full scale reading. They can be used to count the number of lines, copies, characters, or other operating functions of computer peripherals, office or communication equipment.

CURTIS INFINITE MEMORY INTEGRATORS



Battery "Fuel" Gauges
Meter displays % of discharge (amp-hrs. remaining in rechargeable battery systems). Typical of applications for Curtis 921 Millivolt Integrator.

Ampere Hour Meter and Controller Model 926-A For large rechargeable stationary battery systems. High and low level detectors. Adjustable charge/-discharge ratio to compensate for battery losses.

Powered from battery system. Available in panel and bulkhead mountings. Also model for remote panel meter display.

Bipolar Integrator Model 922
A portable instrument integrates positive and negative signals to 100 MV. Readout on 4½" taut band meter. Permanently stores recorded integral until reset. Accuracy: ±2%; Typical linearity: ½%. 115 VAC/60 Hz.

Tri-Phasic™ multimeters

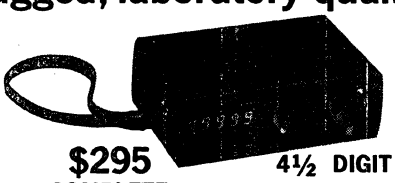
The new standard for DMMs

SUPERIOR PERFORMANCE AND LOWER COST

Three exclusive circuit innovations, TRI-PHASIC™ A/D conversion, ISOPOLAR™ reference and RATIOHMIC™ resistance measurement utilized in this years ahead series of digital instruments dramatically reduces cost while significantly enhancing performance.

NEW! Pocket-size, rugged, laboratory-quality 4½-digit multimeter

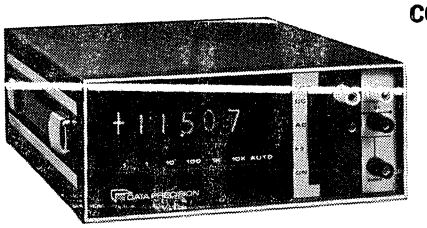
- Measures DCV, ACV, DC and AC current and Resistance
- 0.005% resolution
- 0.05% basic accuracy



$295 COMPLETE

4½ DIGIT MODEL 245

- Includes 6-hr. battery module, input probes, battery charger, carrying case
- 1¾"H x 3½"D x 5½"W
- Weighs less than 20 ounces

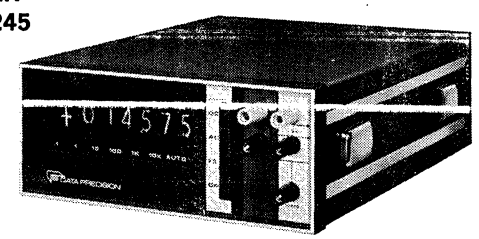


4½ DIGIT 2400 SERIES

Model	DCV	ACV	Ω	Ratio	Unit Price
2440	X	X	X	X	$675
2435	X	X		X	635
2430	X		X	X	625
2420	X			X	580

2400 and 2500 SERIES DMM INCLUDE:

- Auto-ranging
- Auto-polarity
- Remote triggering and ranging
- Overload indicator
- Isolated BCD outputs
- DC/DC Ratio



5½ DIGIT 2500 SERIES

Model	DCV	ACV	Ω	Ratio	Unit Price
2540	X	X	X	X	$1,195
2535	X	X		X	1,125
2530	X		X	X	1,070
2520	X			X	995

DC VOLTS • Ranges: ±1.0000 to ±1000.0 • Basic accuracy, 6 mos., 23°C ±5°C: ±0.007% rdg. ±1 l. s. d. • Resolution: 100μV-100mV. **AC VOLTS** • Ranges: ±1.0000 to ±1000.0 • Frequency: 30 Hz-100 kHz • Basic accuracy, 6 mos., 23°C ±5°C: ±0.02% f. s. ±0.05% rdg. **RESISTANCE** • Ranges (5): 1.0000 kΩ-10.000 MegΩ • Configuration: True 4-wire • Basic accuracy, 6 mos., 23°C ±5°C: ±0.007% rdg. ±1 l. s. d. **DC RATIO** • Ranges (4): 1-1000 • Input: 0 to ±1000V • Reference: +1V to +11V • Basic accuracy, 6 mos., 23°C ±5°C: (±0.007% rdg ±1 l. s. d.) x 10/ Actual Ref. V.

DC VOLTS • Ranges (4): ±1.00000 to ±1000.00 • Basic accuracy, 6 mos., 23°C ±5°C: ±0.001% f. s. ±0.007% rdg ±1 l. s. d. • Resolution: 10μV-10 mV. **AC VOLTS** • Ranges (4): ±1.00000 to ±1000.00 • Frequency: 30 Hz-100 kHz • Basic accuracy, 6 mos., 23°C ±5°C: ±.02% f.s. ±0.05% rdg. **RESISTANCE** • Ranges (5) 1.00000 kΩ-10.0000 MegΩ • Configuration: True 4-wire • Basic accuracy, 6 mos., 23°C ±5°C: ±0.001% f. s. ±0.007% rdg ±1 l. s. d. **DC RATIO** • Ranges (4): 1-1000 • Input: 0 to ±1000V • Reference: +1V to +11V • Basic accuracy, 6 mos., 23°C ±5°C: (±0.007% rdg ±1 l. s. d.) x 10/ Actual Ref. V.

OPTIONS: 100 mV f. s. preamplifier, battery pack, 60" 3-wire input cable, rear input connector, rack mount kit and mating output connector.

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Phone (617) 246-1600

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electronic engineers master
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53 product sections in 4 volumes

Vol.1 TEST INSTRUMENTS EQUIPMENT & SYSTEMS

Vol.2 ACTIVE COMPONENTS CIRCUIT ASSEMBLIES / FILTERS CONTROLS & DRIVES

Vol.3 PASSIVE COMPONENTS MATERIALS / HARDWARE

Vol.4 COMBINES PRODUCT CATEGORIES INCLUDED IN VOLS. 1, 2, AND 3

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The 53 Product Sections categorize related electronic components, equipment, materials, instruments and systems, and fabrication services, enabling you to quickly compare and evaluate similar items.

To find a specific manufacturer's catalog pages refer to the Index of Manufacturers which appears in two places in this volume, at the beginning of the green section and at the beginning of the white section.

Product Section	Volumes 1, 2, 3 Page	1973 Volume 4 Page	Products
1100	Vol.2•308	Vol.4•309	Amplifiers, Audio, Operational, etc.
1200			Antennas & Accessories
1300	Vol.1•308	Vol.4•310	Audio Equipment & Accessories
1400	Vol.3•308	Vol.4•311	Cabinets, Chassis, Containers, Racks, Boxes, etc.
1500	Vol.3•342	Vol.4•314	Capacitors (All Types)
1600	Vol.3•516	Vol.4•324	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
1700	Vol.2•323		Circuit Assemblies, Circuit Boards & Breadboarding Kits
1800	Vol.3•519		Coils (Inductors, Chokes), Assemblies, Forms
1900	Vol.1•319		Communications Equipment (Facsimile, Telephone, Television)
2000	Vol.1•321	Vol.4•325	Computing, Data Handling Equipment & Accessories
2100	Vol.3•544	Vol.4•356	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2200	Vol.2•326	Vol.4•386	Controls, Control Components & Systems
2300	Vol.2•371	Vol.4•389	Crystals & Mechanical Tuning Devices; Oscillators
2350	Vol.3•978	Vol.9•392	Delay Lines (All Types)
2400	Vol.2•456	Vol.4•397	Panel Components (Including Lighting & Readouts)
2500	Vol.3•1004	Vol.4•401	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
2550	Vol.1•382		Environmental Test Equipment
2600	Vol.3•1039		Fans, Blowers & Cooling Equipment
2700	Vol.2•544	Vol.4•403	Filters
2800	Vol.3•1070		Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
2900	Vol.1•386	Vol.4•404	Instruments, Measuring & Test
3000	Vol.1•536	Vol.4•430	Instruments, Graphic Recording
3100	Vol.3•1074		Insulators, Insulating Materials & Parts
3130	Vol.2•588	Vol.4•432	Integrated Circuits & Hybrid Microcircuits
3150	Vol.3•1089		Manufacturing, Subcontracting, Custom Fabrication
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3800	Vol.2•680		Optical Equipment & Accessories
4000	Vol.1•571	Vol.4•444	Power Supplies, Converters, Inverters, Batteries, etc.
4100	Vol.1•934		Production Machinery & Automation Equipment
4200			Engineering Aids (Books, Drafting Equipment, Whiteprinters)
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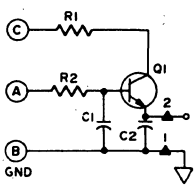

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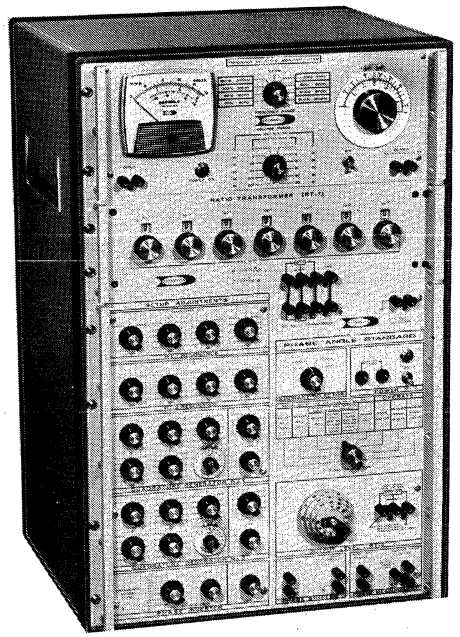

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MODEL 311/RT-1/717S PRIMARY PHASE ANGLE STANDARD

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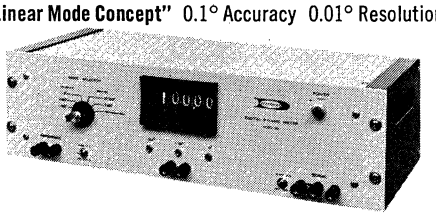
Dytronics offers an array of instrumentation for the measurement and generation of phase angle. This successful and advanced measurement technique pioneered by Dytronics is recognized as the finest throughout the world. See our catalog for complete information or contact Dytronics Company Inc. 4800 Evanswood Drive, Columbus, Ohio 43229, Telephone (614) 885-3303.

Model 224 "hands-off" Digital Phase Meter

Hands-Off Phase Angle Measurements using new **"Linear Mode Concept"** 0.1° Accuracy 0.01° Resolution



Model Number	Frequency Range	Accuracy	Measure Phase?	Shift Phase?	0° to 360° Coverage without Ambiguity?
222	20Hz-100kHz	±0.1°	Yes	No	Yes
224	20Hz-100kHz	±0.1°	Yes	No	Yes
301	10Hz-30kHz	±2°	Yes	Yes	Yes
311/RT-1/717S	30Hz-10kHz	±0.015°	Yes	Yes	Yes
312	4kHz-500kHz	±0.02°	Yes	Yes	Yes
341	400Hz	±0.1°	Yes	Yes	Yes
400K	400Hz	±0.05°	No	Yes	No
410	0.1Hz-130kHz	±0.15°	No	Yes	Yes
445	100Hz-50kHz	±5°	No	Yes	Yes

SEE OUR CATALOG FOR A COMPLETE LIST OF MODELS AND SPECIFICATIONS.

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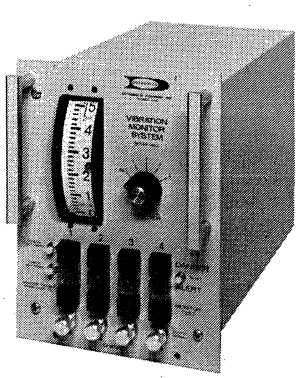

SERIES 4604
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MACHINE PROTECTOR

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Model Number	Tuning Range	Description
700		Automatic tracking of frequency
717S	20Hz-20kHz	Narrow-band tunable filter and Frequency Selective Voltmeter
718	3kHz-400kHz	Narrow-band tunable filter
719	0.1Hz-1kHz	Ultra low-frequency Narrow-band tunable filter
720	1Hz-10kHz	Low-frequency Narrow-band tunable filter
721	1Hz-100kHz	Digital-data filter; stable D.C. response
723	1Hz-100kHz	Universal Filter; Low-pass, high-pass, band-pass, and band-reject
730	0.1Hz-10kHz	Notch Filter

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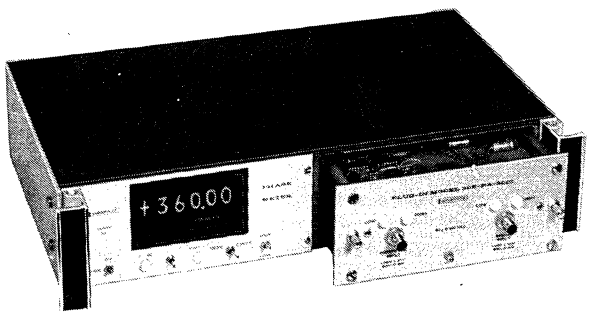
SERIES 305
HIGH ACCURACY PHASEMETERS



The Series 305 Phasemeters produced by Dranetz Engineering Laboratories, Inc. incorporate a totally new series of advances in phasemeter technology to overcome the problems inherent in typical phase measurements. Dranetz's quality craftsmanship has made the 305 the finest, most accurate phasemeter available today.

FEATURES

- No Hands Operation
- ±0.1° Analog and Digital Accuracy; 0.01° Resolution
- Plug-in Concept for Flexibility
- Fully Automatic or Programmable
- Rejects Harmonics and Noise
- Wide Frequency Range — 2 Hz to 11 MHz

FLEXIBILITY THROUGH PLUG-IN CONCEPT

The unique plug-in concept of the 305 Phasemeter offers the user a wide choice of characteristics. Standard mainframes are available with analog readout, with and without digital readout and display to 0.01° resolution, and with a variety of programmable features. In addition, special mainframes and plug-ins can be provided to meet virtually any phase measuring application.

WIDE FREQUENCY RANGE

The basic mainframe provides a direct frequency coverage of 2 Hz to 700 kHz with a high degree of accuracy. By the use of frequency converting plug-ins such as the 305-PA-3005, standard units can handle frequencies up to 11 MHz. Special units can be provided for higher frequency.

NO HANDS OPERATION

The Series 305 Phasemeters require no controls or adjustments by the operator. These units are also equipped with several significant automatic features. These include automatic selection of angle range, automatic sensing of leading or lagging angle, automatic selection of the output time constants, and automatic setting of AC gains. High stability of the DC output assures a drift of less than 0.1° over a 30 day period.

HIGH ACCURACY

High accuracy (better than ±0.1°) is accomplished by the use of precision mainframes in conjunction with carefully designed plug-ins. Mainframes exhibit precise zero crossing detection, excellent angle-to-DC conversion linearity (better than ±0.02°), and outstanding DC stability. Plug-ins are designed for accurate conversion of sine waves to square waves through the use of carefully controlled amplifier circuitry, use of gain autoranging where necessary, and well engineered mechanical layout of components.

INSENSITIVITY TO INPUT LEVEL

Series 305 plug-ins are available with an accuracy of better than ±0.1° even with independent input level variations of 60 dB. Details of typical accuracy are shown in the plug-in section.

NON-AMBIGUOUS ANGLE READINGS

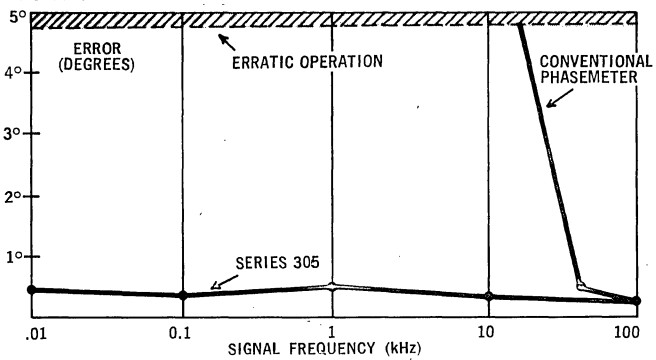
The Series 305 avoids the ambiguity of conventional phasemeters in reading angles close to 0° or 180°. An automatic system selects the appropriate angle range (i.e., 0° to ±180° or 0° to +360°) such that no angle falls within 15° of either end of a range.

OUTSTANDING REPEATABILITY AND STABILITY

Repeatability of Series 305 phasemeters is better than 0.03°. High stability is an outstanding feature, and the DC output drift is less than 0.1° over any 30 day period.

NOISE IMMUNITY

Unique patented circuitry minimizes noise errors and makes possible accurate phase measurements under noise levels where other phasemeters become completely useless. The accompanying curve compares the phase error of the model 305 with that of a conventional phasemeter with broad band noise in both channels.



PHASE READING ERROR VS SIGNAL FREQ.
FOR GAUSSIAN NOISE (FLAT TO 5 MHz)
IN BOTH CHANNELS FOR S/N = 10

PROGRAMMABLE OPERATION

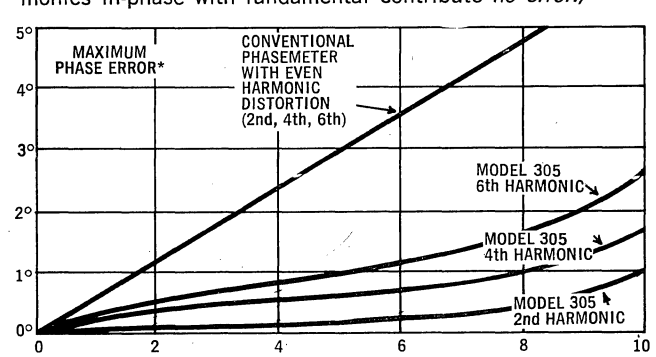
Standard mainframes are provided with rear connections for over-riding the automatic time constant and angle range selectors by relay contact closures. Options are provided for control by DTL and TTL logic.

DIGITAL READOUT

In addition to analog DC output, standard mainframes are available with up to 5 digit panel readouts (i.e., 0.00° to ±180.00° and 0.00° to +360.00°) and BCD outputs for each digit. Front panel controls are available for zero and full scale adjustment of digital readouts.

ABILITY TO REDUCE HARMONICS

The 305 is designed to reduce significantly the errors due to even harmonic distortion without the use of filters. The accompanying curve compares the error due to even harmonic distortion (maximized for worst case harmonic angle) on conventional phasemeters and on the model 305. (Odd harmonics in-phase with fundamental contribute no error.)



COMPARISON OF ERRORS DUE TO EVEN HARMONIC DISTORTION
(* For worst case phase relationship between harmonic and fundamental)

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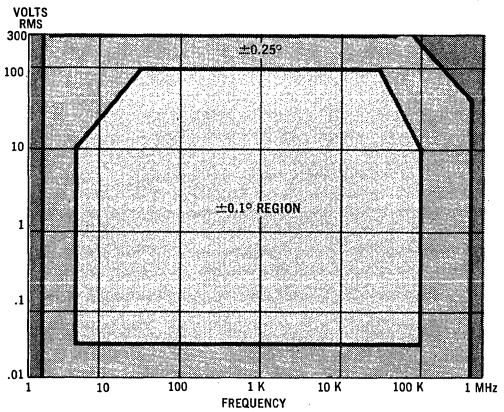
SERIES 305
HIGH ACCURACY PHASEMETER PLUG-INS

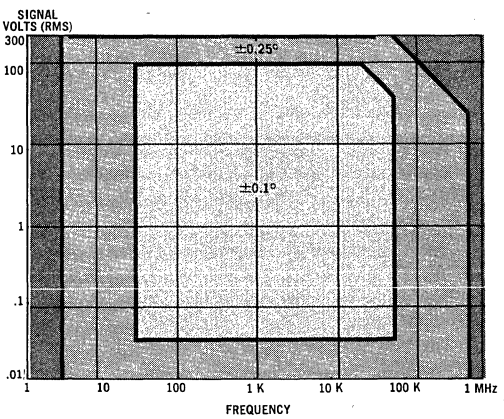
The variety of plug-ins available provides unlimited flexibility for the Series 305 Phasemeters in meeting many phase measurement problems. In addition to an expanding line of standard plug-ins, custom units can be designed for special needs.

305-PA-3001 AUTO RANGING PLUG-IN

This plug-in features high accuracy over a broad range of input levels and frequencies. Autoranging of gain in each channel assures high accuracy (±0.1°) over a dynamic range of 60 dB (50 mV to 50 V rms) for independent levels of inputs, with a useful range of 90 dB (10 mV to 300 V rms). This plug-in covers the range from 2 Hz to 700 kHz, with its highest accuracy of 0.1° in the 50 Hz to 50 kHz range. The curves shown illustrate typical accuracies as a function of level and frequency. The 305-PA-3001 also features compatibility with Textronix probes and includes front panel lamps to indicate when either input signal is below 50 mV or above 50 V rms.



TYPICAL ERROR CONTOURS FOR 305 w/305-PA-3001 FOR EQUAL SIGNAL INPUTS



TYPICAL ERROR CONTOURS FOR 305 w/305-PA-3001 FOR UNEQUAL INPUTS — REF. 0.3 VOLTS RMS

While the above accuracies apply to sine wave inputs, this instrument can also be used for square wave and amplitude modulated signals.

305-PA-3002 SINGLE RANGE PLUG-IN

The 305-PA-3002 is similar to the model 305-PA-3001 except that it does not include autoranging or limit indicator lamps. For sine wave inputs the standard unit is designed for ±0.1° accuracy over independent signal levels of 50 mV to 500 mV rms, with a slight reduction in accuracy from 10 mV to 3 V rms. Other level ranges can be supplied on special order, and Tektronix probes can be used for high input levels. This plug-in is useful for sine wave, square wave and amplitude modulated signals.

305-PA-3005 HIGH FREQUENCY PLUG-IN

This high frequency plug-in is designed for high accuracy to 11 MHz. Using a self tracking oscillator, the input signals are converted to 40 kHz for precision measurement by the mainframe. Input attenuators (50 ohms) are provided with 10 dB steps, to cover a range of 1 mV to 3 V rms in either channel. Front panel lamps indicate when input levels are out of range or when level controls are improperly set. The self tracking oscillator can be controlled by channel A signal or by a third independent signal.

305-PA-3007 PROGRAMMABLE AND AUTO RANGING PLUG-IN

This programmable plug-in features all of the characteristics of the model 305-PA-3001. In addition it includes increased input gain to achieve operation down to 1 mV rms. The unit can be operated either in an automatic or programmable mode. Without rear connections, the plug-in operates automatically as a 305-PA-3001; however, by utilizing rear connectors, the internal autoranging can be over-ridden and additional internal gain can also be inserted. Programming is available by DTL and TTL logic.

305-PA-3008 SINGLE FREQUENCY PLUG-IN

The 305-PA-3008 is a special purpose plug-in designed for precision calibration of 50 Hz, 60 Hz and 400 Hz power line equipment such as wattmeters, phase detectors and watt hour meters. This instrument can measure phase difference between two voltages, two currents or between a voltage and a current. The unit covers a voltage range of 25 V to 250 V rms and a current range of 0.1 to 5 A rms. The basic plug-in covers the frequency range of 50 Hz to 500 Hz. Plug-in filters, available for 50 Hz, 60 Hz and 400 Hz, assure reduction of second harmonic by at least 40 dB and higher harmonics by at least 50 dB. A front panel zero control provides adjustment for high accuracy (±0.1°) at any single frequency.

305-PA-3009 WIDE BAND NETWORK ANALYZER PLUG-IN (GAIN/PHASE/AMPLITUDE)

This plug-in measures the voltage amplitude of each signal input, the phase difference between inputs, and the amplitude ratio of inputs. Featuring auto-ranging of gain in both channels, it requires no manual setting of gains for any measurement. Simultaneous DC outputs on mainframe proportional to all functions. A front panel switch selects the measuring mode for digital panel readout — channel A voltage, channel B voltage, phase difference, or amplitude ratio. Lamps on the front panel of the plug-in indicate the proper decade multiplier.

305-PA-3010 SPECIAL PURPOSE PLUG-IN

This plug-in is typical of special purpose plug-ins which can be supplied to meet unique problems. Having high input impedance, it is equipped with closely matched low pass filters to pass 125 Hz signals while rejecting 400 Hz signals, solving problems in many types of servo control systems. Similar units can be readily designed for other special voltage and frequency applications.

VOLTAGE ISOLATION TRANSFORMERS

Dranetz TR 3100 series transformers are available for input voltage isolation with minimum phase error. Available for use with balanced or signal ended sources, these units are equipped with internal preamplifiers to produce outputs in the 30 mV to 3 V rms range (for use with 305 Series Phasemeters) for input levels from 50 mV to 500 V rms. These transformer units are packaged for direct plug-in into the input BNC's of the phasemeter, and draw B+ power from the front panel accessory connector of the phasemeter plug-in. Size: 2″ D x 2″ long. Input: banana jack. Output: BNC.

Model TR___ *	Zin	Common Mode: >60 dB for frequency	Range for ±0.1° typical shift	Range for ±0.3° typical shift
3101	1 meg Ω 70 pF	Below 1 kHz	20-400 V rms 250 Hz-20 kHz	5-400 V rms 50 Hz-25 kHz
3102	100 k Ω 70 pF	Below 10 kHz	2-40 V rms 250 Hz-20 kHz	0.5-40 V rms 50 Hz-25 kHz
3103	10 k Ω 70 pF	Below 25 kHz	0.2-4 V rms 250 Hz-20 kHz	0.05-4 V rms 50 Hz-25 kHz
3104	1 meg Ω 100 pF	Below 500 Hz	20-500 V rms 50 Hz-5 kHz	5-500 V rms 10 Hz-10 kHz
3105	100 k Ω 100 pF	Below 5 kHz	2-50 V rms 50 Hz-5 kHz	0.5-50 V rms 10 Hz-10 kHz
3106	10 k Ω 100 pF	Below 5 kHz	0.2-5 V rms 50 Hz-5 kHz	0.05-5 V rms 10 Hz-10 kHz

* Add suffix "B" for balanced input. Otherwise input is single ended.

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SERIES 305
HIGH ACCURACY PHASEMETERS

MAINFRAME SPECIFICATIONS

Frequency Range: 2 Hz to 11 MHz (see plug-in data)

Angle Ranges: 0.00° to ±180.00° or 0.00° to +360.00° manually or automatically selected. Extremity of range selected is always at least 15° from measured angle.

Analog Output

Range: −1.8000 to +3.6000 Vdc corresponding to measured angle; 10.0 mVdc per degree

Accuracy: See plug-in specifications

Output Impedance: Less than 10 ohms

DC Resolution: Infinite

Linearity: Better than ±0.02° from straight line

Repeatability: Better than ±0.03° short term

Time Constants: Automatically selected; 10 ms for frequency >5 kHz, 50 ms >500 Hz, 350 ms >50 Hz, 700 ms >2 Hz (Note: 4.6 time constants to respond to better than 99% of step change).

Warm-up Time: 3 Minutes

Recommended Output Devices: Recorders, DVM's, A-D Converters, Printers

Self Check: Front panel switches; dc outputs correspond to −180.00°, 0.00°, +180.00° and +360.00°

Error Rejection: False triggers due to high frequency noise are locked out for signal to noise ratios better than 10:1. Errors and fluctuations due to waveform dissymmetry or low frequency noise reduced by at least 10 to 1.

Harmonic Rejection: Worst case errors due to even harmonic distortion reduced by approximately 5:1 without filters. Odd harmonics in-phase with fundamental contribute no error.

Operator Adjustments: None. Zero and full scale adjustments of analog output are accessible only when plug-in is removed.

Operating Temp. Range: 0° to +50°C

Grounding: Independent grounds for signal, chassis, and power line, can be jumped on rear of mainframe.

Remote Programmability (standard on all mainframes): By rear connector pins. Over-ride by contact closure of automatic time constant selection and angle range. Factory installed wiring from rear connector to plug-in for use with programmable plug-ins.

Modular Construction: Circuits on removable plug-in cards, extenders supplied for ease in servicing.

Size: 3½" high, 16" deep, 19" rack/portable package.

Weight: 20 lbs; shipping 30 lbs.

Power: 115/230 V, 50-400 Hz, <0.75 A (specify voltage and frequency when ordering).

Plug-In Accommodation: Accepts 305-PA-( ) plug-ins. Mainframes and plug-ins are interchangeable.

DIGITAL DISPLAY

Digital Outputs	305	305B	305C
Display	None	4 digit plus sign	5 digit plus sign
Angle Ranges	NA	0.0° to ±180.0° and 0.0° to +360.0°	0.00° to ±180.00° and 0.00° to +360.00°
Resolution	NA	0.1°	0.01°
BCD Output	None	BCD coded (1248), 4 lines per digit plus polarity line; CSL compatible (<0.8V to >+2.4 V dc). Read and hold on command features available on rear connector.	
Warm-up Time	NA	30 Minutes	
Zero & FS Controls	NA	Front panel for FS & 0	

OPTIONS

#101 Rear connectors for signal and reference inputs, BNC

#102 Full mainframe programmability; includes self check, angle range and time constant selection, DTL and TTL compatible.

#103 High speed analog output response. Time to respond to within 99% of step change: 1 ms for frequency >5 kHz, 10 ms >500 Hz, 100 ms >50 Hz, 1 second >5 Hz.

#104 Continuously adjustable angle offset, with analog null indicator; used for precision adjustment of phase angle of filters and other networks. Available on 305C only.

COMBINED PLUG-IN AND MAINFRAME SPECIFICATIONS

MODEL	FREQUENCY RANGE	INPUT LEVELS (Independent)	INPUT Z	ACCURACY[2] WITH INDEPENDENT LEVELS UNLESS OTHERWISE INDICATED Analog output accuracy: As specified below. Digital phase accuracy: For model 305C, same as analog accuracy. For model 305B, add ±0.15° digital readout error to analog accuracy specified.
305-PA-3001 Auto Ranging Plug-in	2 Hz to 700 kHz	10 mV to 300 V rms up to 10 kHz and to 50 V rms up to 700 kHz; can be extended to 40 kV rms with Textronix probes. Each channel has automatic gain ranging, and lamps which indicate when level is below 50 mV and above 50 V rms.	1 megohm shunted with 40 pF	±0.1°, 50 mV to 50 V rms from 50 Hz to 50 kHz; typically ±0.25° at all other levels from 5 Hz to 500 kHz.
305-PA-3002 Single Range Plug-in	2 Hz to 700 kHz	10 mV to 3 V rms[1]; can be extended to 3 kV rms with Textronix probes.	1 megohm shunted with 40 pF	±0.1°, 50 mV to 500 mV rms from 50 Hz to 50 kHz; typically ±0.25°, 10 mV to 3 V rms from 5 Hz to 100 kHz, and 10 mV to 500 mV rms from 100 kHz to 500 kHz.
305-PA-3005 High Frequency Plug-in	200 kHz to 11 MHz	1 mV to 3 V rms; manual level controls in 10 dB steps. Lamps indicate when inputs are out of range or when level controls are improperly set.	50 ohms	Broadband with equal inputs above 10 mV rms: ±0.4° from 200 kHz to 4 MHz; ±1° from 4 MHz to 11 MHz. With independent levels above 10 mV rms: ±1° up to 4 MHz and ±2° up to 11 MHz. Single frequency — above 10 mV rms: ±0.3° at any frequency from 200 kHz to 11 MHz at any fixed levels.
305-PA-3007 Programmable and Auto-Ranging Plug-in	2 Hz to 700 kHz	Auto-ranging: similar to levels of 305-PA-3001. Programmable: over-rides autoranging; extends low levels to 1 mV rms; DTL, TTL logic; program connector in rear of mainframe.	1 megohm shunted with 40 pF	Same as 305-PA-3001 for levels above 10 mV rms; typically ±0.35° from 50 Hz to 50 kHz for levels below 10 mV rms.
305-PA-3008 Single Freq. Plug-in	50-500 Hz without filters. 50 Hz, 60 Hz and 400 Hz L.P. filters available[3]	25 V to 250 V rms; 0.1 A to 5 A rms. Inputs are transformer isolated.	100 k ohm (voltage) 1 Ω max. (current)	At any single frequency, with filter set: ±0.1°, 25 V to 250 V rms, or 0.1 A to 5 A rms.
305-PA-3009 Network Analyzer (Gain/Phase/ Amplitude)	2 Hz to 700 kHz	10 mV to 40 V rms. Each channel has automatic gain ranging. Direct reading of phase angle, amplitude ratio and level of each input. Compatible with Tektronix probes.	1 megohm shunted with 40 pF	Phase: ±0.1° from 40 mV to 40 V rms from 50 Hz to 50 kHz; typically ±0.25° at all other levels from 5 Hz to 500 kHz. Voltage Amplitude: above 40 mV (channel A or B): ±2% reading ±0.03% FS, 50 Hz to 50 kHz; ±5% reading ±0.03% FS, 100 kHz to 500 kHz. Ratio: ±0.5 dB, 50 Hz to 50 kHz; ±1 dB, 50 kHz to 500 kHz.
305-PA-3010 Special Purpose Plug-in (with filter)	For use at 125 ±10 Hz; matched filters in both channels reject higher frequencies	Similar to 305-PA-3002.	1 megohm shunted with 40 pF	±0.1°, 50 mV to 500 mV rms; ±0.25°, 10 mV to 3 V rms.

[1] Can be provided for other voltage levels.

[2] For sinusoidal signal; can be used for square wave inputs over limited frequency range; can be used for amplitude modulated signals up to 97% modulation, depending upon model, level and frequency.

[3] 50 Hz filter, P/N 305-PA-3008-50; 60 Hz filter, P/N 305-PA-3008-60; 400 Hz filter, P/N 305-PA-3008-400. (Other frequencies available on request.)

DRANETZ

ENGINEERING LABORATORIES INCORPORATED

SOUTH PLAINFIELD, NEW JERSEY 07080 • TEL. (201) 755-7080

SERIES 311

PHASE SENSITIVE VOLTMETER

FEATURES

- 400 Hz Phase Sensitive Measurements
- Total, Fundamental, In-Phase and Quadrature Voltages and Phase Angle
- Isolated Reference, External or Line
- Protected Against 1500 V Input Transients
- Low Cost

The Series 311 Portable Phase Sensitive Voltmeters are high quality, low cost instruments designed for measuring a vector voltage and its components with high resolution. These instruments are capable of measuring total voltage over a frequency range of 20 Hz to 20 kHz. At 400 Hz phase sensitive detection is used to measure phase angle as well as fundamental, in-phase and quadrature components of voltage. Band pass filtering is incorporated to reject noise and harmonics to assure high null resolution. Accurate nulling of the minor component is achieved even in the presence of 10 times full scale overload of the major component.

Internal or external reference voltage can be selected by the operator. The internal source is always isolated. The external inputs may be connected directly or through a self-contained isolation transformer. Auto-ranging circuits eliminate reference level adjustments over the entire range of 1 to 150 V rms, and a zero adjust potentiometer on the front panel provides simple phase calibration correction for the isolation transformer. High input impedance eliminates electrical loading errors.

This instrument is ideally suited for synchro and resolver testing, servo systems evaluation, phase sensitive nulling, phase angle measurements, and as a general purpose broad band voltmeter.

The design of these units incorporates solid state and microcircuits throughout, assuring low power consumption and long life of operation. The unit is packaged in a portable, rugged and weatherproof aluminum case for field use. Adapters can also be provided for rack mounting.

SPECIFICATIONS

SIGNAL

Voltage Ranges (FS): 3 mV to 300 V rms
Accuracy: ±2% FS
Frequency Response-Total: 20 Hz to 20 kHz ±3%
Frequency-Fundamental & Phase Sensitive Mode: 400 Hz ±5%
Filtering, Standard, Internal: 380 to 420 Hz, 40 dB at 200 Hz and 800 Hz
Harmonic Rejection: 55 dB minimum, effective
Phase Accuracy: ±0.5° at 26 ±5° and 400 ±5 Hz
Addit. ±0.5° from 0°C to 60°C
Addit. ±0.5° from 380 to 420 Hz
Phase Resolution: 0.1° dial increments over entire 360°
Functions: Total, fundamental, 0°, 90°, 180°, 270° quadrants
Overload, Phase Sensitive: 10 X full scale
Total & Fundamental Noise: <50 microvolts rms
Null Resolutions: <25 microvolts rms
Input Impedance: 2 megohms, 50 pF, single ended
High Voltage Protection: 1500 V transient, 300 V DC

REFERENCE

Selector: Internal/external reference
Voltage Range: 1-150 V rms, single range
Isolation: Internal isolated; external isolated or direct
Input Impedance (External): 1 megohm direct; 50 kΩ isolation transformer
Meter: 4″ taut band, mirror scale, center zero
Power: 45-450 Hz, 110-125 V (230 V optional) 15 watts
Weight: 10 pounds, shipping weight 17 pounds
Size: 9½″ x 7″ x 11″, portable carrying case
19″ Rack Adapter (7″ High): Specify MR-12 (incl. dust cover)

SERIES 314

POWER SYSTEM PHASEMETER / FOR ACCURATE & RAPID MEASUREMENT OF PHASE IN ELECTRIC POWER SYSTEMS

FEATURES

- Universal Current-Voltage Inputs
- Portable
- Immune to Harmonics
- Independent of Frequency Changes
- Digital Readout — "No Hands" Simplicity
- Accuracy ±0.5°, Resolution ±0.1°
- Independent of Input Levels
- Low Cost

APPLICATIONS

- Testing and Adjustment of Protective Relays
- Measuring Load Current Phase Angles
- Testing Polyphase Balance
- Determining Power Flow in Interconnected Systems
- Minimizing Circulating Reactive Currents
- Synchronizing Multiple Sources

Accurate, precise and rapid phase measurement is an essential technique in the setup, operation, and maintenance of modern power systems, subsystems, and the control and protection circuits used in them. The value of a phase meter in such applications is directly proportional to the speed, convenience, and validity with which it indicates the phase angles it measures. With the introduction of the Dranetz Model 314, virtually all of the limitations and error sources of electromechanical meters have been removed, and the overall accuracy of this class of phase measurements has been increased by more than a full order of magnitude. The basic accuracy of ±0.5° specified for the Model 314 is actually **maintained, without degradation,** over the wide ranges of frequency variation, voltage/current level, and harmonic content for which the instrument is rated. Furthermore, the direct-reading **digital** presentation of phase, to four-place resolution (0.1° increments) requires no interpretation or interpolation, and is not subject to reading errors or parallax. **The phase angle you see is the phase angle that exists — to within ±0.5°,** without correction or uncertainty.

SPECIFICATIONS

ELECTRICAL

Range: 000.0° to 360.0°, Direct-reading
Frequency Range: Model 314-60, 57-63 Hz
Model 314-50, 47-53 Hz
Input Current Range: (both input circuits) .015-50 A rms
Input Voltage Range: (both input circuits) 0.3 to 600 V rms
Current-Input Impedance: <0.1Ω
Display: Four digits, non-flickering, approx. 0.6″ numerals
Resolution: 0.1°
Accuracy: ±0.5°
Burden:
Voltage: 1.8 VA max. at 600 V rms input
Current: Approx. 2.5 VA at 50 A rms input
Interaction Between Inputs: None
Errors Due to Harmonic Distortion: None for harmonic distortion up to 30%, any harmonic
Errors Due to Offground Inputs or Reversal: None
Overload:
Voltage: 100% overload for 1 minute
Current: 100 A rms for 1 minute
Insulation: Up to 1000 Volts rms between inputs or between input and case or ground without damage
Self-Check: Provided for 000.0°. Full scale (360.0°) is autocalibrated internally
Power Required: Model 314-60 115/230 V, 60 Hz, 20 Watts
Model 314-50 115/230 V, 50 Hz, 20 Watts
Standard 3-wire line-cord supplied

MECHANICAL AND ENVIRONMENTAL

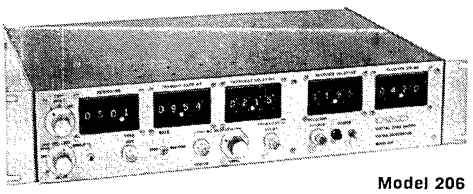
Case: Portable weatherproof carrying case with cover 11″L x 7″W x 9½″D. Without cover 11″L x 7″W x 7″D. (Panel 11″ x 7″)
Operating Temperature Range: 10°F to 110°F
Weight: 10 pounds approx. (shipping wt. approx. 17 pounds)

FOR FULL INFORMATION AND DETAILED SPECIFICATIONS WRITE FOR BULLETIN 314

DRANETZ
ENGINEERING LABORATORIES INCORPORATED
SOUTH PLAINFIELD, NEW JERSEY 07080 • TEL. (201) 755-7080

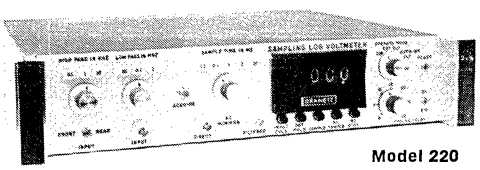
HIGH SPEED AC TEST INSTRUMENTATION
FOR AUTOMATIC & SONAR TEST SYSTEMS

GATING/TIMING GENERATORS
Perform all master timing for high speed AC measuring and monitor equipment, including repetition period, signal ON time, and delays for scopes, voltmeters and network analyzers. Includes signal gating at zero crossings. All timing digitally controlled by remote programming. Frequencies to 3 MHz.



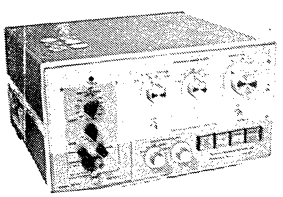
Model 206

AC SAMPLING VOLTMETERS
Average voltage measurements within 1 cycle window. Measures on command, with sample and hold output. 84 dB dynamic range. Fully automatic and/or programmable. Analog and digital displays and outputs. Frequencies to 1 MHz.



Model 220

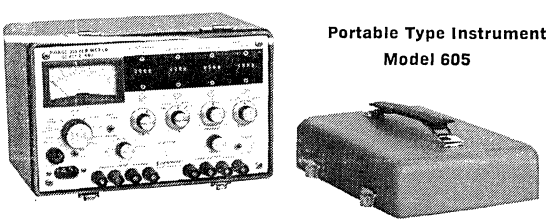
STROBING NETWORK ANALYZERS
Require as little as 2 cycle window for measurement of transfer function, phase or complex impedance. Analog and digital readouts. Measures on command. Manual or programmable operation. Frequencies to 10 MHz.



Model 202

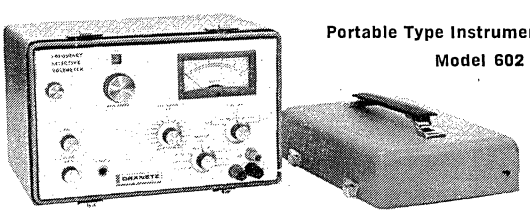
TELECOMMUNICATIONS EQUIPMENT

PHASE JITTER METERS
Measurement of average and peak-to-peak phase jitter in voice band telephone and data systems. Includes transmitting tone generator and phase jitter meter. Also includes totalizers for phase amplitude and coincidence hits as well as dropouts.



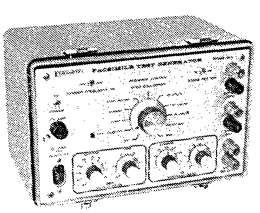
Portable Type Instrument
Model 605

FREQUENCY SELECTIVE VOLTMETERS
Portable and rack mounted instruments ideally suited for level measurements on carrier equipments as well as on open wire cable and other transmission systems. Capable of in-band overloads of 40 dB above desired signals. High Selectivity — down to 100 Hz. Wide frequency coverage. Manual and automatic frequency scanning. Analog and digital readouts. Audio outputs for AM and single sideband.



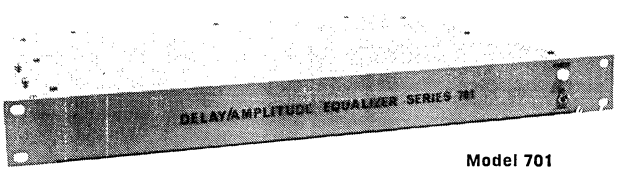
Portable Type Instrument
Model 602

FACSIMILE TEST GENERATORS
Produce coded AC signals to test AM and FM facsimile equipments. Signals for testing start, stop, black, white, and grey, resolution, and phasing. More accurate and simpler to use than test photo transmission. Can be used directly or over transmission lines.



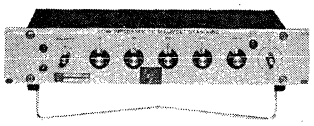
Portable Type Instrument
Model 207

DELAY/AMPLITUDE EQUALIZERS
Inexpensive multi-section units to condition telephone circuits to C4 and S3 performance for high speed data use. Features non-interacting gain and phase controls, delay corrections to 4.5 ms, amplitude correction to 17 dB, 600 ohm balanced input and output, 40 dB longitudinal balance and 300-3400 Hz range. Occupies only 1¾" rack space.

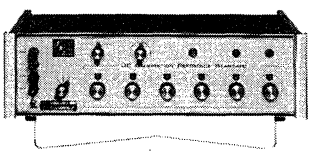


Model 701

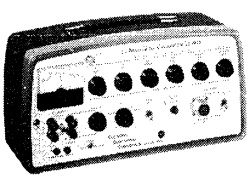
AC & DC voltage and current calibrators
General purpose and special purpose standard, sources and references



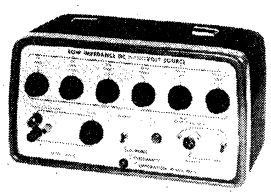
Model E 10D



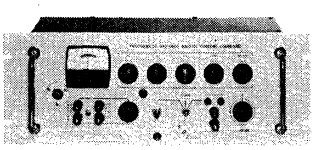
Model VS 330



Model MV 105G/B



Model MV 106/B



Model CR 103 N/R

DC Voltage Standards

Applications for Production Line QC, Field Service Calibration Laboratories. Ideal as a Reference/ Source/Supply for design and development labs. Simulator for thermocouples and transducers.

MODELS	E 100E	VS 110/B	VS 330	VS 1030
Bulletin	(#26.1)	(#26)	(#19)	(#26)
DC Volts (ranges)	± 11 V ±100 mV	±111 V ± 11 V	±311 V ± 31 V ± 3 V	±1111 V ± 111 V ± 11 V
Resolution	100 μV 1 μV	100 μV 10 μV	100 μV 10 μV 1 μV	1 mV 100 μV 10 μV
I_{out}	75 mA	50 mA	100 mA	10 mA
Accuracy	±0.01% of setting	±0.005% of setting	±0.003% of setting	±0.005% of setting
PRICE	$525	$920	$990	$1250

MODELS	MV 100/B	MV 105/B	MV 106/B	MV 115/B	MV 116/B
Bulletin	(#25)	(#25)	(#25)	(#23)	(#26)
DC Volts (ranges)	± 11 V ±100 mV	± 11 V ±100 mV	± 11 V ±100 mV ± 10 mV	±11 V ± 1 V	± 11 V ± 1 V ±100 mV
Resolution (1 ppm)	10 μV 0.1 μV	10 μV 0.1 μV	10 μV 100 nV 10 nV	10 μV 1 μV	10 μV 1 μV 100 nV
I_{out}	50 mA	50 mA	50 mA	50 mA	50 mA
Accuracy Limit of Error	±0.005% of setting	±0.005% of setting	±0.005% of setting	±0.005% of setting	±0.005% of setting
PRICE	$770	$850	$975	$850	$920

DC Current Standards

Short circuit and open circuit protected. 30 second warm-up. Automatic zero.

MODELS	CR 10/A	CR 100/A	CR 102/A	CR 103/A
Bulletin	(#31)	(#31)	(#32)	(#32)
Output I mode E mode	 ±11.1110 mA ±11.1110 Vdc	 ±111.110 mA ———	 ±111.110 mA ±11.1110 Vdc	 ±111.110 mA ±11.1110 V ±111.110 mV
Compliance I mode E mode	 50 V 50 mA	 100 V N/A	 100 V 50 mA	 100 V 50 mA
Resolution ±Vernier	10 ppm	10 ppm	10 ppm	10 ppm
Accuracy	±0.01%	±0.01%	±.0075%	±.0075%
PRICE	$900	$1000	$1200	$1350

Options — See bulletin #27. Available in most MV, VS, and CR instruments.

ELECTRONIC GALVANOMETER (Option "G")
For potentiometric and differential measurements:
from 1 μV up to 1000 V.
Accuracies from ±0.01% to ±0.003%
Price $225.00. Factory installed. Use suffix letter "G"

NULL DETECTOR (Option "N") for potentiometric measurements:
from 100 μV to 1100 V.
Accuracies from ±0.01% to ±0.003%
Price $30.00. Factory installed. Use suffix letter "N"

RACK MOUNTABLE (Option "R")
Price $15.00. Factory installed. Use suffix letter "R"

RESOLUTION
Series A: 10 ppm (5 decade switches) with ± vernier . . . No Charge
Series B: 1 ppm (6 decade switches) without vernier . . . No Charge

ORDERING INFORMATION: Please designate either Series A or Series B.
eg., MV 100 Series A or MV 100 Series B.

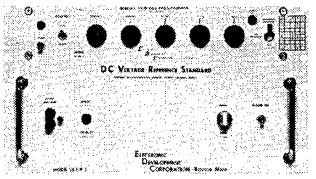
Digitally Programmable Standards

True digital programming from BCD, parallel entry. Sign and each digit independently selected and isolated from chassis and output. Logic levels as low as 1.5 V (for TTL or DTL Logic) and as high as 28 V.

MODEL	MV 100 P5	CR 102 P5	AC 121 P5
Bulletin	(#34.1)	(#34.2)	(#34.4)
Output	10 V dc 100 mV dv	20 V or 20 mA dc	100 V ac RMS (60 Hz to 20 kHz)
Compliance	50 mA	10 mA or 25 V dc	25 mA
Accuracy	0.01% of setting	±0.01% or ±0.02% of setting	0.05% of setting
Resolution	100 μV 1 μV	110 μV or 0.1 μA	1 mV ac
PRICE	$1250	$1750	$3900

Programming: Computer programmable. Punched paper tape, incremental mag. tape, punched card, DVM or electronic calculator outputs.

Memory Feature: Preserves the register contents and maintains voltage output without maintaining digital input. Programmer may then be used for other functions.



Model MV 100 P5

Options

All Programmable instruments described above are: (1) sensed at the terminals, (2) Unipolar.

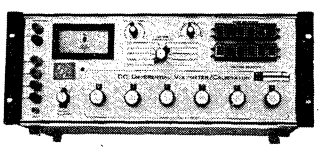
Remote Sensing:	Option H- 4 terminal output to sense voltage at the load.	$ 50
Bipolar:	Option J- Programmable Bipolar Operation	$100

Accessories

Remote (Manual) Control: Part No. RCM-2 bench and rack mountable configuration for manual operation of programmable standards supplied with 10 ft. of cable with connector. $350

Differential Voltmeter Galvanometer & Calibrator

The Model 2901 is a high accuracy potentiometric null-balance galvanometer. Also a high impedance differential voltmeter, and, in addition, a high accuracy voltage reference/source/calibrator.



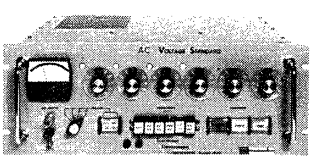
Model 2901

Model 2901 — Bulletin #21

MEASURE MODE		OUTPUT MODE	
E_{in}	±1 μV to ±1100 Vdc	Accuracy	±0.002%
Resolution	1 ppm	E_{out}	±0.1 μV to ±111 Vdc
Sensitivity	1 μV	Resolution	1 ppm
Z_{in}	Infinite at null 10 MΩ — off null	Current	50 mA
		Z_{out}	0.01 Ω
PRICE	$1350	Weight	10 lbs.

AC Voltage Standards

Completely solid state. Highly stable. 60 second warm-up. Low output impedance.



Model AC 1000 D/B

MODEL	AC 1000 C	AC 1000 D/B	AC 200/B	AC 100/A
Bulletin	(#35)	(#36.1)	(#37)	(#38)
Vac rms	1000 V	1000 V in 4 ranges	200 V	100 V
Accuracy	0.025%	0.025%	0.05%	0.05%
Burden	50 VA (2A max.)	50 VA (2A max.)	20 VA (1A max.)	25 mA
Frequency Range	50 Hz to 5 kHz	50 Hz to 5 kHz	50 Hz to 20 kHz	10 Hz to 50 kHz

5 internal frequencies 50 Hz, 60 Hz, 400 Hz, 1 kHz plus optional frequency and unlimited number of frequencies attained by use of external oscillator via front panel terminals.

Distortion	.5%	.5%	.5%	.5%
Weight	45 lbs.	45 lbs.	45 lbs.	35 lbs.
Price	$2750	$3100	$2750	$2850
Options	Model IC-15 — Meter increment calibration — Bulletin 35.2 — $1290			

Electronic Development Corp.
11 Hamlin Street, Boston, MA 02127 (617) 268-9696
All EDC instruments are traceable to the U.S. National Bureau of Standards. Certification supplied with each instrument / All instruments are available under GSA Contract / Export prices slightly higher / Line (Mains) power: 115 Vac. 60 or 400 Hz; or 220 Vac. 50 Hz / Instruments available for no-charge evaluation. Contact your local sales representative or the main plant.

Soul Source

AND, in many instances*, "sole source", as well. Particularly, when **all** of the fine-print parameters must be met. Our customers will attest to the fact that we've been soul source because we understand their problems, requirements and specifications. We're completely responsive to their needs. When they've a problem in systems implementation, time, temperature, frequency, crystals, filters, oscillators, controlling or counting, people usually call us first. After all, solving problems in these areas . . . or telling people that we can't . . . is how we've built our reputation. Both customers and non-customers will tell you it's true. And, it's good to be true.
Matter of fact, we're seriously thinking of adopting a customer's suggestion for the slogan of our company: "People doing things that matter . . . imaginatively!"

For example, in miniature digital components for industrial control systems, we feature: rugged, all aluminum cases, circular, polarized lenses, solid state displays, BCD outputs, remote control options, power fail indications, and instruments to implement your systems that lend themselves to the clean, uniform look that you need to make that system of "whole cloth."

Industrial digital counters for starters . . . both uni- and bi-directional . . . in rates as high as 20 MHz, and prices as low as $216.00. Digital clocks that run the gamut from to from either 60Hz time bases or Xtal time bases. And, comparators , of all kinds . . . uni-directional, count-throughs, bi-directional, tracking . . . with every desirable kind

of option. 60Hz and Xtal time-base digital stop watches , that count up, count down with unbelievable accuracies. Frequency meter/tachometers too numerous to mention in detail. Digital thermometers , that you'll have to use to appreciate. And, of course, Digital Panel Meters , with absolutely no peers. And ; and, whatever else you need from your soul/sole source.

For complete specifications, options, etc., do what others have always done . . . contact us first . . . to last. We're here to help, not just to sell. Even if that means recommending another source. We think that's the reason we can truthfully say that we're the only real soul source.

P.O. Box 913 • Shawnee Mission, Kansas 66201 • 913/631-6700

electronic research co. erc a textron company

Electro IMPULSE, INC.
116 CHESTNUT STREET • RED BANK, NEW JERSEY 07701
TELEPHONE: 201 - 741-0404

AUTOMATIC DIGITAL READOUT CALORIMETERS
1% ACCURACY-COMPLETE SYSTEMS

TRACEABLE TO NATIONAL BUREAU OF STANDARDS!

"THE STANDARD OF THE INDUSTRY IN HIGH POWER PRECISION CALORIMETERS"

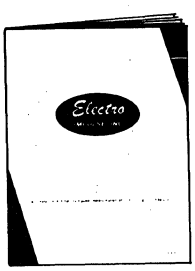
- 1% Accuracy is independent of frequency and waveshape, but does not include Load error. Frequency vs. VSWR Chart can be furnished for maximum accuracy.
- Not affected by minor variations in ambient temperature or voltage fluctuations.
- Simple Calibration — use DC or Line Frequency and .25% Wattmeter.
- Waveguide or Coaxial Loads to 40 GHz.

ADR-1000

AUTOMATED PRECISION instead of time consuming manipulation of Controls, Flow Adjustments, Reading of Thermometers, Flow Meters, Graphs and other error producing devices. Only 60 seconds reading time for full accuracy. (Less on some units.)

WHEN ORDERING: Be sure to specify Waveguide or Coaxial Load, Type of Connector and Frequency Range desired.

- Foolproof Interlock System protects both Transmitter and Calorimeter.
- 3½ Digit Nixie Readout standard.
- Simplicity of operation makes this Instrument ideal for use by relatively unskilled personnel.
- BCD Output Available.



WRITE FOR CATALOG #800
FOR OTHER ELECTRO IMPULSE PRODUCTS

- CALORIMETERS
- COOLING UNITS
- ATTENUATORS
- BALUNS
- POWER METERS
- WAVEGUIDE LOADS
- COMPLETE LINE OF TERMINATIONS

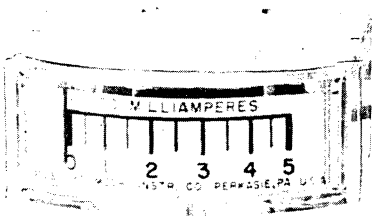
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

SEE OUR OTHER PRODUCTS IN Vol.1•548 & 1•549; Vol.3•1044

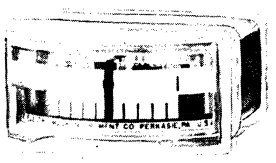
EMICO high tork METERS

EMICO is the dependable VOLUME source for 100% American-made AC and DC meters, supplying both standard and custom types, for a wide range of applications in the electronics, automotive, appliances and test equipment fields...

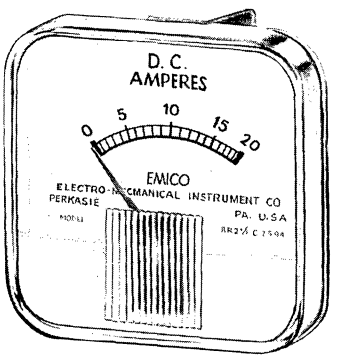
- VOLTMETERS
- AMMETERS
- MILLIVOLT METERS
- MILLIAMMETERS
- MICROAMMETERS
- DB METERS
- VU METERS
- CIRCUIT INDICATORS
- VOLTAGE TESTERS
- INDUCTION METERS



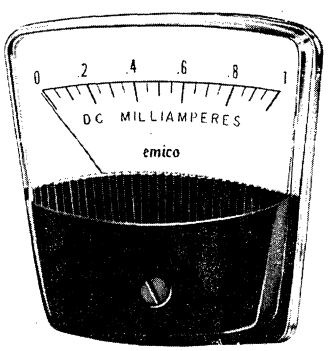
EDGE READING METER
Model 13
1 13/16" x 3/4"



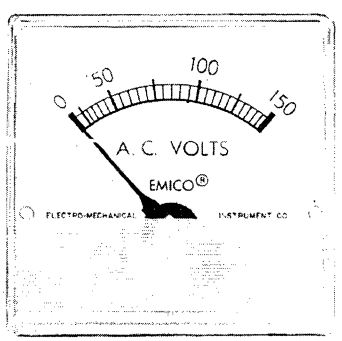
EDGE READING METER
Model 12 1¼" x 5/16"



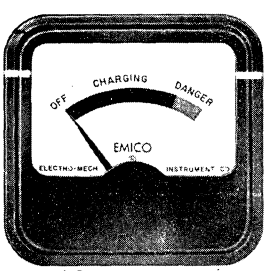
PLASTIC BEZEL METER
Model 42 2 5/16" square



STARLINE METER
Model 32
approx. 3" square

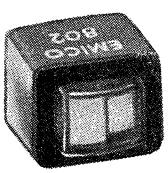


PLASTIC BEZEL METER
Model 52 approx. 2 3/8" square

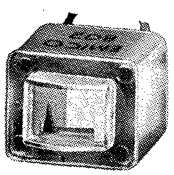


METAL BEZEL METER
Model 72 2¼" square

MICRO-MINIATURE CIRCUIT INDICATORS



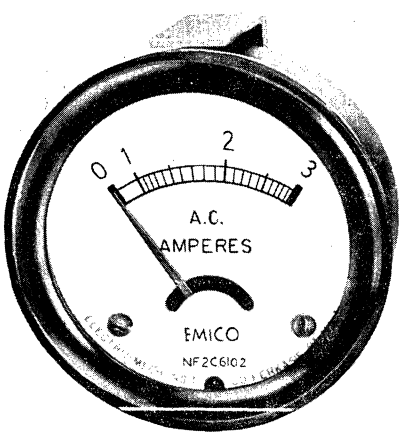
For monitoring on-off conditions, malfunctions, or battery charge conditions, select either Model 802P (pointer-type) or 802F (flag-type) indicator. Rugged, dependable, extremely low-cost. Available with either wire leads or plug-in jacks for easy installation. For technical details, request Bulletin R12-A.



Model 802F approx. ½" square

Model 802P approx. ½" square

EMICO designs and engineers meters to your exact requirements, including any custom dial face, with special scale, trademark, name or colors. Send details or drawings for prompt quotation.

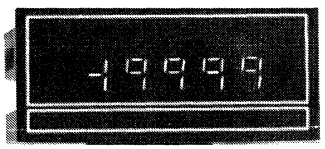


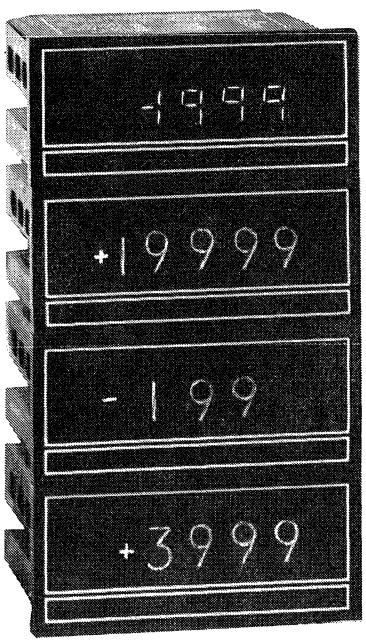
METAL BEZEL METER
Model 73
2¼" diameter

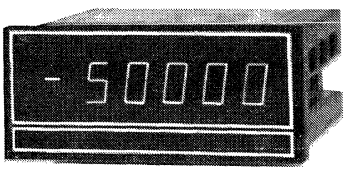
Phone: (215) 257-6561 TWX: 510-661-5170

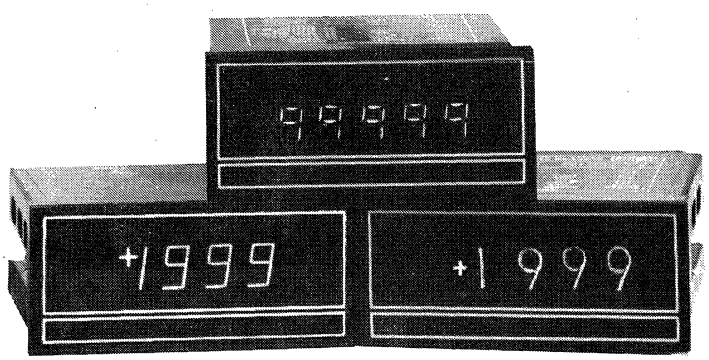
ELECTRO-MECHANICAL INSTRUMENT DIV. ***VLN CORP. • PERKASIE, PA. 18944***

DIGITAL PANEL METERS









- **CHOICE OF DISPLAYS** – Nixie®[R1], Numitron®[R2], or Sperry
- **BROAD LINE** – 2½ to 4¾ digits
- **MOST OPTIONS** – Bipolarity, differential input, wide range ratio, zero offset, DC current, resistance, 10 μV resolution, analog output & AC volts
- **HIGHEST RELIABILITY** – Each unit receives a 96 hour operational bake at 60°C
- **LONGEST WARRANTY** – 2 full years
- **(408) 738-1840 COLLECT!**

ELECTRO-NUMERICS CORPORATION • 2961 Corvin Drive • Santa Clara, California 95051

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200
(IN N. Y. STATE CALL COLLECT (516) 294-0990)

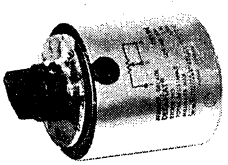
®[R1] Burroughs ®[R2] RCA

e|s|i® precision decades and components

Electro Scientific Industries makes available panel mount decades, dividers and individual resistors that are the nucleus components for all our precision measurement and calibration equipment.

The patented Dekadial® stacked decades save panel space at 0.02% accuracy in the decades, 0.002% (20 ppm) for the dividers. Solid silver-alloy switches are used throughout, plus silicone-treated ceramic switch wafers with 10^{10} ohms insulation resistance. The wire-wound resistors are produced by a proprietary winding ageing process for highest precision and stability.

Resistive Decades



DS 12 Individual Decade Resistor

Nine different total resistances available for DC and audio frequency applications. Can be used as a divider by cutting jumper wire.

Dekastats®

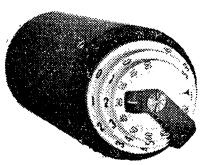
DS 1365 Precision Dekastat

Three coaxial decades available in four different total resistances.

MODEL	DESCRIPTION	PER STEP	TOTAL RESISTANCE	NOMINAL ACCURACY	PRICE
DS 12	Single 10-step resistance decades	0.01 Ω—1 MΩ	0.1 Ω—10 MΩ	0.02%	**$35-140**
DS 1265	Decade resistor, coaxial 2 decades plus rheostat	0.1, 1, 10 Ω/dial div.	1.2, 12 kΩ	0.02%	**125.**
			120 kΩ*	0.02%	**140.**
DS 1365	Decade resistor, coaxial, 3 decades	1, 10, 100 Ω	1.2, 12, 120 kΩ	0.02%	**125.**
		0.01 Ω	120 Ω*	0.02%	**150.**
DS 1463	4 dial coaxial, 3 decades plus rheostat	0.1, 1 Ω/dial div.	12, 120 kΩ	0.02%	**125.**
DS 1464	Decade resistor—4 decade coaxial	0.1, 1 Ω	1.2, 12 kΩ	0.02%	**125.**
		10 Ω	120 kΩ	0.02%	**140.**
		0.01 Ω, 100 Ω	120 Ω, 1.2 MΩ*	0.02%	**180.**

*Special order

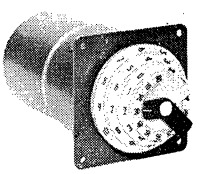
Dekapot® Dividers



DP 1311 Decade Potentiometer

Kelvin-Varley linearity is guaranteed 20 ppm stable/yr. Three decades plus 100-division potentiometer gives resolution of 0.0003%. Three different values available.

Dekatrans®

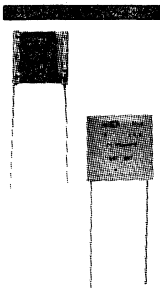


DT 1145 Miniature Decade Ratio Transformer

Dekatrans are inductive voltage dividers for use at audio frequencies. High input impedance, low output, and low phase shift make it ideal for testing voltage and current division, turns-ratio measurement, divider calibration and impedance comparison.

MODEL	DESCRIPTION	VALUE OR RATIO	LINEARITY	PRICE
DP 1211	Panel-mounting—coaxial dial decade potentiometer (Kelvin-Varley); 2 decades plus pot	1, 10 kΩ	20 ppm	**$115.**
		100 kΩ*	20 ppm	**130.**
		1 k to 100 kΩ*	20 ppm	**175.**
DP 1311	Decade potentiometer—3 decades plus pot	1, 10, 100 kΩ	20 ppm	**170.**
		1 kΩ to 100 kΩ	20 ppm	**210.**
DT 1135	Panel mounting ratio transformer—2 decades plus pot	1.1105	100 ppm	**225.**
DT 1145	Panel mounting ratio transformer—3 decades plus pot	1.11100	10 ppm	**300.**

*Special order



Precision Wirewound Resistors

A special ageing process ensures stability to 0.005% standard, or 0.001% on the best available. Standard initial accuracy is 0.01%, but 0.0015% is available. Changes in environment have little effect and ac residuals are low. Come in open frames (RF), encased in diallyl phthalate (RC) or hermetically sealed cases (RH).

Special DEKA Units

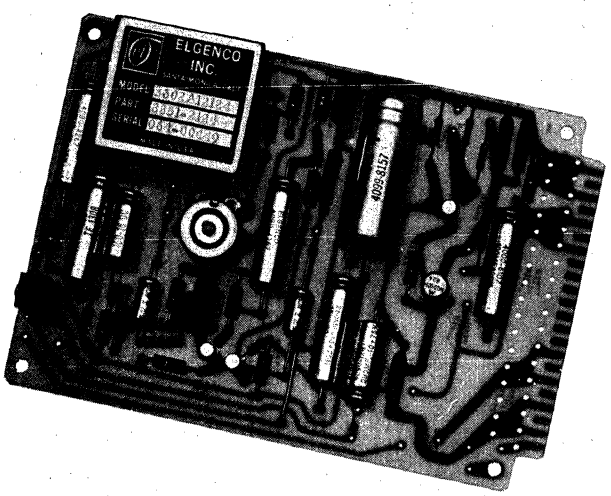
Standard model DEKATRANS, DEKAPOTS®, and DEKASTATS® are available in modified form. "O" rings and quad rings are installed to seal against moisture, and special epoxy glass rings are used to protect the resistor switch assemblies against shock and vibration hazards (designed to meet MIL-T-21200, classes 2 and 3). resistor switch assemblies against shock and vibration For details, consult factory.

e|s|i, Electro Scientific Industries, 13900 N.W. Science Park Drive, Portland, Oregon 97229

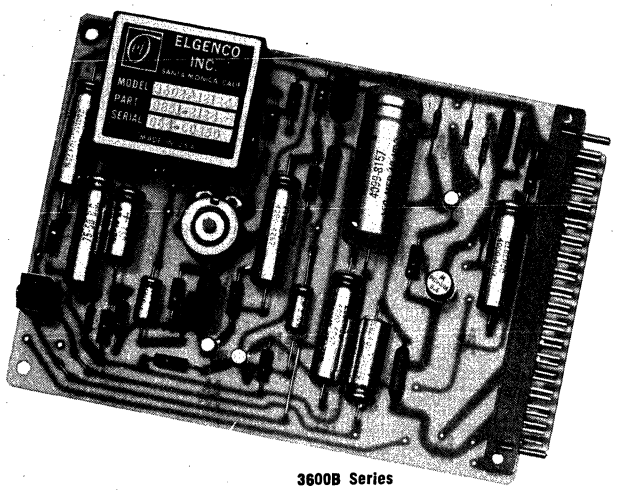
Phone: (503) 646-4141 **Telex: 36-0273**

ELGENCO INCORPORATED
statistical instruments for industry
1550 EUCLID STREET • SANTA MONICA, CALIFORNIA 90404 • (213) 451-1635

SERIES 3600 FIXED RANGE • NOISE GENERATOR CARDS



3600A Series



3600B Series

SPECIFICATIONS

FREQUENCY RANGE: The frequency band may be any combination of the listed low and high frequencies.

Lower Frequency: 10, 20, 50, or 200 Hz, 5 kHz.

Upper Frequency: 20, 50, 100, 200, or 500 kHz; 1, 2, 3, or 5 mHz.

SPECTRAL UNIFORMITY: Spectral uniformities are available as:

Upper Frequency	Spectral Uniformity
20 kHz to 500 kHz	±0.5, ±1.0, ±2.0 or ±3.0db
1 mHz to 3 mHz	±1.0, ±2.0, or ±3.0db
5 mHz	±2.0 or ±3.0db

As a rule of thumb, the roll off above the specified upper frequency gives a 3db point about twice the specified upper frequency. Roll off above 3db point approaches 12db per octave.

OUTPUT IMPEDANCE:

20 kHz to 500 kHz units .....600 ohms
1 to 5 mHz units .....200 ohms

POWER REQUIREMENTS:

	3600A Series or 3600B Series	Low Current Option 3600A or 3600B	3600C Series
Power supply voltage required	−30 VDC ±1%	−30 VDC ±1%	−24 VDC ±1%
Approximate current..	50 ma	30 ma	37 ma
Output level	0 to 3.0 VRMS	0 to 1.5 VRMS	0 to 2.2 VRMS

Note: The 3600B series units are the same as the 3600A series except the 3600B series have a test point and Elco 00-7023-035-000-001 connector mounted on the PCB.

The 3600A and 3600C units mate with a Cinch 250-22-30-170, Elco 00-6007-022-940-022 connector or equivalent.

SPECIFICATIONS COMMON TO ALL UNITS:

Amplitude Probability Distribution: Gaussian.

Peak to RMS Capability: Minimum dynamic ranges 3.5 to 1 at specified maximum level. Increases with lower output levels.

Maximum Load: 900 ohms minus output impedance.

Operating Temperature Range: 0 to 50°C.

Size: 4½ x 6½ x ⅞ inches.

Weight: 7 oz.

PRICING:

Base Price: 3600A, 3600C and 3600A or C with reduced current option (specify on order).

Base price plus $10.00: 3600B or 3600B with reduced current option (specify on order).

OPTIONS:

Other than specified frequency; add $10.00 each per frequency per board.

Steel shield plate, ¼-inch off conductor side of PCB; add $4.90 each.

Other than specified output impedance; add $5.00 each.

To operate on other power supply voltages, voltage difference must be 30-volts for 3600A or 3600B and 24-volts for 3600C. Specify on order; "Decoupled option for operation on _____ power supply," and add to price as:

Quantity Per Order	Add Each	Quantity Per Order	Add Each
1	$15.00	25-49	$2.50
2	10.00	50-99	2.00
3	7.50	100-249	1.95
4	6.00	250-499	1.90
5-9	5.00	500 up	1.85

DISCOUNT: Quantity discounts apply as:

Quantity	Discount	Quality	Discount
1-4	List	20-49	13%
5-9	5%	50-99	17%
10-19	10%	100	20%

MODEL 3609A POWER SUPPLY CARD

Size: 4½" x 6½" x 2 1/16".

Input: 115/230 volts ± 10/20 volts, 50 to 1000 Hz.

Supplies power for up to 2 noise generator cards or up to 4 noise generator cards with reduced current option. Price: **$69.00**

MATING CONNECTOR: Mating Elco Connector; Elgenco, Inc. part numbers 7521-1122, for 3600A, 3600C and 3609A is available at $6.25 each.

ELGENCO INCORPORATED
statistical instruments for industry
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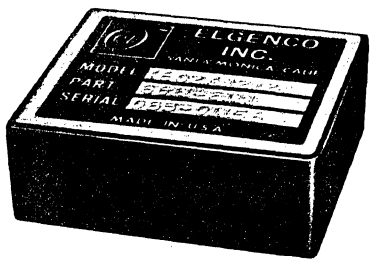
SERIES 1600 • ENCAPSULATED NOISE SOURCE MODULES • 10Hz TO 5MHz



SPECIFICATIONS IN RECOMMENDED CIRCUIT:

The 1600 series provide a low level wide band output. A portion of this wide band is specified to a certain flatness; uniformity. The 3 or 5 millivolt output is for the whole band extending to 5 mHz. Specifications are for 25°C unless specified otherwise.

SPECTRAL DENSITY UNIFORMITY: Available with uniformity to ±½db, ±1db, ±2db, or ±3db and many frequency ranges within 10 Hz to 5 mHz. See price list for complete list of standards.

SPECTRAL DENSITY: Approximately 2 $\mu v/\sqrt{}$ Hz .

RMS OUTPUT LEVEL: 1602A series 3 mv; 1603A, 1606A, and 1607A series 5 mv.

OUTPUT IMPEDANCE: Approx 20 ohms.

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian.

OPERATING TEMPERATURE RANGE: 0 to 50°C.

POWER REQUIREMENTS: −30 volts dc ±1% at approximately 3.5 ma. **Note:** external passive components are required to properly install unit.

MOUNTING: .032" Printed Circuit Leads.

Size: 11/16" H x 1 51/64" W x 1 37/64" D.

WEIGHT: Approx 1.5 oz.

SERIES 3600/1600 PRICES

Frequency Band	Flatness	SERIES 3600 CARDS Model No.	Price	SERIES 1600 MODULES Model No.	Price	Frequency Band	Flatness	SERIES 3600 CARDS Model No.	Price	SERIES 1600 MODULES Model No.	Price
200 Hz to 20 kHz	±½db	3606A-52224	$279.00	1606A-52224	$230.00	200 Hz to 500 kHz	±1db	3603A-12255	$229.00	1603A-12255	$180.00
50 Hz to 20 kHz	±½db	-55124	$289.00	-55124	$240.00	50 Hz to 500 kHz	±1db	-15155	$239.00	-15155	$190.00
20 Hz to 20 kHz	±½db	-52124	$309.00	-52124	$260.00	20 Hz to 500 kHz	±1db	-12155	$259.00	-12155	$210.00
10 Hz to 20 kHz	±½db	-51124	$344.00	-51124	$280.00	10 Hz to 500 kHz	±1db	-11155	$294.00	-11155	$235.00
200 Hz to 50 kHz	±½db	3606A-52254	$299.00	1606A-52254	$250.00	200 Hz to 50 kHz	±2db	3602A-22254	$154.00	1602A-22254	$105.00
50 Hz to 50 kHz	±½db	55154	$309.00	-55154	$260.00	50 Hz to 50 kHz	±2db	-25154	$164.00	-25154	$115.00
20 Hz to 50 kHz	±½db	-52154	$329.00	-52154	$280.00	20 Hz to 50 kHz	±2db	-22154	$184.00	-22154	$135.00
10 Hz to 50 kHz	±½db	-51154	$364.00	-51154	$305.00	10 Hz to 50 kHz	±2db	-21154	$219.00	-21154	$160.00
200 Hz to 100 kHz	±½db	3606A-52215	$319.00	1606A-52215	$270.00	200 Hz to 100 kHz	±2db	3602A-22215	$159.00	1602A-22215	$110.00
50 Hz to 100 kHz	±½db	-55115	$329.00	-55115	$280.00	50 Hz to 100 kHz	±2db	-25115	$169.00	-25115	$120.00
20 Hz to 100 kHz	±½db	-52115	$349.00	-52115	$300.00	20 Hz to 100 kHz	±2db	-22115	$189.00	-22115	$140.00
10 Hz to 100 kHz	±½db	-51115	$384.00	-51115	$325.00	10 Hz to 100 kHz	±2db	-21115	$224.00	-21115	$165.00
200 Hz to 200 kHz	±½db	3606A-52225	$334.00	1606A-52225	$285.00	200 Hz to 200 kHz	±2db	3602A-22225	$179.00	1602A-22225	$130.00
50 Hz to 200 kHz	±½db	-55125	$344.00	-55125	$295.00	50 Hz to 200 kHz	±2db	-25125	$189.00	-25125	$140.00
20 Hz to 200 kHz	±½db	-52125	$364.00	-52125	$315.00	20 Hz to 200 kHz	±2db	-22125	$209.00	-22125	$160.00
10 Hz to 200 kHz	±½db	-51125	$399.99	-51125	$335.00	10 Hz to 200 kHz	±2db	-21125	$244.00	-21125	$185.00
200 Hz to 500 kHz	±½db	3606A-52255	$354.00	1606A-52255	$305.00	200 Hz to 500 kHz	±2db	3602A-22255	$194.00	1602A-22255	$145.00
50 Hz to 500 kHz	±½db	-55155	$364.00	-55155	$315.00	50 Hz to 500 kHz	±2db	-25155	$204.00	-25155	$155.00
20 Hz to 500 kHz	±½db	-52155	$384.00	-52155	$335.00	20 Hz to 500 kHz	±2db	-22155	$224.00	-22155	$175.00
10 Hz to 500 kHz	±½db	-51155	$419.00	-51155	$360.00	10 Hz to 500 kHz	±2db	-21155	$259.00	-21155	$200.00
200 Hz to 20 kHz	±1db	3602A-12224	$154.00	1602A-12224	$105.00	200 Hz to 500 kHz	±3db	3602A-32255	$154.00	1602A-32255	$105.00
50 Hz to 20 kHz	±1db	-15124	$164.00	-15124	$115.00	50 Hz to 500 kHz	±3db	-35155	$164.00	-35155	$115.00
20 Hz to 20 kHz	±1db	-12124	$184.00	-12124	$135.00	20 Hz to 500 kHz	±3db	-32155	$184.00	-32155	$135.00
10 Hz to 20 kHz	±1db	-11124	$219.00	-11124	$160.00	10 Hz to 500 kHz	±3db	-31155	$219.00	-31155	$160.00
200 Hz to 50 kHz	±1db	3602A-12254	$174.00	1602A-12254	$125.00	5 kHz to 1 mHz	±1db	3607A-15316	$345.00	1607A-15316	$286.00
50 Hz to 50 kHz	±1db	-15154	$184.00	-15154	$135.00	5 kHz to 2 mHz	±1db	-15326	$435.00	-15326	$376.00
20 Hz to 50 kHz	±1db	-12154	$204.00	-12154	$155.00	5 kHz to 3 mHz	±1db	-15336	$535.00	-15336	$476.00
10 Hz to 50 kHz	±1db	-11154	$239.00	-11154	$180.00						
200 Hz to 100 kHz	±1db	3603A-12215	$194.00	1603A-12215	$145.00	5 kHz to 1 mHz	±2db	3607A-25316	$255.00	1607A-25316	$196.00
50 Hz to 100 kHz	±1db	-15115	$204.00	-15115	$155.00	5 kHz to 2 mHz	±2db	-25326	$330.00	-25326	$271.00
20 Hz to 100 kHz	±1db	-12115	$224.00	-12115	$175.00	5 kHz to 3 mHz	±2db	-25336	$410.00	-25336	$351.00
10 Hz to 100 kHz	±1db	-11115	$259.00	-11115	$200.00	5 kHz to 5 mHz	±2db	-25356	$570.00	-25356	$511.00
200 Hz to 200 kHz	±1db	3603A-12225	$209.00	1603A-12225	$160.00	5 kHz to 1 mHz	±3db	3607A-35316	$195.00	1607A-35316	$136.00
50 Hz to 200 kHz	±1db	-15125	$219.00	-15125	$170.00	5 kHz to 2 mHz	±3db	-35326	$255.00	-35326	$196.00
20 Hz to 200 kHz	±1db	-12125	$239.00	-12125	$190.00	5 kHz to 3 mHz	±3db	-35336	$325.00	-35336	$266.00
10 Hz to 200 kHz	±1db	-11125	$274.00	-11125	$215.00	5 kHz to 5 mHz	±3db	-35356	$460.00	-35356	$401.00

NOTE: A SERIES TO OPERATE ON −30VDC
C SERIES TO OPERATE ON −24VDC, PRICE SAME AS (A) SERIES
TO EXTEND 3607A LOW FREQUENCY ADD AS FOLLOWS:
200 Hz add $30.00 20 Hz add $60.00
50 Hz add $40.00 10 Hz add $95.00

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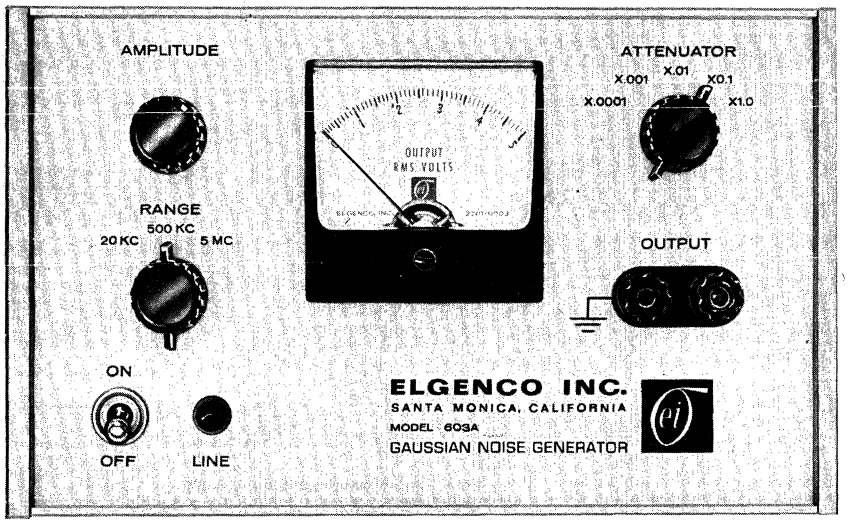
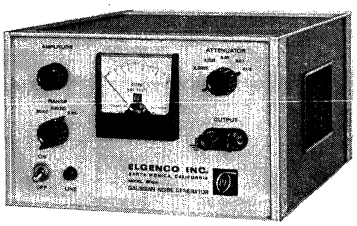
MODELS 602A-200/602A-1390/603A • ALL SOLID STATE NOISE GENERATORS 5 Hz TO 5 MHz





SPECIFICATIONS:

These specs are unique to the Series 602A-200, 602A-1390, 603A introduced on this page.

FREQUENCY RANGES: 5 Hz to 20 kHz, 5 Hz to 500 kHz, 5 Hz to 5 mHz.

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian.

OUTPUT SPECTRUM:

Accuracy	602A-1390	602A-200	603A
20 Hz to 20 kHz	±1 db	±1 db	—
20 Hz to 500 kHz	±3 db	±2.5 db	—
500 kHz to 5 mHz	±8 db	±5 db	—
10 Hz to 500 kHz	—	—	±1 db
500 mHz to 5 mHz	—	—	±3 db

RMS OUTPUT LEVEL: (Minimum value of maximum open circuit output).

20 kHz range	3 volts	3 volts	3 volts
500 kHz range	2 volts	2.5 volts	3 volts
5 mHz range	1 volt	2.0 volts	3 volts

OUTPUT IMPEDANCE:

	900 ohms ±10%	200 ohms ±10%	200 ohms ±10%

MAXIMUM LOAD: (on direct output)

	no limit	700 ohms	700 ohms

OUTPUT STEP ATTENUATOR: Five positions: X1.0, X0.1, X.01, X.001, and X.0001; calibrated to work into open circuit. Accuracy:

to 100 kHz	±3%	±3%	—
to 500 kHz	—	—	±3%
to 5 mHz	±10%	±10%	±5%
Output Impedance	200 ohms	200 ohms	200 ohms
	—	±1%	±1%

SPECTRAL DENSITY: Approximate spectral density (mv $\sqrt{}$ Hz) for 1 volt RMS output.

20 kHz band	5.0	5.0	5.0
500 kHz band	1.2	1.2	1.2
5 mHz band	0.6	0.4	0.4

PRICE

	$395.00	$475.00	$625.00

SPECIFICATIONS • ALSO COMMON TO SERIES 624A

These specs are common to the Series 602A-200, 602A-1390, 603A introduced on this page and the Series 624A on facing page.

DYNAMIC RANGE: 3.5 to 1 peak to RMS at 3 volts RMS open circuit; 5 to 1 at 2.1 volts RMS. Dynamic range is inversly proportional to output level as set by front panel amplitude control.

OUTPUT METER: Rectifier type meter circuit reads proportional to average value, calibrated to read RMS value of Gaussian Noise; 0-5 volts RMS scale.

OPERATING TEMPERATURE RANGE: 0 to 50°C.

POWER SUPPLY: Built-in highly regulated dc supply.

POWER REQUIREMENTS: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac; approximately 5 watts. A rechargeable battery option is available. Battery is recharged by operating unit on ac line.

DIMENSIONS: 5¼″ high x 8⅝″ wide x 11″ deep.

RACK MOUNT: A rack mounting adapter kit is available for rack mounting two units side by side. Also available is a rack mounting adapter kit for rack mounting one unit. One or two units use 5¼″ x 19″ of rack panel space with adapter kit. Full rack width cabinet option for one unit is available. Size of unit with this option is 5¼″ high x 17″ wide x 11″ deep and comes with rack mounting hardware.

SHIPPING WEIGHT: Approximately 12 lbs.

OPTIONS AVAILABLE: Full rack width cabinet with mounting hardware option; rechargeable battery option; BNC output terminal on rear panel option.

ACCESSORIES AVAILABLE: Dual adapter kit and rack mounting hardware; single unit adapter kit with rack mounting hardware and front and rear dummy panels; rechargeable battery adapter kit.

OPTIONS & ACCESSORIES FOR MODELS 602A/603A/610A & SERIES 624A

Adapter kit, single unit rack mounting (mounts one unit in rack, includes blank panel to make dual unit) Part No. 8804-0002 ..... $75.00

Adapter kit, dual unit and rack mounting hardware (mounts two units side by side) Part No. 8804-0001 ..... $10.00

Full rack width cabinet and rack mounting hardware option....add $35.00

Pink filters, Part No. 8890-0015 ..... $ 49.00

Rechargeable battery option .....add $165.00

Rechargeable battery kit $175.00

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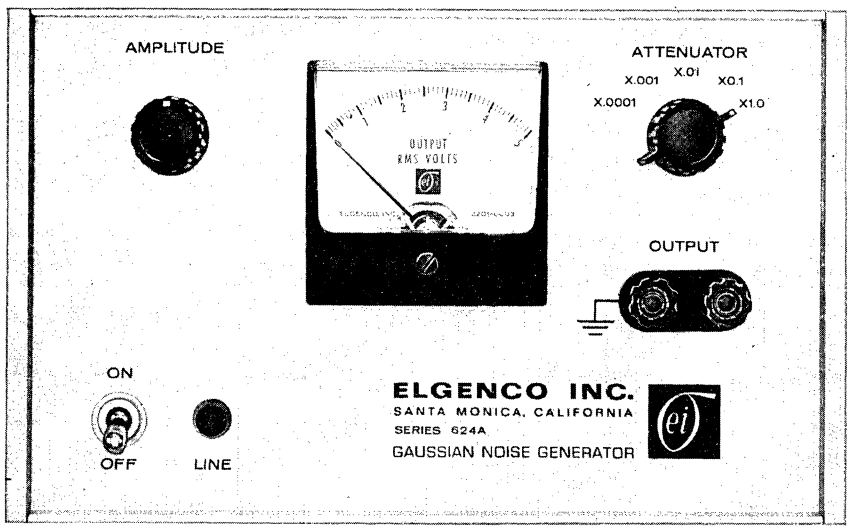
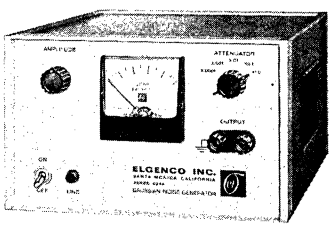
SERIES 624A FIXED RANGE • ALL SOLID STATE NOISE GENERATORS





SPECIFICATIONS • ALSO SEE FACING PAGE

FREQUENCY RANGES: See price list for a partial list of frequency ranges available.

RMS OUTPUT LEVEL: (Minimum value of maximum open circuit output) 3 volts.

OUTPUT IMPEDANCE: 200 ohms ±10%.

MAXIMUM LOAD: (on direct output) 700 ohms.

OUTPUT STEP ATTENUATOR: Five positions: X1.0, X0.1, X.01, X.001, and X.0001; calibrated to work into open circuit.
Accuracy: ±3%
Output Impedance: 200 ohms

SPECTRAL DENSITY: Approximate spectral density (mv√Hz) for 1 volt RMS output.

Accuracy	mv	Accuracy	mv
20 kHz band	5.0	200 kHz band	1.6
50 kHz band	3.1	500 kHz band	1.0
100 kHz band	2.2		

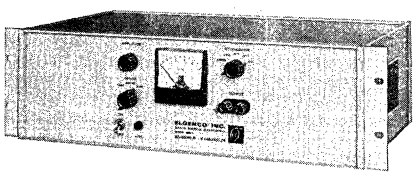
AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian.

SPECIFICATIONS FOR SERIES 624A

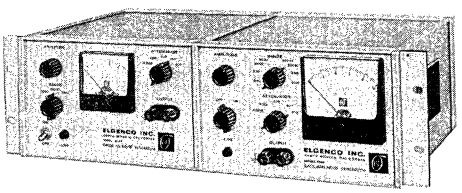
624A-11124	10 Hz to 20 kHz, ±1db	$420.00
-12124	20 Hz to 20 kHz, ±1db	$375.00
-15124	50 Hz to 20 kHz, ±1db	$365.00
-12224	200 Hz to 20 kHz, ±1db	$355.00
624A-11154	10 Hz to 50 kHz, ±1db	$440.00
-12154	20 Hz to 50 kHz, ±1db	$405.00
-15154	50 Hz to 50 kHz, ±1db	$385.00
-12254	200 Hz to 50 kHz, ±1db	$375.00
624A-11115	10 Hz to 100 kHz, ±1db	$460.00
-12115	20 Hz to 100 kHz, ±1db	$425.00
-15115	50 Hz to 100 kHz, ±1db	$405.00
-12215	200 Hz to 100 kHz, ±1db	$395.00
624A-11125	10 Hz to 200 kHz, ±1db	$510.00
-12125	20 Hz to 200 kHz, ±1db	$475.00
-15125	50 Hz to 200 kHz, ±1db	$455.00
-12225	200 Hz to 200 kHz, ±1db	$445.00

SPECIFICATIONS FOR SERIES 624A (Cont'd)

624A-11155	10 Hz to 500 kHz, ±1db	$530.00
-12155	20 Hz to 500 kHz, ±1db	$495.00
-15155	50 Hz to 500 kHz, ±1db	$475.00
-12255	200 Hz to 500 kHz, ±1db	$465.00
624A-21154	10 Hz to 50 kHz, ±2db	$420.00
-22154	20 Hz to 50 kHz, ±2db	$385.00
-25154	50 Hz to 50 kHz, ±2db	$365.00
-22254	200 Hz to 50 kHz, ±2db	$355.00
624A-21115	10 Hz to 100 kHz, ±2db	$425.00
-22115	20 Hz to 100 kHz, ±2db	$390.00
-25115	50 Hz to 100 kHz, ±2db	$370.00
-22215	200 Hz to 100 kHz, ±2db	$360.00
624A-21125	10 Hz to 200 kHz, ±2db	$440.00
-22125	20 Hz to 200 kHz, ±2db	$410.00
-25125	50 Hz to 200 kHz, ±2db	$390.00
-22225	200 Hz to 200 kHz, ±2db	$380.00
624A-21155	10 Hz to 500 kHz, ±2db	$460.00
-22155	20 Hz to 500 kHz, ±2db	$425.00
-25155	50 Hz to 500 kHz, ±2db	$405.00
-22255	200 Hz to 500 kHz, ±2db	$395.00
624A-31155	10 Hz to 500 kHz, ±3db	$420.00
-32155	20 Hz to 500 kHz, ±3db	$385.00
-35155	50 Hz to 500 kHz, ±3db	$365.00
-32255	200 Hz to 500 kHz, ±3db	$355.00
624A-51124	10 Hz to 20 kHz, ±½db	$545.00
-52124	20 Hz to 20 kHz, ±½db	$510.00
-55124	50 Hz to 20 kHz, ±½db	$490.00
-52224	200 Hz to 20 kHz, ±½db	$480.00
624A-51154	10 Hz to 50 kHz, ±½db	$560.00
-52154	20 Hz to 50 kHz, ±½db	$510.00
-55154	50 Hz to 50 kHz, ±½db	$490.00
-52254	200 Hz to 50 kHz, ±½db	$480.00
624A-51115	10 Hz to 100 kHz, ±½db	$585.00
-52115	20 Hz to 100 kHz, ±½db	$550.00
-55115	50 Hz to 100 kHz, ±½db	$530.00
-52215	200 Hz to 100 kHz, ±½db	$520.00
624A-51125	10 Hz to 200 kHz, ±½db	$635.00
-52125	20 Hz to 200 kHz, ±½db	$600.00
-55125	50 Hz to 200 kHz, ±½db	$580.00
-52225	200 Hz to 200 kHz, ±½db	$570.00
624A-51155	10 Hz to 500 kHz, ±½db	$655.00
-52155	20 Hz to 500 kHz, ±½db	$620.00
-55155	50 Hz to 500 kHz, ±½db	$600.00
-52255	200 Hz to 500 kHz, ±½db	$590.00



Model 602A with full rack width mounting option



Models 602A and 610A combined by dual unit adapter kit.

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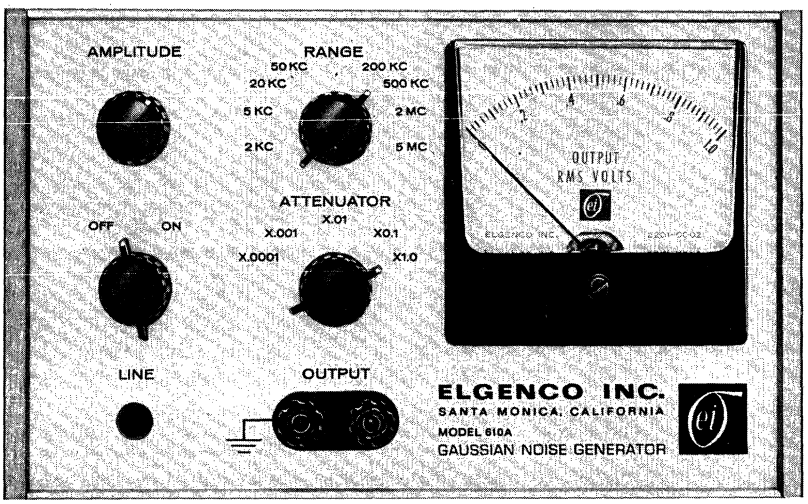
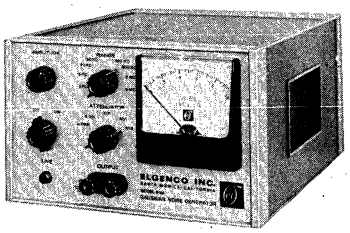
MODEL 610A • ALL SOLID STATE NOISE GENERATOR • 5Hz TO 5MHz





SPECIFICATIONS

FREQUENCY RANGES: Eight ranges selectably by front panel switch; 5 Hz to 2 kHz, 5 Hz to 5 kHz, 5 Hz to 20 kHz, 5 Hz to 50 kHz, 5 Hz to 200 kHz, 5 Hz to 500 kHz, 5 Hz to 2 mHz, and 5 Hz to 5 mHz.

OUTPUT SPECTRUM: Uniform to ±0.5 db from 10 Hz to 500 kHz and ±2.0 db from 500 kHz to 5 mHz.

OUTPUT LEVEL: 0 to 1 volt RMS, adjustable by front panel amplitude control. A dynamic range of 5 to 1 peak to RMS value is provided.

OUTPUT STEP ATTENUATOR: Five positions; X1.0, X0.1, X.01, X.001, X.0001. Accuracy ±0.1 db to 500 kHz; ±0.25 db to 5 mHz.

SPECTRAL DENSITY: Approximate spectral density for 1 volt RMS output.

Band	volts/√ Hz	Band	volts/√ Hz
2 kHz	1.75×10^{-2}	200 kHz	1.75×10^{-3}
5 kHz	1.1×10^{-2}	500 kHz	1.1×10^{-3}
20 kHz	5.5×10^{-3}	2 mHz	5.5×10^{-4}
50 kHz	3.5×10^{-3}	5 mHz	3×10^{-4}

AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical Gaussian Distribution all ranges.

OUTPUT METER: Meter reads 0 to 1 volt RMS. Accuracy ±2% of full scale to 2 mHz; ±5% to 5 mHz.

MAXIMUM LOAD: 500 ohms on direct output.

OUTPUT IMPEDANCE: Approximately 50 ohms direct output. Step attenuated output 50 ohms ±1%.

POWER SUPPLY: Built-in highly regulated dc supply.

POWER REQUIREMENTS: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac; approximately 7 watts. A rechargeable power option is available. Battery is recharged by operating unit on ac line.

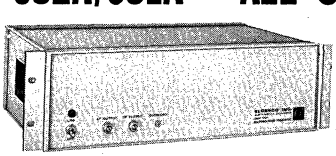
DIMENSIONS: 5¼" high x 8⅝" wide x 11" deep.

RACK MOUNT: A rack mounting adapter kit is available for rack mounting two units side by side. Also available is a rack mounting adapter kit for rack mounting one unit. One or two units use 5¼" x 19" of rack panel space with adapter kit. Full rack width cabinet option for one unit is available. Size of unit with this option is 5¼" high x 17" wide x 11" deep and comes with rack mounting hardware.

SHIPPING WEIGHT: Approximately 14 lbs.

PRICE: $1,295.00.

MODELS 632A/631A • ALL SOLID STATE NOISE GENERATOR



Model 632A Dual Output DC to 400 Hz and 5 Hz to 40 kHz.....**$2,595**

LOW FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±1.0%.
OUTPUT SPECTRUM: Uniform ±0.1 db from DC to 350 Hz.

MAXIMUM OUTPUT: 1.0 volts rms. A dynamic range of 5 to 1 peak to rms value is provided.

MAXIMUM SPECTRAL DENSITY: Approx. 1.5×10^{-3} volts²/Hz.

OUTPUT MEAN: Less than 5 mv.

OUTPUT IMPEDANCE: Approximately 1,000 ohms.

HIGH FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±2%.

OUTPUT SPECTRUM: Uniform ±0.5 db from 10 to 35,000 Hz.

MAXIMUM OUTPUT: 1.0 volts rms. A dynamic range of 5 to 1 peak to rms values is provided.

MAXIMUM SPECTRAL DENSITY: Approx. 2×10^{-5} volts²/Hz.

OUTPUT MEAN: Less than 1 mv.

OUTPUT IMPEDANCE: Approximately 100 ohms.

NOISE REGULATOR: rms output level continuously stabilized against a reference voltage.

OVERLOAD INDICATOR: Panel overload indicator lights when input noise level to regulator is out of regulation range.

POWER: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac.

DIMENSIONS: 5¼" high x 17" wide x 11" deep. 19" wide with rack mounting flanges mounted (supplied).

Model 631A 5 Hz to 40 kHz **$1,645**

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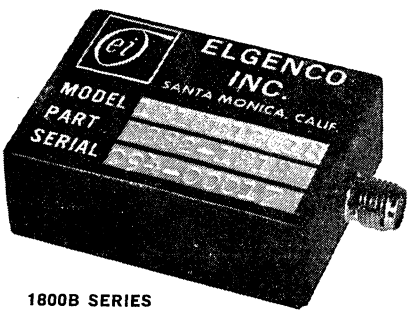
SERIES 1800 • NOISE SOURCE MODULES • 10KHz TO 100MHz

1800A SERIES



1800B SERIES

SPECIFICATIONS

The 1800 Series provides a low level wide band output. A portion of this band is specified to a certain flatness; uniformity. The approximate 6 mv open circuit output is for the whole band. The 1800B Series modules are the same as the 1800A series except the output is via a SMA connector. Specifications are for 25°C unless specified otherwise.

SPECTRAL DENSITY UNIFORMITY: Available with uniformity of ±0.5 db, ±1 db, ±2 db, ±3 db and ±4 db for many frequency ranges between lower frequencies of 10 kHz and 2 mHz and upper frequencies of 20 mHz, 30 mHz, 45 mHz, 50 mHz, 70 mHz, 80 mHz and 100 mHz.

SPECTRAL DENSITY: Approximately 0.3 μV per root Hz into 50 ohms.

RMS OUTPUT LEVEL: Approximately 3 mv rms into 50 ohms; 6 mv rms open circuit.

OUTPUT IMPEDANCE: Approximately 50 ohms.

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian.

OPERATING TEMPERATURE RANGE: 0 to 50°C.

POWER REQUIREMENTS: Model 1815, −15 VDC; Model 1818, −18 VDC; Model 1820, −20 VDC; Model 1822, −22 VDC; Model 1824, −24 VDC (well regulated power is required); current approximately 25 ma. Note: No external components are needed to properly install unit.

MOUNTING: .032" printed circuit leads.

SIZE: 1.60 x 1.30 x 0.65 inches.

WEIGHT: Approximately 1 oz.

PRICING:
Base Price: 1818A, 1820A, 1822A and 1824A.
Base Price plus $10.00: 1818B, 1820B, 1822B and 1824B.
Base Price plus $20.00: 1815A.
Base Price plus $30.00: 1815B.

SERIES 1800 PRICES

Model No.	Frequency Band	Price
1818A-31427	10 kHz to 20 mHz, ±3 db	$139.00
-21427	10 kHz to 20 mHz, ±2 db	$169.00
-11427	10 kHz to 20 mHz, ±1 db	$279.00
-51427	10 kHz to 20 mHz, ±0.5 db	$399.00
1818A-31437	10 kHz to 30 mHz, ±3 db	$149.00
-21437	10 kHz to 30 mHz, ±2 db	$179.00
-11437	10 kHz to 30 mHz, ±1 db	$299.00
-51437	10 kHz to 30 mHz, ±0.5 db	$449.00
1818A-31447	10 kHz to 45 mHz, ±3 db	$179.00
-21447	10 kHz to 45 mHz, ±2 db	$229.00
-11447	10 kHz to 45 mHz, ±1 db	$399.00
-51447	10 kHz to 45 mHz, ±0.5 db	$579.00
1818A-31457	10 kHz to 50 mHz, ±3 db	$229.00
-21457	10 kHz to 50 mHz, ±2 db	$299.00
-11457	10 kHz to 50 mHz, ±1 db	$449.00
-51457	10 kHz to 50 mHz, ±0.5 db	$699.00
1818A-41477	10 kHz to 70 mHz, ±4 db	$229.00
-31477	10 kHz to 70 mHz, ±3 db	$249.00
-21477	10 kHz to 70 mHz, ±2 db	$319.00
-11477	10 kHz to 70 mHz, ±1 db	$499.00
1818A-41487	10 kHz to 80 mHz, ±4 db	$249.00
-31487	10 kHz to 80 mHz, ±3 db	$269.00
-21487	10 kHz to 80 mHz, ±2 db	$349.00
-11487	10 kHz to 80 mHz, ±1 db	$549.00
1818A-41418	10 kHz to 100 mHz, ±4 db	$279.00
-31418	10 kHz to 100 mHz, ±3 db	$299.00
-21418	10 kHz to 100 mHz, ±2 db	$399.00
-11418	10 kHz to 100 mHz, ±1 db	$689.00

Model No.	Frequency Band	Price
1818A-32627	2 mHz to 20 mHz, ±3 db	$ 89.00
-22627	2 mHz to 20 mHz, ±2 db	$119.00
-12627	2 mHz to 20 mHz, ±1 db	$229.00
-52627	2 mHz to 20 mHz, ±0.5 db	$299.00
1818A-32637	2 mHz to 30 mHz, ±3 db	$ 99.00
-22637	2 mHz to 30 mHz, ±2 db	$129.00
-12637	2 mHz to 30 mHz, ±1 db	$249.00
-52637	2 mHz to 30 mHz, ±0.5 db	$349.00
1818A-32647	2 mHz to 45 mHz, ±3 db	$129.00
-22647	2 mHz to 45 mHz, ±2 db	$179.00
-12647	2 mHz to 45 mHz, ±1 db	$349.00
-52647	2 mHz to 45 mHz, ±0.5 db	$479.00
1818A-32657	2 mHz to 50 mHz, ±3 db	$179.00
-22657	2 mHz to 50 mHz, ±2 db	$249.00
-12657	2 mHz to 50 mHz, ±1 db	$399.00
-52657	2 mHz to 50 mHz, ±0.5 db	$599.00
1818A-42677	2 mHz to 70 mHz, ±4 db	$179.00
-32677	2 mHz to 70 mHz, ±3 db	$199.00
-22677	2 mHz to 70 mHz, ±2 db	$269.00
-12677	2 mHz to 70 mHz, ±1 db	$449.00
1818A-42687	2 mHz to 80 mHz, ±4 db	$199.00
-32687	2 mHz to 80 mHz, ±3 db	$219.00
-22687	2 mHz to 80 mHz, ±2 db	$299.00
-12687	2 mHz to 80 mHz, ±1 db	$499.00
1818A-42618	2 mHz to 100 mHz, ±4 db	$229.00
-32618	2 mHz to 100 mHz, ±3 db	$249.00
-22618	2 mHz to 100 mHz, ±2 db	$349.00
-12618	2 mHz to 100 mHz, ±1 db	$639.00

Note: 1815 Series not available in 80 mHz and 100 mHz units.

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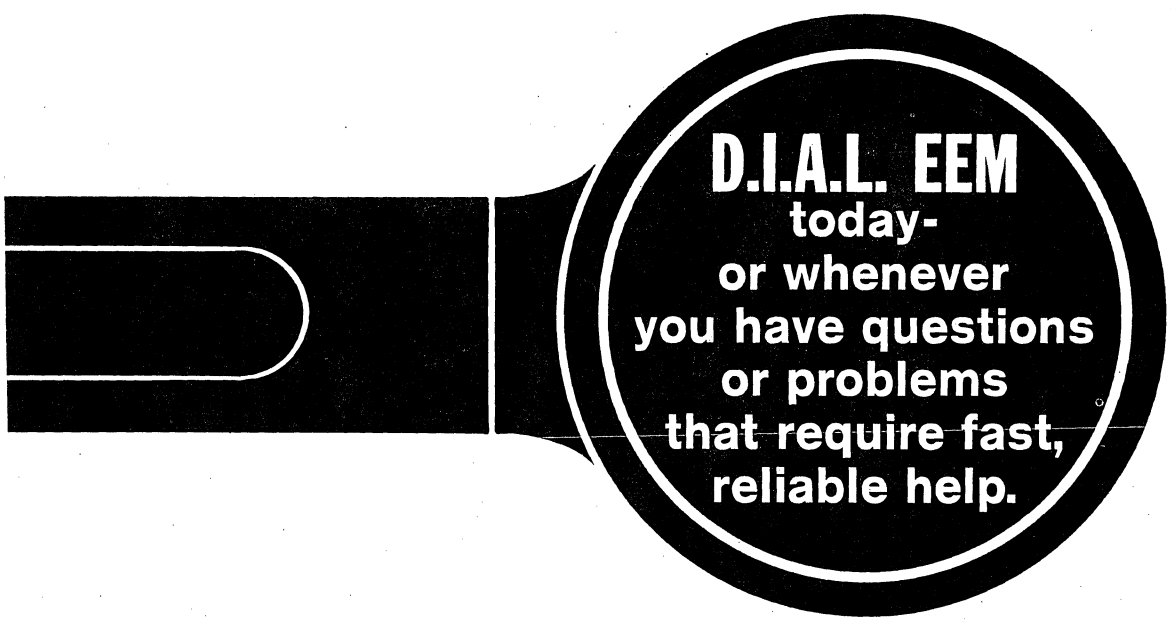

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Keeping you better informed.

United Technical Publications
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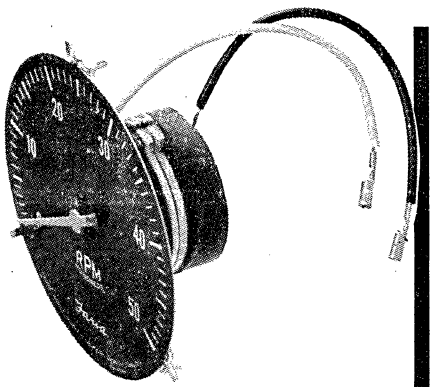
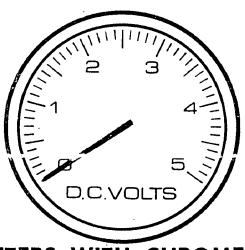
FARIA 250° METERS

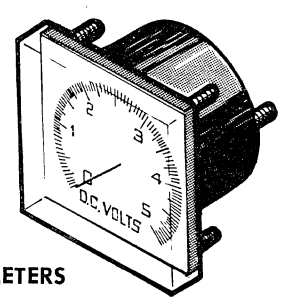
COST THE SAME AS ORDINARY 100° METERS!!!



METER MOVEMENTS
MODEL 1101



ROUND
PANEL METERS WITH CHROME BEZELS, AUTOMOTIVE STYLING
2" MODEL 1102
3" MODEL 1103
4" MODEL 1104
HERMETICALLY SEALED TO 5 PSI WITH INTERNAL LIGHTING



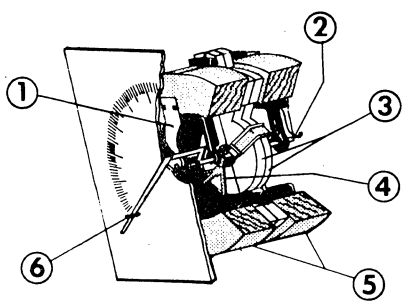
SQUARE
PANEL METERS
2½" MODEL 1105
3½" MODEL 1106
— ASA DIMENSIONS —

GET 2-1/2 TIMES GREATER READABILITY—AT THE SAME PRICE!!!

TYPICAL RANGES AVAILABLE

Range	Resistance	Part No.
50 ua	5,770	xxxx-1-101
100 ua	3,280	xxxx-1-102
200 ua	1,370	xxxx-1-103
500 ua	596	xxxx-1-105
1 MA	233	xxxx-1-200
5 MA	28	xxxx-1-201
10 MA	14	xxxx-1-202
50 MA	3.7	xxxx-1-203
1 A(DC)	50 MV	xxxx-1-400
5 A(DC)	50 MV	xxxx-1-402
10 A(DC)	50 MV	xxxx-1-403
25 A(DC)	50 MV	xxxx-1-404
50 A(DC)	50 MV	xxxx-1-405
5 DCV	1,000 ohms/volt	xxxx-1-300
10 DCV	1,000 ohms/volt	xxxx-1-301
25 DCV	1,000 ohms/volt	xxxx-1-303
50 DCV	1,000 ohms/volt	xxxx-1-304
100 DCV	1,000 ohms/volt	xxxx-1-305
150 DCV	1,000 ohms/volt	xxxx-1-306
500 DCV	1,000 ohms/volt	xxxx-1-307
150 ACV(Rect)	1,000 ohms/volt	xxxx-2-501
300 ACV(Rect)	1,000 ohms/volt	xxxx-2-502
500 ACV(Rect)	1,000 ohms/volt	xxxx-2-503

SPECIAL RANGES NOT SHOWN AND CUSTOM DIALS ARE AVAILABLE. CONSULT FACTORY. TO ORDER RANGES SHOWN ABOVE SPECIFY 4 DIGIT MODEL NUMBER AND PART NUMBER.



1. Tension member assures constant band tension while absorbing shock and vibration to prevent band breakage.

2. Strong taut-band eliminates friction and will withstand heavy shock and vibration without damage.

3. Pole piece design assures uniform flux density from 0 to 250° deflection for better tracking.

4. Unique balance weight design assures proper balance even after heavy shock and vibration. No weight wires to shift as on other meters.

5. Large berrium ferrite magnet provides 40% more flux density than other "core magnet" designs for better torque.

6. Movement is suppressed slightly against stop peg to eliminate zero adjust. Pointer is always at zero in any position.

Field proven in the most rugged automotive and snowmobile OEM applications, this high performance 250° meter movement is featured in all the case styles shown at left. Wrtie or call for data sheets and prices today!

Faria Meter Corporation

19 FARIA LANE, UNCASVILLE, CONNECTICUT 06382
(203) 848-9271

FREED TRANSFORMER CO., INC.

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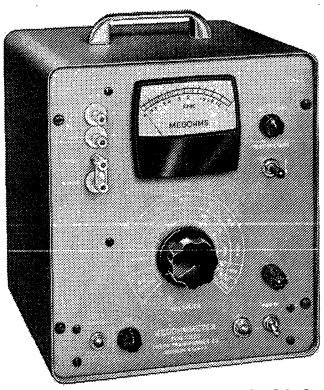
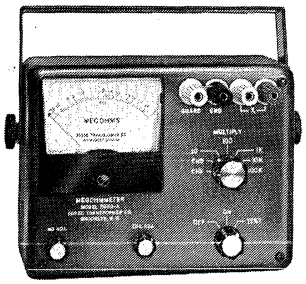
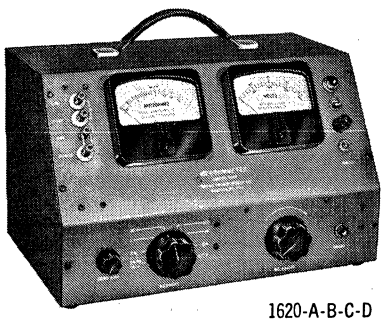


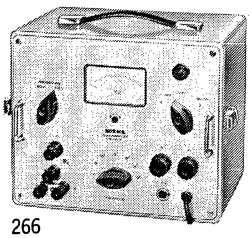
1020-C



2030-A-B-C



1620-A-B-C-D



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MEGOHMMETERS

Freed can supply a complete range of insulation resistance measuring equipment with fixed and variable d.c. test voltages from 5 to 5000 volts. Insulation and leakage measurements can be made on transformers, motors, cables, electronic assemblies and components, dielectric materials, electrical appliances and tools, capacitors and resistors.

Type	Resistance Range	Test Voltage	Accuracy	Power Requirements	Size and Weight	Price
1620	0.1 to 4,000,000 megohms 1 to 2,000,000 megohms @ 500 volts	Variable 50 to 1000 volts d.c.	±5% at full scale	105-125 volts 50-60 cycles	15" x 9" x 7½" 24 lbs. *	400.00
1620-A	0.01 to 4,000,000 megohms 0.1 to 200,000 megohms @ 50 volts 1 to 2,000,000 megohms @ 500 volts	Variable 5-100 volts d.c. 100-1000 volts d.c.	±5% at full scale	105-125 volts 50-60 cycles	15" x 9" x 7½" 24 lbs. *	415.00
1620-B	1 to 2,000,000 megohms 10 to 2,000,000 megohms @ 2500 volts	Variable 250-2500 volts d.c.	±5% at full scale	105-125 volts 50-60 cycles	15" x 9" x 7½" 24 lbs. *	435.00
1620-C	All features same as Type 1620 with additional circuitry for capacitor measurements	Variable 50 to 1000 volts d.c.	±5% at full scale	105-125 volts 50-60 cycles	15" x 9" x 7½" 24 lbs. *	420.00
1620-D	0.01 to 40,000,000 megohms 0.1 to 2,000,000 megohms @ 50 volts 1 to 20,000,000 megohms @ 500 volts	Variable 5-100 volts d.c. 100-1000 volts d.c.	±5% at full scale except highest range ±10%	105-125 volts 50-60 cycles	15" x 9" x 7½" 25 lbs. *	435.00
1020-C	0.1 to 2,000,000 megohms 0.1 to 200,000 megohms @ 50 or 100 volts d.c. 1 to 2,000,000 megohms @ 500 volts d.c.	Fixed 50, 100, 500 volts Regulated	±3% all ranges except highest range ±5%	105-125 volts 50-60 cycles	9½" x 10½" x 8" 18 lbs. *	330.00
1020-D	0.1 to 2,000,000 megohms 0.1 to 200,000 megohms @ 100 or 200 volts d.c. 1 to 2,000,000 megohms @ 500 volts d.c.	Fixed 100, 200, 500 volts Regulated	±3% all ranges except highest range ±5%	105-125 volts 50-60 cycles	9½" x 10½" x 8" 18 lbs. *	330.00
* 266	0.6 megohm to 500 teraohm @ 500 v. 0.6 megohm to 100 teraohm @ 100 v.	Fixed 100-500 v.d.c. Regulated	± 5% at full scale	105-125 Volts 50-60 Hz	11½" x 9" x 9" 18 lbs.	525.00
* 668	0 to 20,000 megohms @ 1000 v 0 to 50,000 megohms @ 2500 v 0 to 100,000 megohms @ 5000 v	Fixed 1000-2500 5000 v.d.c.	±2.5% of scale length	battery operated transistor supply built in charger	16" x 12½" x 6½" 23 lbs.	995.00
2030-A	10 to 2,000,000 megohms	Fixed 500 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	215.00
2030-B	1 to 20,000,000 megohms	Fixed 500 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	260.00
2030-C	1 to 2,000,000 megohms	Fixed 50 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	235.00
2030-D	1 to 2,000,000 megohms	Fixed 100 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	235.00
2030-E	1 to 2,000,000 megohms	Fixed 200 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	235.00
* 667	0 to 10,000 megohm	Fixed 100-250-500 1000 v.d.c.	± 2.5% of scale length	battery operated transistor supply	8½" x 4½" x 5" 4½ lbs.	205.00

Rack type available — 1620 series 19" x 10½" x 9½"
1020 series 19" x 7" x 9½"

* Norma Instruments, Freed exclusive U.S. agent.

Prices quoted are subject to change without notice

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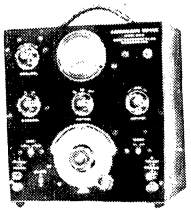
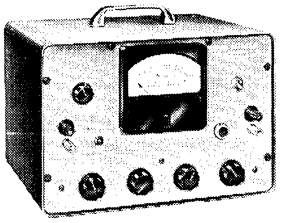
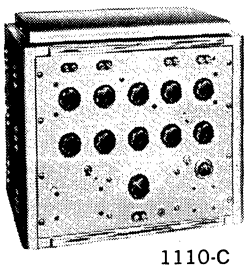


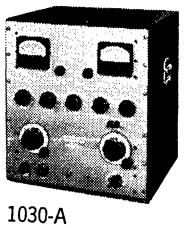
1010-A



1140-B



1110-C



1030-A

INCREMENTAL INDUCTANCE BRIDGES

Direct in-line readings of inductance and conductance of iron core component at audio frequencies with or without superimposed direct current. The bridge uses the Owens circuit with provisions for measuring the series or parallel inductance and conductance of the unknown inductor; five precision resistance and capacitance decades are provided to indicate these values. "Q" or storage factor can be measured as the product of the inductive reactance and the conductance.

Type	Inductance Range	Conductance Range	Frequency Range	D.C. Current	Accuracy	Dimensions and Weight	Price
1110-C	1111.1 h to 1 mh 5 decades 1.1 h to 1 μh 2 decades	0.015 μmho—100 mho "Q" = 600 max @ 100 cycles	20 cycles to 10KC	up to 2 amperes	±0.5% to 5 KC ±2% to 10 KC	21¾" x 17½" x 15¼" 50 lbs.	595.00
1115	111.1 h to 100 μh 5 decades 0.11 h to 0.1 μh 2 decades	0.15 μmho—1000 mho "Q" = 600 max @ 100 cycles	20 cycles to 10 KC	up to 15 amperes	±1% to 5 KC ±3% to 10 KC	21¾" x 28" x 15¼" 80 lbs.	895.00
1185	111.1 h to 100 μh 5 decades 0.11 h to 0.1 μh 2 decades	0.15 μmho—1000 mho "Q" = 600 max @ 100 cycles	20 cycles to 10 KC	up to 30 amperes	±1% to 5 KC ±3% to 10 KC	21¾" x 33¼" x 15¼" 100 lbs.	1295.00

IMPEDANCE & ADMITTANCE BRIDGE

An audio frequency bridge for measuring the complex impedances of inductors, transformers, filter networks and capacitors.

Type	Frequency Range	Impedance and Admittance	Accuracy	Maximum Applied Voltage	Dimensions and Weight	Price
1120	20 to 20,000 cycles	XL, XC and R up to 1000 ohms, BL, BC and G up to 1000 microhms	R: ±1% G: ±2% X: ±1% up to 5 KC B: ±1% up to 5 KC	125 Volts	10½" x 12" x 12" 25 lbs.	595.00

NULL DETECTOR

Sensitive null detectors for bridge measurements, with self contained selective filters to limit the amplifier characteristics at various bridge measuring frequencies.

Type	Sensitivity	Frequency Range	Filter	Power Requirements	Dimensions and Weight	Price
1140-B	10μ volts @ 1 KC for 15% meter deflection filter in	20 to 20,000 cycles	Fixed 60, 400, 1000 cycles Adjustable ±5% of center Other frequencies available	105-125 volts 50-60 cycles	Cabinet 12" x 8½" x 10"—18 lbs. Rack—19" x 6" x 10"	275.00

D.C. SUPPLY

A constant voltage transformer regulated current source designed for use with the Freed Incremental Inductance Bridges. Solid state bridge rectification, L-C filters and low internal impedance provides good current regulation with a minimum of circuit complexity.

Type	Current Ranges	Voltage Ranges	Regulation	Power Requirement	Dimensions and Weight	Price
1170-A	4 ranges, 0-5, 25, 100 and 1000 milliamperes	Maximum no load voltage 1000 Ma, 270V, 100 Ma, 270V, 25 Ma, 85 V, 5 Ma, 48 V	± 1% for line variation 105-125 V	105-125 volts 60 cycles	19" x 10½" x 13½" 66 lbs.	375.00

LOW FREQUENCY "Q" INDICATORS

Direct indication of "Q" at low frequencies, inductance, distributed capacity, impedance and dielectric loss can also be measured. Instrument may be used to study the magnetic properties of iron core material for stability as a function of applied voltage and losses as a function of the frequency.

Type	Test Frequency	Q Range	Accuracy	Test Voltage	Power Requirements	Dimensions and Weight	Price
1030-A	20 cycles to 200 K.C.	1-1000	±5% 20 cycles to 50 KC— to 200 KC at reduced accuracy	Voltage to series circuit, 0.01 to 10 volts voltage across coil variable to 100 volts	105-125 volts 50-60 cycles	21" x 23" x 15" 120 lbs.	1400.00

COMPARISON & LIMIT BRIDGE

A rapid and convenient method for laboratory or production testing of resistors, capacitors and inductors. Components may be sorted for tolerances up to ±20% or selected in matched pairs.

Type	Inductance Range	Capacitance Range	Resistance Range	Test Frequency	Accuracy	Dimensions and Weight	Price
1010-A	10 μh-100 h	10 Pf-100 mf.	1 Ω-20 MΩ	50 or 60 cycles 1 KC-10 KC	±0.1% on 5% range	10½" x 12" x 12" 17 lbs.	375.00

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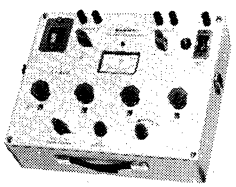
FREED TRANSFORMER CO., INC.



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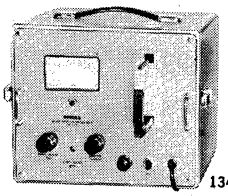

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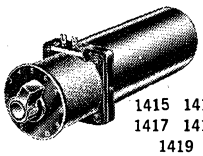
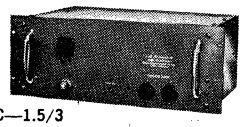


1415 1416
1417 1418
1419



RAC—1.5/3

DISTORTION METER

The type 1970 Distortion Meter is a wide range low input impedance instrument, designed with passive circuitry resulting in high stability, low residual disortion and hum levels.

Type	Frequency Range	Input Impedance	Input Voltage	Sensitivity	Dimensions and Weight	Price
1970	20 cycles to 1 megacycle	75-150 300-600	1 to 200 volts	Distortion level of 0.02% for 1 volt input	19" x 10½" x 12" 30 lbs.	610.00

A.C. LINE REGULATOR

A distortion free 60/400 Hz electromechanical a.c. line regulator. Features a tubeless fast response phase reversible magnetic amplifier preceded by a transistor comparison amplifier with zener reference.

Type	Nominal Input Voltage-Frequency	Output Voltage	KVA Rating and Regulation Range	Regulation Accuracy	Response Speed Volts/sec.	Dimensions and Weight	Price
R.A.C. 1.5/3	115 Volts 60 or 400 Hz	Adjustable 110-120 volts	3 KVA for ± 10% regulation 1.5 KVA for ± 20% regulation	± 0.25% for ± 10% regulation range ± 0.5% for ± 20%	10@ ± 10% 20@ ± 20%	19" x 7" x 13" 45 lbs.	475.00

In addition to the above R.A.C. 1.5/3 A.C. Line Regulator, other models are available from 500 VA to 5 KVA. Write for complete specifications and prices.

DECADE CAPACITORS

The Freed series of Decade Sapacitors cover a wide range of values and can be supplied as individual decades from 0.0001 PF. per step to 1 mf. per step or in various combinations of assembled decade boxes. All capacitors are non-inductively wound and heat treated for stability.

Type	Total Capacity	Dielectric	Dissipation Factor	Accuracy	Dimensions and Weight		Price
1415	10 μf in steps of 1 μf	Mylar	<0.005	±1%	3" x 3" x 7"	2 lbs.	50.00
1416	1 μf in steps of 0.1 μf	Polystyrene	<0.0002	±1%	3" x 3" x 7"	2 lbs.	65.00
1417	0.1 μf in steps of 0.01 μf	Polystyrene	<0.0002	±1%	3" x 3" x 7"	2 lbs.	50.00
1418	0.01 μf in steps of 0.001 μf	Polystyrene	<0.0002	±1%	3" x 3" x 7"	2 lbs.	50.00
1419	0.001 μf in steps of 0.0001 μf	Polystyrene	<0.0002	±1%	3" x 3" x 7"	2 lbs.	55.00
1250	1.110 μf in steps of 0.001 μf	Polystyrene	<0.0002	±1%	13¾" x 6" x 4½"	8 lbs.	225.00
1351	11.111 μf in steps of 0.0001 μf plus 100 pf variable air capacitor	Mylar Polystyrene Air	<0.005	±1%	19" x 10¾" x 8"	25 lbs.	325.00
1352	1.111 μf in steps of 0.0001 μf	Polystyrene	<0.0002	±1%	19" x 5¼" x 10"	13 lbs.	280.00
1353	11.111 μf in steps of 0.0001 μf	Mylar Polystyrene	<0.005	±1%	19" x 5¼" x 10"	14 lbs.	335.00

Maximum operating voltage, 500 VDC or peak. Capacitors can be supplied to better than ±1%, write for complete information.
In addtion to listed equipment, Freed manufactures a complete series of decade inductors, AC and DC regulated power supplies, comparison and limit bridges. Write for complete catalog.

DECADE INDUCTORS

Each unit is an assembly of four toroids wound on a stabilized Molybdenum permaloy dust core. The coils have a nominal inductance of 1-2-3-4 and are connected in series and switched to vary the inductance from 0-10.

Type	Frequency Range, Cycles	Maximum*	Inductance per Step	Total Inductance	Accuracy	Dimensions and Weight		Price
1220	500-20,000	230 @ 4 KC	0.001 h	0.01 h	±2%	3" x 3" x 9"	4½ lbs.	185.00
1230	500-20,000	280 @ 3 KC	0.01 h	0.1 h	±2%	3" x 3" x 9"	4½ lbs.	155.00
1240	500-20,000	260 @ 3 KC	0.1 h	1. h	±1%	3" x 3" x 9"	4½ lbs.	155.00
1270	500-20,000	190 @ 2 KC	1. h	10 h	±0.5%	3" x 3" x 9"	4½ lbs.	185.00
1341	100-2,000	100 @ 1 KC	10 h	100 h	±0.5%	3" x 3" x 9"	4½ lbs.	195.00
1280	500-20,000	280 @ 3 KC	0.001 h	1.11 h	See note	13¾" x 6⅛" x 5½"	16 lbs.	545.00
1290	500-20,000	280 @ 3 KC	0.001 h	11.11 h	See note	15" x 7" x 5½"	20 lbs.	685.00
1310	500-20,000	280 @ 3 KC	0.01 h	11.1 h	See note	13¾" x 6⅛" x 5½"	16 lbs.	545.00
1164†	30-2,000	60 @ 300	0.1 h	111 h	±1%	15" x 7" x 5½"	28 lbs.	425.00

† Type 1164 inductors are wound on special nickel alloy laminated cores.

Inductance per step:	1 mh	10 mh	100 mh	1 h	10h
Nominal Accuracy:	±2%	±2%	±1%	±0.5%	±0.5%

*Maximum Q depending on inductance value and a.c. voltage across coil.

SHORTED TURNS INDICATOR

*type 134 shorted turns indicator is a high sensitivity instrument which will detect the presence of one or more shorted turns in a coil using up to #44 wire. Eddy current losses are minimized by the use of a very low frequency built in test oscillator. The instrument will test most types of audio, power, IF chokes, relays and other coreless coils. Power requirement: 115 Volt, 60 Hz; Wt.: 13.5 lbs.; Dimension: 11" x 9" x 10"; Price: $475.00

TRANSFORMER RATIO METER

The *type 227 will measure transformer ratio of 1 to 1011 in three decade ranges with an accuracy of 0.1%. The instrument can also be operated as a ratio comparison tester with a deviation range of ±1%. Power requirements: 115 volts, 60 Hz; Size 17" x 13" x 6"; Wt.: 25 lbs.; Price: $1050.00

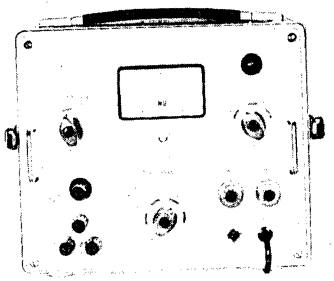
*Norma Instruments, Freed Exclusive U.S. Agent.

Prices quoted are subject to change without notice

FREED TRANSFORMER CO., INC.

Norma Instruments*

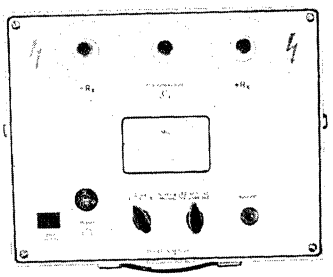
TERAOHMMETER, NO. 1808 20101 (266)



For measuring high values of insulation and other resistances in the range of 0.6 megohm to 500 million megohms (500 teraohms). Two test voltages are available: the 100 volt setting for tests requiring low test voltage (0.6 megohm through 100 teraohms) and the 500 volt setting for general testing (0.6 megohm to 500 teraohms). Line operated: 115 V., 50/60 Hz. Weight: 18 lbs.

Price: $525.00

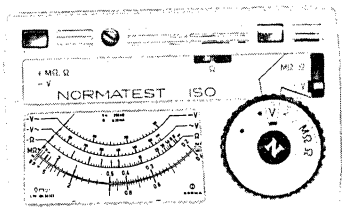
HIGH VOLTAGE INSULATION TESTER, NO. 1807 30402 (668)



The Norma high voltage insulation tester has three measuring voltages: 1000 (0 to 20,000 megohms), 2500 (0 to 50,000 megohms), and 5000 volts (0 to 100,000 megohms). The instrument comes complete with built-in storage cells and charger for 115 V. AC. Weight: 23 lbs.

Price: $995.00

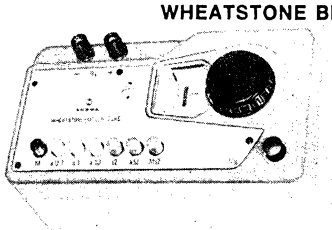
NORMATEST ISO, NO. 1811 50303



An ideal maintenance and service instrument providing insulation resistance, ground and continuity testing and a. c.-d. c. voltage measurements. Transistorized regulated battery supply. Resistance range: 0.2 to 50 megohms at 250 v.d.c., 0.4 to 100 megohms at 500 v.d.c.; Continuity: 0.5 to 150 ohms; Voltage: d. c. 0 to 300, a. c. 0 to 600.

Price with carrying case and test leads: $155.00

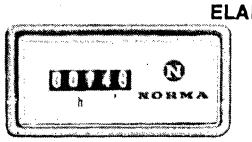
WHEATSTONE BRIDGE, NO. 1802 30301 (665)



Precision d. c. resistance measurements to 120 megohms without external batteries. Single dial resistance indication combined with a sensitive mirror scale galvanometer provides rapid measurements. Resistance range: 0.08 ohms to 120 megohms; ± 0.5% accuracy, 0.8 to 12 megohms.

Price: $230.00
with leather case, $250.00

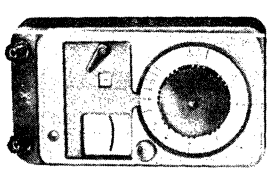
ELAPSED TIME METER, NO. 1900 00009



The NORMA Elapsed Time Meter is a rugged synchronous drive elapsed time indicator which indicates hours to 9999.9. For 115 volts, 60 Hz. operation.

Price: $17.40

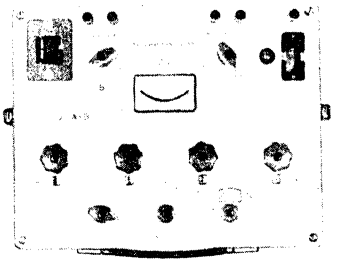
WHEATSTONE BRIDGE, NO. 1802 30201 (185 R1)



A portable general purpose bridge for accurate d. c. resistance measurements. Can be used for measuring electrolytes and other components requiring a. c. with available accessories. Resistance range: 0.08 to 60,000 ohms; Accuracy ± 0.5%, ± 2% extreme ends of dial.

Price $125.00

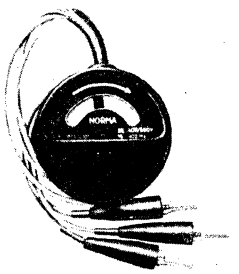
TRANSFORMER RATIO METER, NO. 4104 12909 (277)



Transformer ratio of 1 to 1011 in three decade ranges with an accuracy of 0.1%. The instrument can also be operated as a ratio comparison tester with a deviation range of ± 1%. Line operated: 115 volts, 60 Hz.

Price: $1050.00

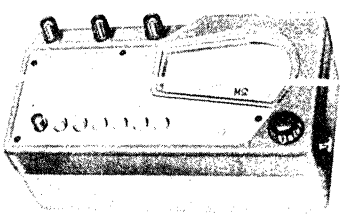
PHASE SEQUENCE INDICATOR, NO. 1803 10001 (206)



For determining the proper connections of motors, meters and relays operating in the 3 phase system. Operates over a voltage range of 80 to 400/500 volts, 16 to 400 Hz. Comes complete with leather carrying case.

Price: $ 36.50

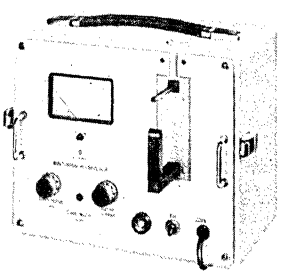
INSULATION TESTER, NO. 1806 30301 (667)



A portable transistorized insulation tester for field and shop use. Provides four separate measuring voltages of 100, 250, 500 and 1000 v.d.c. Insulation resistance range from 0 to 10,000 megohms at 500 volts.

Price, including leather case, batteries and test leads: $210.00

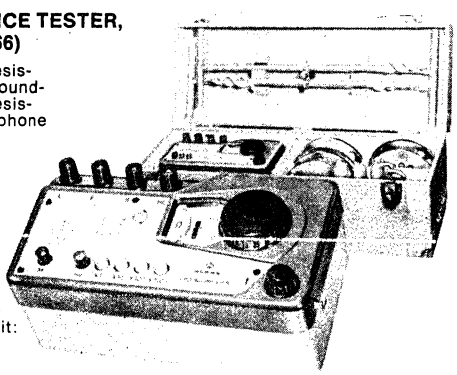
SHORTED TURN TESTER, NO. 1801 20101 (134)



A high sensitivity instrument for detecting shorted turns in audio, power, IF, Chokes, relays and other coreless coils. Line operated: 115 volts, 50/60 Hz.

Price: $475.00

EARTH RESISTANCE TESTER, NO. 1805 30303 (666)



For measuring soil resistance for effective ground-For measuring soil resising of power and telephone lines, geophysical exploration, corrosion control and all lightning protective equipment. Fully transistorized operation. Resistance 0–5000 ohms in four ranges.

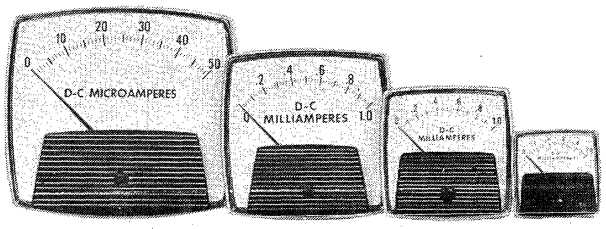
Price: $265.00 with leather carrying case $285.00; Accessory Kit: $135.00

Write or call for complete specifications, Tel. Evergreen 6-1300

*Freed Exclusive U.S. Agent

PANEL, SWITCHBOARD, AND RECORDING INSTRUMENTS

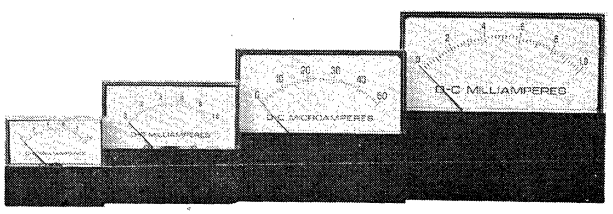
BIG LOOK® PANEL METERS

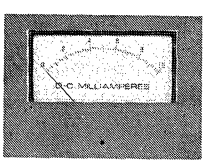


features: 1½-, 2½-, 3½-, and 4½-inch sizes . . . a-c, d-c, and rectifier types . . . iron-vane mechanism in a-c models . . . pivot-and-jewel or taut-band mechanism for d-c models . . . expanded scale available for all models . . . All meters have snap-on snap-off masks. Available for front or back-of-panel mounting with no additional hardware . . . optional mounting stud arrangement for physical interchangeability.

Write for Bulletin GEP-307

HORIZON LINE® PANEL METERS





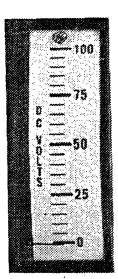
Mounted behind panel

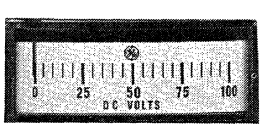
features: 1½-, 2½-, 3½-, and 4½-inch sizes . . . a-c, d-c, and rectifier types . . . iron-vane mechanism in a-c models . . . pivot and jewel, or taut-band mechanism for d-c models . . . expanded scale available for all models . . . All meters have snap-on snap-off masks. Available for front or back-of-panel mounting with no additional hardware.

specifications: accuracy ±2% (3% on rectifier types) . . . meets ANSI Spec C39.1 . . . displays a-c and d-c volts, amperes, percent motor load, and other parameters equivalent to d-c microamperes, milliamperes, etc.

Write for Bulletin GEP-307

TYPE 185 EDGEWISE PANEL METERS



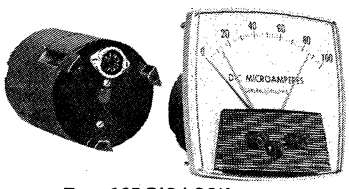


features: 2¼ inches wide by 1 inch high by 3 inches deep . . . horizontal or vertical scale . . . d-c meters have moving-coil D'Arsonval mechanism . . . rectifier-type D'Arsonval mechanism in a-c meters . . . shielded, dust-tight, one-piece molded cycolac window . . flush case sides permit mounting of two, three or more units.

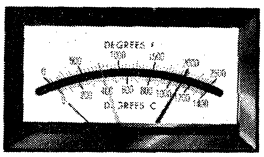
specifications: accuracy d-c meters 2% of full scale (3% on a-c meters) . . . meets ANSI Spec C39.1 . . . displays a-c and d-c volts, amperes, microamperes and milliamperes.

Write for Bulletin GEP-302

TYPE 195 AND 196 METER RELAYS AND CONTROLLING PYROMETERS



Type 195 BIG LOOK



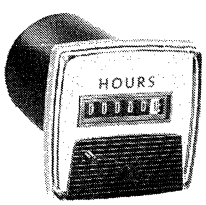
Type 196
recessed with bezel

features: 2½-, 3½-, and 4½-inch sizes in BIG LOOK Type 195 style, and 3½- and 4½-inch sizes in HORIZON LINE Type 196 style for front or back-of-panel mounting . . . new 4½-inch Type 196 model for alarm indication and manual control has integral lights and push buttons. Requires no extra wiring, panel punching, or hardware . . . single and double setpoints . . . contactless control . . . d-c type with pivot-and-jewel mechanism . . . "piggyback" mounting of relay and meter on 3½- and 4½-inch sizes . . . a-c or d-c powered . . . high-sensitivity pyrometers down to 5 μa input and 150F.

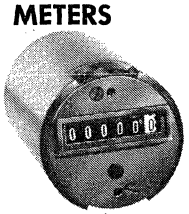
specifications: accuracy ±2% . . . ON/OFF contact standard . . . DPDT relay rated at either 5 amp, 120V a-c with 120-volt input or 5 amp, 28V d-c with 12, 24, 33, or 48-volt d-c power input . . . displays a-c or d-c parameters.

Write for Bulletin GEP-307

TYPE 240 ELAPSED-TIME METERS



BIG LOOK
commercial case,
with
reset knob

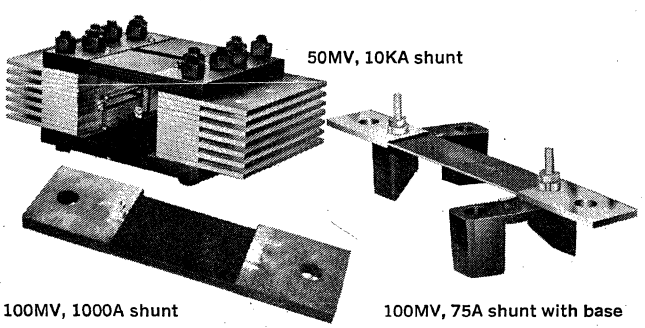


Back-of-panel model
(unmounted)

features: UL listed . . . distinctive appearance with excellent readability. Designed to match BIG LOOK ammeters and voltmeters . . . **new** back-of-panel model for neat, clean look. Saves valuable panel space . . . BIG LOOK style in 2½- and 3½-inch sizes. Available in other sizes and mounting styles.

Write for Bulletin GEP-307

TYPE 140 SHUNTS



50MV, 10KA shunt

100MV, 1000A shunt

100MV, 75A shunt with base

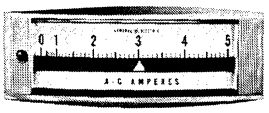
features: lighter and smaller than earlier designs, easy to handle and install . . . full-length manganin strips provide greater structural strength . . . silver-plated terminals on larger ratings provide low-resistance contact . . . "chimney" design for maximum self-cooling.

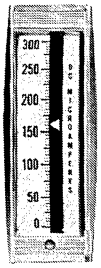
specifications: accuracy of ¼% (calibrated) of rated millivolts . . . ratings minimum 10A, 50MV, 100MV maximum 10KA, 50MV, 100 MV (for 5A, 50MV use 10A, 100MV) . . . Standard 6-ft. leads for back-of-panel wiring have machined terminals and FLAMENOL® insulation, suitable for operating temperatures up to 75C and, when base included, for line-to-ground voltages up to 600 volts maximum.

Write for Bulletin GEP-307

PANEL, SWITCHBOARD, AND RECORDING INSTRUMENTS

SWITCHBOARD TYPE 180 EDGEWISE INSTRUMENTS (semiflush)





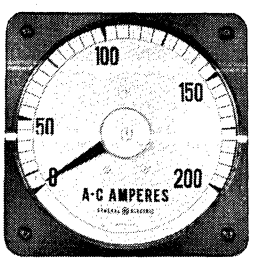
features: space-saving, slimline design . . . cluster mounting . . . flush case-sides for easy stacking . . . vertical or horizontal models . . . non-parallax scale plate . . . magnetic shielding . . . durable, one-piece molded lucite case . . . gasketed to resist moisture, dust and fungus . . . large 4½-in. scales. Illumination available.

specifications: accuracy a-c 1.5% horizontal . . . 2.0% vertical, d-c 1.5% vertical or horizontal . . . scale length approx. 4½ in. . . . size (flange) 1¾ in. wide x 6 in. long.

Write for Bulletin GEP-302

SWITCHBOARD A-C TYPE AB-16; D-C TYPE DB-16 (semiflush)

Type AB-16



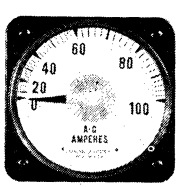
features: non-parallax scale plates . . . self-contained transducers . . . magnetic damping . . . rugged, taut-band construction . . . self-contained resistors to simplify wiring of transformer-rated instruments . . . magnetic shielding . . . rugged, dust-tight, moisture-resistant cases.

specifications: accuracy ±1% of full scale . . . scale length 14.2 in. (AB-16, DB-16).

Write for Bulletin GEP-302

SWITCHBOARD A-C TYPE AB-30, D-C TYPE DB-30 (semiflush)

Type AB-30



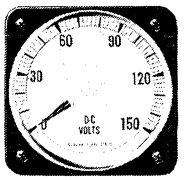
features: non-parallax scale plate . . . self-contained transducers . . . easy-to-read, large, black numerals and pointer plus convex, shadow-proof cover . . . magnetic shielding . . . rugged drawn-steel case and molded lucite cover resist shock, dust, and moisture. Predetermined scales for 5A and 150V transformer-rated instruments.

specifications: accuracy ±1% of full scale . . . scale length 5.1 in. . . . size 4¼ x 4¼ in.

Write for Bulletin GEP-307

SWITCHBOARD A-C TYPE AB-40 D-C TYPE DB-40 (semiflush)

Type DB-40

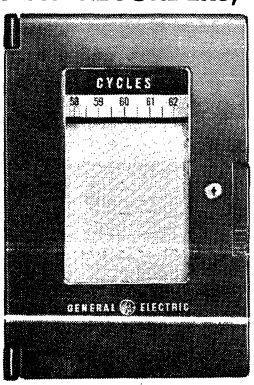


features: High sensitivity . . . ratings as low as 50 microamperes . . . taut-band suspension on a-c and d-c ammeters and voltmeters eliminates mechanism friction and jewel roll . . . permits higher sensitivities . . . insures greater resistance to shock and vibration . . . weather-tight construction . . . non-parallax scale plate . . . self-contained transducers.

specifications: accuracy ±1% of full scale . . . scale length 7.1 in. . . . size 4¼ x 4¼ in.

Write for Bulletin GEP-302

ONE PERCENT RECORDERS, TYPE CH

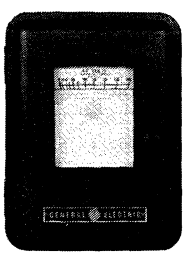


features: ink-type marking mechanism with throw-away inkwell or . . . Telechron motor-driven tapper-type inkless mechanism . . . 110-ft. record roll . . . multispeed synchronous motor or optional spring-clock drives . . . high readability . . . fast response: inking ¾ second, inkless 2 seconds . . . heavy-duty cases . . . rugged, spring-mounted jewel bearings . . . this recorder available in portable case or for panel mounting.

specifications: accuracy 1% . . . record roll size 6 in. overall width, 4½ in. calibrated width, 110 ft. long . . . AC voltmeter, wattmeter and varmeter; ammeter, power factor, frequency, and speed . . . DC instruments: permanent magnet, moving-coil mechanism.

Write for Bulletin GEA-8619

TWO PERCENT RECORDERS, TYPE CF



features: tapper-type inkless recording mechanism . . . sturdy case . . . dependable Telechron motor drives . . . this recorder available in portable case or panel mounting for practically all AC and DC values.

specifications: accuracy ±2% . . . record roll 4 in. wide, 3½ in. calibrated width, 65 ft. long . . . AC motor-driven chart drive . . . 3 in. per hour standard chart speed . . . other chart speeds available.

Write for Bulletin GEA-8619

For complete information contact your nearby GE Sales Office, or write to General Electric Co., Section 998-60, Schenectady, N. Y. 12345.

GENERAL ELECTRIC

DPMs

In 2½, 3½ and 4½-digit models. We've got them all. Just ask us.

FULL 1-YEAR WARRANTY ON PARTS & LABOR!

Model 45 (shown actual size)
- 4½ digits
- .01% accuracy
- 20ppm/°C stability
- Sperry planar display
- Floating differential input
- Bipolar with autopolarity

(Also available in 2½ and 3½-digit models)

Model 36 (shown actual size)
- 3½ digits
- .05% accuracy
- 50ppm/°C stability
- Sperry planar display
- Floating differential input
- <3.5 watts power drain

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INDUSTRIES

DIVISION OF GENERAL MICROWAVE CORP.
155 MARINE ST., FARMINGDALE, N. Y. • 516-694-3607

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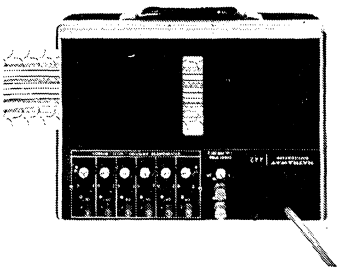
(918) 663-0110 • TWX 910-845-2129

OSCILLOGRAPHS & PRINTERS

442 Oscillograph



The world's most versatile 2000 Hz 6 Channel Oscillograph is now the least expensive! Only a direct-write oscillograph can offer 6 channels of 2000 Hz performance in such a small package (9″ x 5″ x 13″). It uses no ribbons, chemicals or hot stylii. This second-generation, high-performance unit retains the proven ruggedness of our Model 444, yet sells for half the price.

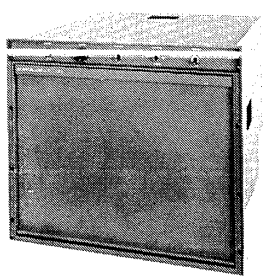
The 442 is portable; uses 3⅝″ x 150′ paper; operates from one of the following power sources:

12 VDC	220 VAC
28 VDC	115 VAC, 400 Hz
115 VAC, 50-60 Hz	

The 442 is completely self contained.

Accessories and options include signal conditioning, full width timing lines, grid lines, and any of the standard Model 210 Galvanometers may be used.

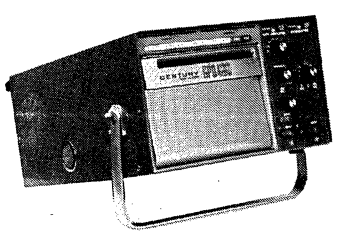
440 Oscillograph



The new 440 Oscillograph from Hathaway Industries, Inc. utilizes 12″, 10″ or 8″ wide paper by simple field adjustment. It provides up to 64 channel capacity with all the standard options of grid lines, timing, trace identification, and remote operation.

This instrument is highly versatile and sells for ¾ the price of competitive units and may be provided with an internal paper take-up option. It will accommodate 475′ extra thin base paper with chart speeds of .2 to 160 inches per second optional.

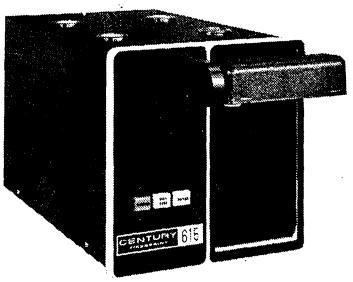
460 GPO Oscillograph



Now you can record high-frequency phenomena beyond the capability of pen and ink or hot stylus recorders. The Hathaway GPO is a light beam recording oscillograph at an unprecedented low price any laboratory can afford. Even more important, the GPO accepts calibrated signal conditioners that permit direct reading of values from the chart with a minimum of set up and interpretation.

The Hathaway Model 460 GPO is a complete high-performance oscillograph that incorporates many features of the most expensive models — yet is easy to carry, easy to use and easy to pay for. It opens a new era in data recording.

Videoprint 615 Ultra High Speed Printer

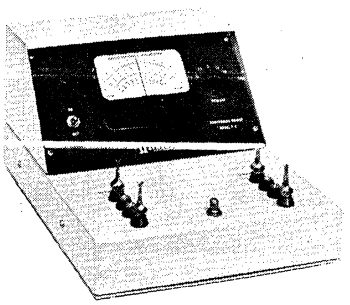


The Videoprint 615 is the third generation, non-impact Ultra High Speed Printer offered by Hathaway and incorporates the latest advancements in the art of electronic printers.

Completely silent, the Videoprint 615 prints 6000 lines per minute by means of a cathode ray tube and fiber optics. It is completely solid state with integrated circuits. The only moving parts are for the paper drive.

The Videoprint 615 has 32 columns at 6000 lines per minute; computer compatible with simple interface; synchronous or asynchronous operation. It is available in two basic character sets, 15 character numeric or 64 character alphanumeric and has self-test mode for system check out.

E-2 Comparison Bridge

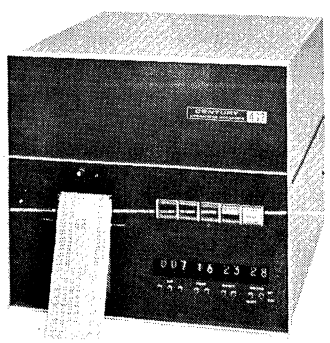


A versatile and fast component tester from Hathaway Industries for incoming inspection, laboratory, or assembly line, offers a high level of accuracy at low cost. It is used for measuring, matching and rejecting such components as resistors, capacitors, and inductors.

Low in cost because of highly simplified circuitry, the E-2 offers increased accuracy, reduced component selection time, low operator fatigue, and elimination of errors, with even an unskilled operator averaging about 0.1 percent accuracy.

The E-2 is easily calibrated and operated and has a sensitivity of one part in 10,000. Test limits are: Resistance, 1 ohm to 5 megohms; capacitance, 500 mmf to 2,000 mfd; and inductance, 3 millihenrys to 10,000 henrys. These ranges cover most electronic circuit components.

433/432 Operations Recorder



The Hathaway 433/432 Operations Recorder is a complete recorder with or without sequential memory. It can be expanded from 4 to 64 points by the addition of plug-in cards and to a full-blown sequential events recorder with millisecond resolution by the addition of plug-in printed circuit cards. It is a self contained recorder for complete log of operations of change of state data.

Galvanometers

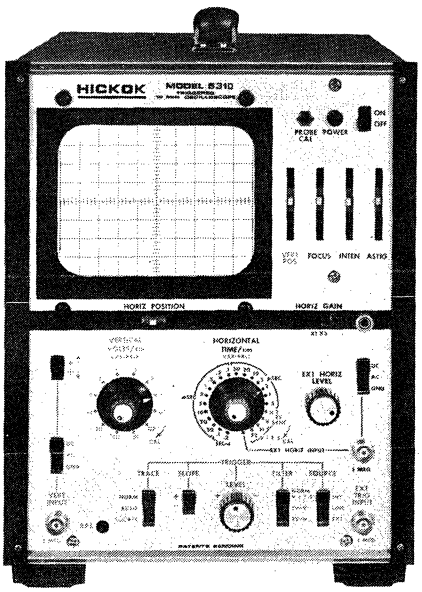
A wide variety of galvanometers designed to meet your specific requirements are available. Contact factory for details.

HICKOK

THE HICKOK ELECTRICAL INSTRUMENT CO.
10514 Dupont Avenue • Cleveland, Ohio 44108
(216) 541-8060 • TWX: 810-421-8286

10-MHz OSCILLOSCOPE

- ***10-MHz Bandwidth, Single Trace for $425***
- ***5 millivolts/cm Sensitivity***



10-MHz Model 5310

10-MHz bandwidth, 3% accuracy is offered over the entire Model 5310 range of 5 millivolts to 50 volts.

Stable triggering to 15 MHz is provided for internal and external sources. Internal source sensitivity is ½ division deflection at 10 MHz to 1 division at 15 MHz.

Bright, sharp trace on large 8 cm x 10 cm screen allows clear and comprehensive viewing of waveforms. With high accelerating potential and P31 phosphor, the display is easily observed, even in high ambient light conditions.

For broadcast work, the 5310 has an easy-to-use automatic VITS capability.

X-Y operation using 1-MHz bandwidth horizontal input with variable attenuator.

BRIEF SPECIFICATIONS, MODEL 5310

VERTICAL RANGES: 10 mV/cm to 50 V/cm in 12 calibrated ranges with continuously variable control between ranges. Sensitivity to 5 mV/cm.

BANDWIDTH: DC to 10 MHz, AC or DC coupled.

TRIGGERING: Modes: Auto, normal. Source: Line, internal, external. Coupling: DC, AC, TV syn separator and VITS.

SWEEP RANGES: 0.5 microsecond/cm to 0.2 s/cm in 18 calibrated steps.

SIZE, WEIGHT: 10" H x 8½" W x 17" D. 15 lb.

PRICE: 5310 10-MHz Single Channel Oscilloscope **$425**

25-MHz PORTABLE OSCILLOSCOPES

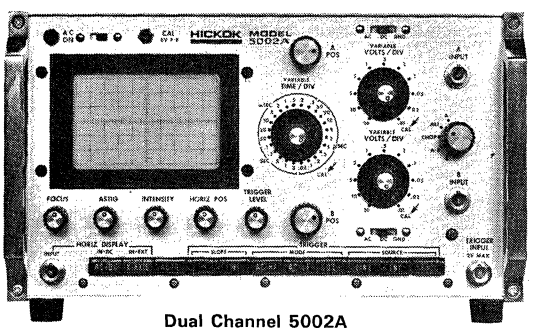
- ***14-nanosecond Rise Time***
- ***Stable Triggering to Beyond 50 MHz***

25-MHz bandwidth, 3% accuracy are offered on both the dual channel 5002A and the single channel 5000A on all ranges. Accuracy is for both vertical and horizontal.

Stable triggering beyond 50 MHz. Auto trigger mode provides base line in absense of input.

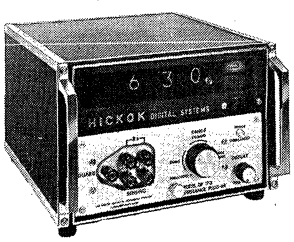
Pulse analysis is made possible by the internal delay on the Oscilloscopes. A low-loss distributed delay line is included in both models for observing the leading edge of the input signal on a triggered sweep.

Prices:
5000A Single Channel 25-MHz Oscilloscope . . . $595
5002A Dual Channel 25-MHz Oscilloscope $895



Dual Channel 5002A

DIGITAL RESISTANCE METER



DP170 Resistance Bridge Plug-in in 3202 Main Frame

- ***1 milliohm to 1 gigaohm Range***
- ***3½-digit Resistance***

0.1% accuracy results from a patented automatic Wheatstone Bridge circuit.

For low resistance measurements, the 4-terminal input eliminates inaccuracies caused by lead and contact resistances. Maximum power dissipation for any range varies from 6 nanowatts to 2.5 milliwatts.

For high resistance measurements, the guarded input minimizes leakage paths which cause measurement errors.

Price: DP170/3202 plug-in and main frame . . . $690

DIGITAL CAPACITANCE METER

DP200 Capacitance Meter Plug-in in 3202 Main Frame

- ***1 picofarad to 10 millifarads Dynamic Range***
- ***3½-digit resolution***

True capacitance readings are obtained through the charge transfer method, similar to that of NBS.

Simple operating procedures make measuring with the DP200 extremely easy. No manual balancing is required. For low capacitance measurements, lead capacitance can be balanced out with a front-panel control.

No external polarizing voltage is needed for electrolytics. The test signal used is a low DC potential.

Price: DP200/3202 plug-in and main frame . . . $690

HICKOK

THE HICKOK ELECTRICAL INSTRUMENT CO.
10514 Dupont Avenue • Cleveland, Ohio 44108
(216) 541-8060 • TWX: 810-421-8286

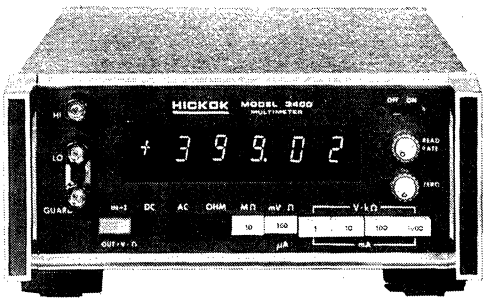
4¾ DIGIT MULTIMETERS

- *0.01% Accuracy*
- *3-year Warranty*
- *Measure DC and AC Voltage and Current, and Resistance and Frequency*

You get extra performance with the Hickok 3400 Series DMMs: 300% overranging on all functions, allowing you to read to 39999. And a 3-year warranty guarantees the reliability of the units. New LSI circuitry, a result of Hickok's pioneer engineering, reduces component count and power dissipation to increase reliability.

Model 3400 offers most digital capability for the price. With one compact instrument, you can measure 26 ranges and 5 functions with 4½-digit resolution. 100% overranging is standard; 300% is optional.

3410 Microvolt Multimeter offers 1-microvolt and 1-milliohm resolutions. This is in addition to the standard ranges found on the 3400. The Model 3410 also has a high-level output proportional to the display for strip chart recordings.



4¾-Digit Model 3400 Multimeter

3420 Multimeter/Counter is a compact, versatile unit, combining full multimeter capability with a 20-MHz frequency counter. The 3420 has 5 full-digit display, 0.01-Hz resolution, and crystal accuracy.

BRIEF SPECIFICATIONS, 3400 SERIES

DC VOLTAGE RANGES: ±199.99 millivolts to ±1500.0 volts. Accuracy: ±0.01% of reading ±1 digit, ASA reference conditions.

AC VOLTAGE RANGES: 199.99 millivolts to 1000.0 volts. Bandwidth: 30 Hz to 50 kHz.

DC/AC CURRENT RANGES (Models 3400 and 3410 only): 199.99 microamperes to 1.9999 amperes.

RESISTANCE RANGES: 199.99 ohms to 19.999 megohms. Accuracy: ±0.05% of reading ±2 digits.

SIZE, WEIGHT: 3½" H x 8⅜" W x 13" D. 10 pounds.

PRICES:

3400 Digital Multimeter with 100% overranging	**$595**
Option 001–internal rechargeable battery	$195
Option 003–300% overranging	$100

3410 MICROVOLT MULTIMETER has same specifications as 3400, with addition of 19.999-millivolt and 19.999-ohm ranges.
Price: Model 3410 Microvolt Multimeter **$695**

3420 MULTIMETER/COUNTER replaces current functions with frequency ranges, from 2 Hz to 19.999 MHz.
Price: Model 3420 Multimeter/Counter **$750**

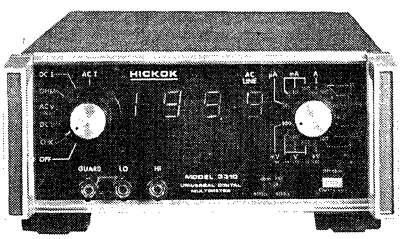
TRUE RMS/dBm MULTIMETER

- *Measures True RMS AC and DC Voltage and Current, dBm Directly, and Resistance*
- *3½-digit Resolution*

True RMS response is achieved by using a specially designed all-solid-state RMS converter for both voltage and current. Range from 100 microvolts to 1 kilovolt.

dBm is directly displayed: no conversion or mental additions are needed. Range from —30 dB to +50 dB.

0.1% accuracy for 1 year is achieved by using state-of-the-art components and design techniques.



Model 3310 Universal Multimeter

6 functions, 32 ranges on bright 3½-digit display provide dynamic measurement versatility for $845.

3½-DIGIT PORTABLE AND BENCH MULTIMETERS

- *Measure DC and AC Voltage and Current, and Resistance*
- *0.1% Accuracy Guaranteed for 12 Months*

Truly portable for field service, the Model 3300A operates up to 20 consecutive hours from its self-contained battery before it needs recharging.

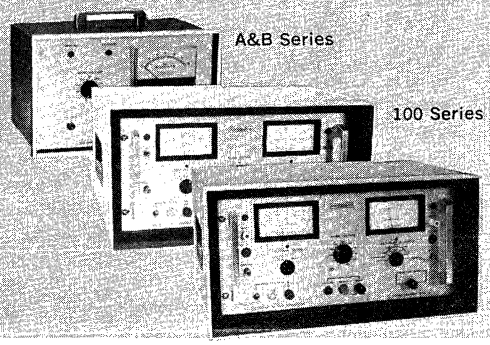
Ruggedly designed, the Model 3300A has a tough ABS case and shock-mounted components to allow accurate measurements over a wide range of environments.

Compact, bench-top Model 3301 is the laboratory counterpart of the 3300A. It has the same measurement capability, and it operates from AC power lines. The 3301 has the same configuration as the Model 3310.

0.1% accuracy for 12 months without calibration is achieved by using solid-state LSI circuitry and ultra-stable internal references.

27 ranges measure from 100 microvolts to 1.5 kilovolts, DC and AC; 100 nanoamperes to 2 amperes, DC and AC; and 100 milliohms to 200 megohms.

Price of the 3300A, including batteries, is $435; of the 3301, $385. BCD output option on the 3301 is $100.



HIPOTRONICS

AC/DC hipot & insulation testers

NON-DESTRUCTIVE UNITS FOR PRODUCTION OR LABORATORY USE . . . IN RANGES UP TO 10 KV AC AND TO 25 KV DC

AC/DC HIPOT TESTERS & MEGOHMMETERS (300 Series)

■ Three test functions . . . with one flexible unit: (1) AC dielectric/insulation tests, (2) DC dielectric/insulation tests, and (3) insulation/resistance tests with direct megohmmeter readings.

■ Two versions available . . . to fit all requirements:
A Series — current readings as low as 1 ua on four range meter, resistance to 1,000 megohms on two range megohmmeter.
B Series — current readings as low as 0.01 ua on six range meter, resistance to 100,000 megohms on four range megohmmeter.

■ Bench-top or rack mount . . . fits any standard 19-inch equipment rack.

FEATURES:

■ Overload circuit has continuously adjustable sensitivity from 50 ua to 5 ma, allowing non-destructive testing of insulation and dielectrics.

■ Dual range output connected KV meter, with calibrated set point for megohmmeter readings clearly marked.

■ Reset button and failure indicator.

■ Recalibration facilities.

■ Guard circuit for grounded or ungrounded operation.

■ Front panel re-entrant test lead connections.

■ AC/DC function indicator lights.

■ Zero start interlock — compels operator to start tests at zero volts.

SPECIFICATIONS:

Input . . . . . 115 VAC, 60 Hz, 1 amp max.
Size & Weight . . . . . 21″W x 19″D x 10″H; approx. 50 lbs.
Meters . . . . . 2% full scale accuracy, 4½″ meter.
Current meter ranges:
A Series . . . . . Ranges of 0-50/500/5000 ua, DC, 0 to 5 ma AC, 1 to 1000 megohms in 2 ranges
B Series . . . . . Ranges of 0-0.5/5/50/500/5000 ua, 0 to 5 ma AC, 1 to 100,000 megohms in 4 ranges

Model	Output Voltage (KV) AC	DC	Current Meter Range AC	DC	Megohm Ranges
H 301A	1.0	1.5	0-5 ma	0-50/500/5000 ua	2
H 301B	1.0	1.5	0-5 ma	0-0.5/5/50/500/5000 ua	4
H 303A	2.5	3.0	0-5 ma	0-50/500/5000 ua	2
H 303B	2.5	3.0	0-5 ma	0-0.5/5/50/500/5000 ua	4
H 306A	5.0	6.0	0-5 ma	0-50/500/5000 ua	2
H 306B	5.0	6.0	0-5 ma	0-0.5/5/50/500/5000 ua	4

OPTIONAL EXTRAS (ALL UNITS):
■ HV test probe $10
■ Gravity operated output shorting solenoid with discharge resistor . . $35
■ Audible failure signal $15

AC/DC HIPOT TESTERS (100 Series)

■ Similar to our 300 series . . . without the direct reading megohmmeter. Megohms can be calculated from the accurate readings on the KV and DC current meters.

■ Two versions available . . . a standard unit with simplified control features, and a more deluxe unit with all the necessary controls for laboratory precision testing programs.

■ Bench top or rack mount . . . this attractive bench-top unit fits any standard 10-inch equipment rack.

FEATURES:

■ Overload circuit has continuously adjustable sensitivity from 50 ua to 5 ma permitting non-destructive testing of insulation and dielectrics.

■ KV meter recalibration facility.

■ Output control continuously adjustable from zero to maximum.

■ Front panel re-entrant test lead connections.

■ AC/DC function indicator lights.

ADDITIONAL FEATURES IN DELUXE HD MODELS:

■ Zero start interlock with HV on and off switches — compels operator to start tests at zero volts.

■ Triple range KV meter and DC current meter.

SPECIFICATIONS:

Input . . . . . 115 VAC, 60 Hz, 5 amps max.
Size & Weight . . . . . 21″W x 19″D x 10″H; approx. 60 lbs.
Meter . . . . . 2% full scale accuracy. 4½″ meter.

Model	Output Voltage (KV) AC	DC	Output Current Meter DC	AC	KV Meter Ranges
H 103	2.5	3.0	0-5 ma	0-5 ma	0-3 KV
HD 103	2.5	3.0	0-50/500/5000 ua	0-5 ma	0-0.6/1.2/3 KV
H 106	5.0	6.0	0-5 ma	0-5 ma	0-6 KV
HD 106	5.0	6.0	0-50/500/5000 ua	0-5 ma	0-1.2/3/6 KV
H 115	12.0	15.0	0-5 ma	0-5 ma	0-15 KV
HD 115	12.0	15.0	0-50/500/5000 ua	0-5 ma	0-3.75/7.5/15 KV
H 125	10.0	25.0	0-5 ma	0-5 ma	0-25 KV
HD 125	10.0	25.0	0-50/500/5000 ua	0-5 ma	0-5/10/25 KV

OPTIONAL EXTRAS (ALL UNITS):
■ HV test probe $10
■ Gravity operated output shorting solenoid with discharge resistor . . . $35
■ Audible failure signal $15

AC & DC PRODUCTION HIPOT TESTERS (A and B Series)

■ Simple to operate . . . reliable for go-no/go testing. Designed for use by unskilled or semi-skilled personnel in mass testing of electrical components, transformers, etc.

■ Visual indicators . . . illuminate on front panel when component leakage or internal arcing is detected . . . audible alarm optionally available.

■ Compact, lightweight, and rugged . . . this unit goes where the problem is.

Hipot testers are available in all models which comply with revised UL specification 499, paragraph 280B. Consult factory for details.

FEATURES:

■ Arcing detector employs corona pick-up network for optimum sensitivity.

■ Leakage detector sensitivity continuously adjustable from 500 ua to 5 ma permitting non-destructive testing of insulation and dielectrics.

■ Output connected KV meter for maximum accuracy.

■ Shielded output lead through re-entrant jack.

ADDITIONAL FEATURES IN HD MODELS:

■ Audible failure alarm circuit incorporated into design of all deluxe models.

Hipotronics manufactures AC/DC dielectric and insulation testers from 10 volts to 2 million volts with KVA ratings to 10,000 KVA.
Contact factory for customized designs.

SPECIFICATIONS:

Input . . . . . 115 VAC, 60 Hz, 3 amps max.
Size & Weight . . . . . 7″H x 12″W x 8″D; approx. 20 lbs.
Meter . . . . . 3% full scale accuracy, 4″ meter.

AC Models	Output Voltage	Short Circuit Current
H A1	1 KV AC	18 ma
H A2	2 KV AC	18 ma
H A3	3 KV AC	18 ma
HD A3	3 KV AC	18 ma
H A5	5 KV AC	18 ma
HD A5	5 KV AC	18 ma
H A10	10 KV AC	18 ma
HD A10	10 KV AC	18 ma
DC Models	**Output Voltage**	**Short Circuit Current**
H B1	1 KV DC	5 ma
H B2	2 KV DC	5 ma
H B3	3 KV DC	5 ma
H B4	4 KV DC	5 ma
HD B4	4 KV DC	5 ma
H B6	6 KV DC	5 ma
HD B6	6 KV DC	5 ma
H B12	12 KV DC	5 ma
HD B12	12 KV DC	5 ma

Prices and specifications subject to change without notice.

HIPOTRONICS®
HIPOTRONICS, INC.
Brewster, N. Y. 10509 / (914) 279-8091
TELEX: 710-574-2420

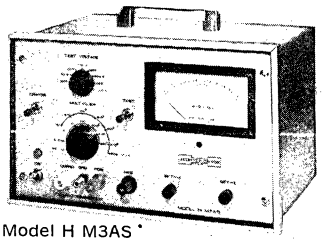
For more data call our Marketing Department and ask for descriptive literature. See other Hipotronics' listings under Power Supplies, Transformers, and Capacitors.

megohmmeters/insulation testers

HIPOTRONICS

PORTABLE HIGH RESISTANCE SERIES COVERING RANGES FROM 100,000 OHMS TO 20,000,000 MEGOHMS

. . . FOR TESTING INSULATION RESISTANCE TO ASTM SPECIFICATION D-257 AND TO APPLICABLE UL, CSA, AND MIL STANDARDS



Model H M3AS

FEATURES

- No meter bounce; therefore, meter averaging not required, even with large capacitive loads or any input voltage change in 20,000,000-megohm range . . . Output voltage is double regulated with both a ferro-resonant line and solid state electronic regulators.
- Dead shorts on megohmmeter output will not damage components . . . short circuit protection will handle continuous shorting without injury to any component.
- Grounded or ungrounded testing . . . with three-terminal output (positive, negative, and guard).
- Verify the calibration at any time . . . self-contained calibration resistors permit operator to periodically verify the calibration.
- Discharge internal and load capacitance . . . switch position and resistor provided for complete capacitive discharge.
- No zero shift . . . on any range. VTVM circuit drives the meter on this high quality megohmmeter.
- Better than 2% accuracy on all readings below 1 million megohms, with 3% on 20 million megohms.

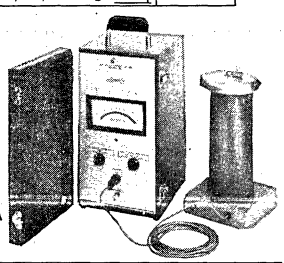
SPECIFICATIONS:

Input: (all models) ..... 115 volts, 60 Hz.
Weight: (all models) ..... 20 lbs. (approx.)
Size: (all models) ..... 7″H x 12″W x 8″D

Model No.	Output Voltage	Megohm Range	Megohm Ranges
H M1	500	1 to 1,000 megohms	2
H M3A	50 100 500 1000	0.1 to 1,000,000 megohms 0.2 to 2,000,000 megohms 1 to 10,000,000 megohms 2 to 20,000,000 megohms	6 6 6 6
H M3AS		Same as H M3A, but with mandatory 2 hand operation	
H M6B	50 250 500	0.1 to 1,000,000 megohms 0.5 to 5,000,000 megohms 1 to 10,000,000 megohms	6 6 6
H M6S		Same as H M6B, but with mandatory 2 hand operation	
M6C	250	0.1 to 1,000,000 megohms	6

AC/DC kilovoltmeters

. . . SELF-STORING ANALOG SERIES WITH ACCURACY GUARANTEED TO 0.5% DC AND 1.0% AC (TRACEABLE TO NBS)



Model KV50A

FEATURES

- Precision instruments for laboratory use — yet ruggedly designed and packaged for field and portable service.
- Models to 200 KV available from stock.
- Unique packaging concept permits one-hand portability for field use . . . plus safe storage for dividers behind front panel . . . yet operator safety is assured with two-piece construction.
- Average-reading meter calibrated in rms.
- Ripple measurements . . . merely turn the switch to AC.
- Burn-out proof . . . cannot be injured by over voltages or sharp rise time transients.

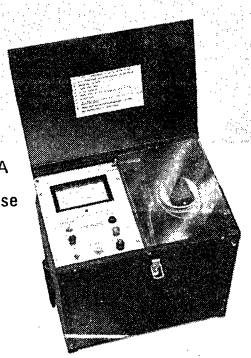
SPECIFICATIONS:

	Model KV50A	Model KV100A	Model KV200A
DC accuracy	0.5%	0.5%	0.5%
AC accuracy	1.0%	1.0%	1.0%
Tracking	0.5%	0.5%	0.5%
DC temp. coefficient	0.025%/C°	0.025%/C°	0.025%/C°
AC temp. coefficient	0.1%/C°	0.1%/C°	0.1%/C°
Frequency response	DC and 40 to 1000 Hz	DC and 40 to 1000 Hz	DC and 40 to 1000 Hz
Meter ranges (KV)	0-10/25/50	0-20/50/100	0-40/100/200
Volts division	100/250/500	200/500/1000	400/1000/2000
Impedance	190 megohms @ 200 pfd.	380 megohms @ 100 pfd.	760 megohms @ 50 pfd.
Size	8½″W x 10½″D x 15½″H	8½″W x 10½″D x 15½″H	9½″W x 10½″D x 40″H
Weight	20 lbs.	21 lbs.	40 lbs.
Delivery	From stock	From stock	From stock
Warranty	One year free parts and service		

Prices and specifications subject to change without notice.

liquid dielectric tester

TEST YOUR OIL, NOT YOUR OPERATOR. MODELS OC-50A, OC-60A, OC-90A AND OC-51M: PORTABLE, AUTOMATIC UNITS (50, 60 AND 90 KV) AND MANUAL UNIT (50 KV) DESIGNED TO TEST THE BREAKDOWN VOLTAGE OF INSULATING OILS IN ACCORDANCE WITH ASTM SPECIFICATIONS



Model OC-60A

FEATURES

- Performs tests to ASTM D149, ASTM D877, and ASTM D1816.
- Fully automatic — just select motorized rate of rise.
- Accuracy assured — memory meter records breakdown point.
- Wide range — 50 KV rating is standard to accommodate the dielectrics now being used in transformers, bushings, capacitors, etc.
- Cup options — accepts all standard cups.

Prices and specifications subject to change without notice.

SPECIFICATIONS

Input: 115 volts, 50/60 Hz, 2 amps, single phase
Output: OC-50A 0-50 KV rms @ 2 KVA
OC-60A 0-60 KV rms @ 2 KVA
OC-90A 0-90 KV rms @ 2 KVA
OC-51M 0-50 KV rms @ 2 KVA
Accuracy: 2% at full scale
Dimensions: OC-90A 16½″ W x 18½″ H x 20¾″ D
All others 15½″ W x 14½″ H x 11½″ D
Weight: OC-50A, OC-51M ..... 60 lbs.
OC-60A ..... 65 lbs.
OC-90A ..... 90 lbs.

HIPOTRONICS®

HIPOTRONICS, INC.
Brewster, N. Y. 10509 / (914) 279-8091
TELEX: 710-574-2420

Call or write our Marketing Department for more data and descriptive literature. See other Hipotronics' listings under Power Supplies.

HOYT ELECTRICAL INSTRUMENTS

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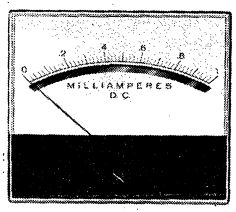
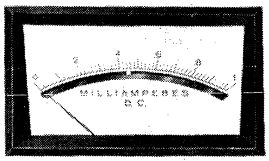
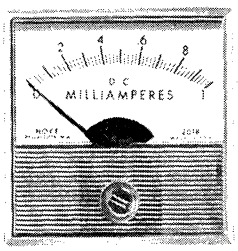
556 TRAPELO ROAD • BELMONT, MASSACHUSETTS 02179 • (617) 489-1520

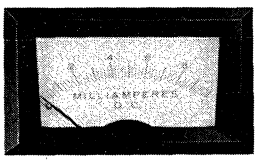


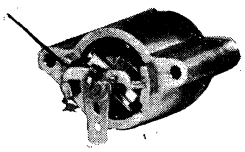


CUSTOM PANEL METERS

Available in sizes of 1½", 2½", 3½", 4½", 6" and 8". These smartly styled meters are available with die cast metal bezels for mounting the 1½" to 4½" meters behind equipment panels. They can also be supplied with an illumination provision. Other options include painted fronts and mirror dials. Four stud mounting permits interchangeability with most other meter types. Refer to dimensions on bottom of page. 2% A.C. Repulsion, 2% and 1% Moving Coil D.C. and VU meters available.

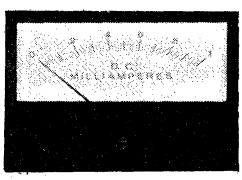


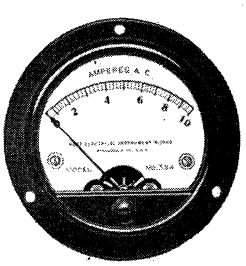




SELF-SHIELDED TAUT BAND PANEL METERS

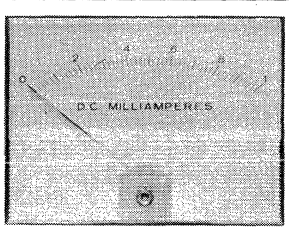
These new Taut Band Self-Shielded meters are for applications requiring a friction-less movement at very reasonable prices. Available with clear polystyrene cases in the 1½", 2½", 3½", and 4½" sizes. They may be mounted on the panel or behind the panel with bezel.

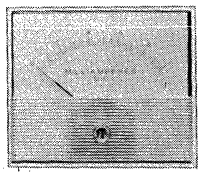




BAKELITE PANEL METERS FOR INDUSTRIAL APPLICATIONS

For more industrial panels Hoyt has a complete line of both round and square Bakelite Panel Meters. Square and Round Bakelite styles are available in 2½", 3½", and 4½" cases. Both A.C. Repulsion and D.C. D'Arsonval Movements available in most ranges. Some metal case styles also available in 2½" to 8" round sizes.





NEW ACRYLIC CASE PANEL METERS

These new 6" No. 2260 and 3" No. 2340 meters are supplied in scratch resistant acrylic cases. The 2260 has a projected front to permit behind the panel mounting without the customary bezel. Both models have a plain lined case front, and are available with either A.C. Repulsion or D.C. D'Arsonval movements.

POPULAR RANGE DEALER PRICES

Range	2½"	3½"	4½"
0-1DCmA	17.50	18.55	20.55
0-300DCV or under	19.00	19.85	21.70
0-100DCUA	21.70	23.15	25.15
0-5 ACA or ACV	18.20	19.20	20.30
0-150 ACV	19.50	20.30	21.45
VU Meters	31.90	33.30	34.50

A complete AC and DC price sheet for all meter styles, sizes and movements is available on request.

Please write or phone for quotations covering your specific requirement. Substantial discounts will apply on quantity orders.

Sample meters are available for electrical test and evaluation.

HOYT ELECTRICAL INSTRUMENT WORKS, INC.

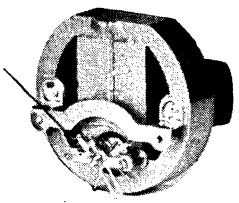
BURTON-ROGERS COMPANY Sales Division

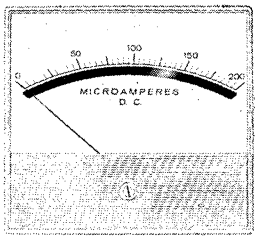
HOYT ELECTRICAL INSTRUMENTS

BURTON-ROGERS COMPANY Sales Division
556 TRAPELO ROAD • BELMONT, MASSACHUSETTS 02179 • (617) 489-1520

NO. 2025-19, NO. 2035-19, NO. 2045-19, NO. 2060-19
HIGH TORQUE-SHIELDED PANEL METERS

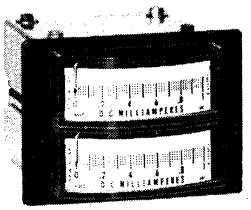
Here is the New completely shielded high torque D.C. movement for those applications requiring higher accuracies, rugged applications, higher torque, and the best in dependability and long life. Hoyt's own design employs a Super V Alnico Bar Magnet electronically bonded to machined and plated soft iron shielding pole pieces. Hoyt's best meter movements for special applications.
#20 Accu-ring Taut Band Shielded movement available soon.





EDGEWISE PANEL METERS

The newest Hoyt Edgewise Meter No. 685 is designed without any barrel projection so that the meter may be used as a single unit or mounted together horizontally or vertically in quantities of two or more. Mounting bezels are available for one, two, or three stack units. This is completely shielded from interaction and stray magnetic fields. Our other Edgewise No. 673/S with a narrower .64" front is best for limited front panel space. Both types available in 2% Moving Coil ranges or VU Meters.

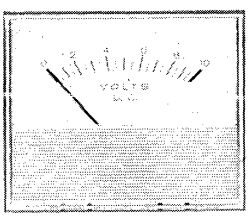


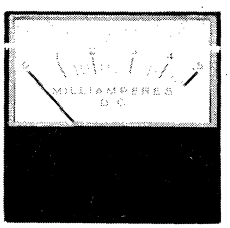
MOVING MAGNET INDICATORS

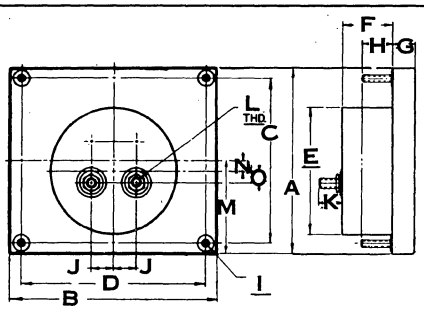
These inexpensive indicators feature rugged movements, round or square cases with a variety of mounting arrangements. The newest indicator, Model No. 795 is available with die cast metal bezel for behind panel mount.

SHUNTS & TRANSFORMERS

For D.C. or A.C. Ammeters Hoyt has a complete stock of 50 Millivolt drop shunts with leads and 5 amp ratio donut transformers.

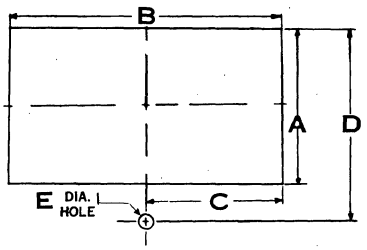






CUSTOM SERIES DIMENSIONS.
OTHER METER DIMENSIONS ON REQUEST.

DC Model	AC Model	DIMENSIONS FOR METER CASES A	B	C	D	E	F	G	H	IJKL-Below M	N	O
2015	2016†	1.74	1.74	1.31	1.31	1.50	1.00	.33	.50	.87	O.C.	—
2025	2026	2.37	2.81	1.87	1.87	2.16	1.12	.42	.50	1.18	O.C.	O.C.
2035	2036	2.97	3.50	2.25	2.25	2.75	1.10	.45	.56	1.48	.03	.28
2045	2046	4.03	4.50	3.56	4.00	2.75	1.09	.48	.62	2.01	.24	.49
2060	2061	4.49	5.72	3.00	5.25	2.75	1.10	.51	.66	2.24	.65	.71
2080	2081†	6.50	7.75	4.50	6.00	3.50	1.10	.66	.62	3.25	1.25	.187



DC Model	AC Model	A	B	C	D	E
2015-B	2016-B†	1⅛"	1 29/32"	61/64"	1.480"	13/64
2025-B	2026-B	1 39/64"	3"	1½"	2.061"	¼"
2035-B	2036-B	2 5/16"	3¾"	1⅞"	2.646"	¼"
2045-B	2046-B	2¾"	4 13/16"	2 13/32"	3.390"	¼"

DIMENSIONS FOR BEZEL CUTOUTS

1=4½", 6", 8" use 6-32, others 4-48
J=.48*
†Rectifier type movement only.
L=10-32*
*Except 2015-16 Solder Lugs
K=.50*

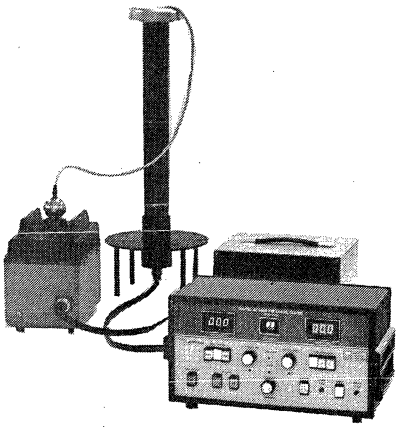
HOYT ELECTRICAL INSTRUMENT WORKS, INC.

BURTON-ROGERS COMPANY Sales Division

NEW high voltage test and measuring equipment

AC HIGH VOLTAGE TEST SYSTEMS • MODEL 17100 SERIES

This series of AC high potential testers is available in over 20 standard configurations at voltages up to 200 Kv and at power levels of 2, 5, and 10 KVA Systems are supplied either in modular form or installed in an integral console. A portable 70 Kv system is available. All configurations feature a digital control module providing three-digit readout of AC kilovolts peak and AC milliamperes (RMS).



Reactive Compensation: Automatically separates, reads reactive current component, resistive current component or total AC current. Switch selectable.

Voltage Pre-Set: Voltage increases from 0 to pre-set value with HV turned on.

Current Limit: Over current trip turns off high voltage if pre-set current limit is exceeded.

Timer: 0-10 minutes, voltage increases from 0 to pre-set value and remains on for selected time period.

Manual HV Slew • Two digit breakdown counter.

COMPLETE SYSTEMS

Modular Model	Console Model	Nominal System Power	Max. Test Voltage (KV Peak)	Maximum Current (Ma RMS)
17101	17110	2 KVA	50	42
17102	17111	2 KVA	70	30
17103	17112	2 KVA	100	20
17104	17113	5 KVA	50	140
17105	17114	5 KVA	70	100
17106	17115	5 KVA	100	70
17107	17116	10 KVA	50	280
17108	17117	10 KVA	70	200
17109	17118	10 KVA	100	140

PORTABLE SYSTEM

Model	Nominal System Power	Max. Test Voltage (KV Peak)	Maximum Current (Ma RMS)
17151	2 KVA	70	30

CONVERSION SYSTEMS

Supplied without high voltage transformer.

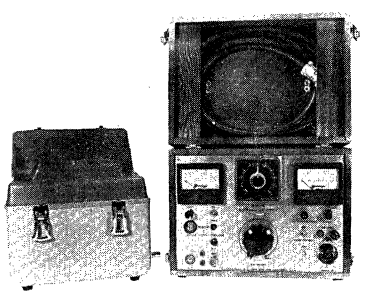
Modular Model	Console Model	Nominal System Power	
17135	17131*	2 KVA	Voltage and Current Ratings Determined by Customer Furnished H.V. Transformer
17136	17132*	5 KVA	
17137	17133*	10 KVA	

*Supplied for rack mounting without console or enclosure.

PORTABLE AC HIGH VOLTAGE TESTER

MODEL JHP-70A

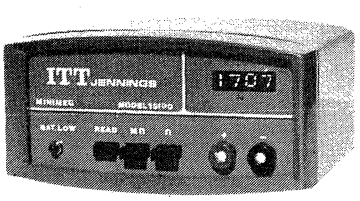
The smallest and lightest instrument available at its power level the JHP70A will generate and measure 70,000 volts peak for on-site testing of high voltage components such as capacitors, switches, transformers, bushings, vacuum tubes, etc.



Maximum Output Voltage ..... 70 KV Peak
Maximum Continuous Current ..... 30 MA RMS
Short Circuit Current (Est.) ....100 MA RMS
Power Requirements .....105-125 Volts RMS
Frequency .....50-60 Hz
Current .....15 Amps
Surge Current .....10 Amps
Weight:
Control Cabinet .....28 lbs.
Transformer .....43 lbs.

MINIMEG — MINIATURE PORTABLE MEGOHMMETER

MODEL 15100



A hand-held portable instrument for general purpose electrical insulation testing. Applications include both production and maintenance testing of a wide variety of electrical equipment including motors, generators, cables, signal equipment, circuit breakers, transformers, switchgear, and insulators. Power is supplied by a self-contained rechargeable battery. Test voltage is fixed at 500 VDC, and there is a factory pre-set current limiter. This feature along with a digital readout makes for a simple and foolproof tester. There are three megohm ranges: 0-19.99 M, 0-199.9 M, and 0-1999 M and 0-199.9 ohms range for continuity testing. Test values are read on a 3½ digit LED display. Accuracy is ±2% of reading ±one digit. The unit is compact, 7″ x 6″ x 3″, and weighs less than 3½ lbs. An external battery charger and vinyl carrying case are available as accessories.

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

WRITE FOR CATALOG E3J100

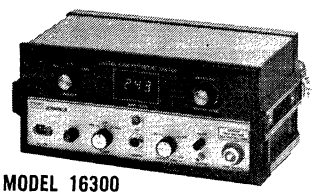
ITT JENNINGS 970 McLaughlin Ave. • San Jose, Calif. 95116 • (408) 292-4025

DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

NEW high voltage test and measuring equipment

DIGITAL DC HIGH POTENTIAL TESTERS

MODEL 16400

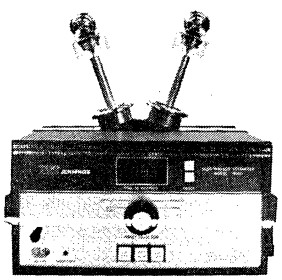


MODEL 16300

Compact portable instruments for measuring high voltage leakage currents in the insulation of electrical equipment including: rotating machinery, transformers, switchgear, relays, interrupters, contactors, capacitors, cables and insulators. The high voltage power supply is electronically regulated against line and load changes. Circuitry is all solid state and features an adjustable current limiter (30 to 300 microamperes) for protection of the tester and non-destructive testing of components. Model 16400's functions are separately accessible, permitting its use as a portable laboratory high voltage power supply or as a digital kilovoltmeter. Internal battery and AC line operation.

Specifications	Model 16300	Model 16400
Max. Output Voltage	25 KV DC	25 KV DC
Max. Output Current	150 μamps	300 μamps
Ripple	3% of rated output	3% of rated output
Load Regulation	3%	3%
Input Regulation	1%	1%
Displays	One 3-digit high intensity plasma "kilovolts" or "microamps"	Two 3-digit high intensity plasma "kilovolts" and "microamps"
Voltmeter and Microammeter Accuracy	0.5% of full scale, 1 bit LSD	0.5% of full scale, 1 bit LSD
Power Requirements	117/230 volts ±10% 50/60 Hz, 6 watts	117/230 volts ±10% 50/60 Hz, 30 watts

AC & DC DIGITAL KILOVOLTMETERS



• DIGITAL AC KILOVOLTMETER, MODEL 11100

Direct Reading: For on-line applications.

Accuracy: Calibration better than 1.0% of full scale.

Wide Range: 0-10, 0-100 kilovolts; 10 Hz - 30 MHz.

Portability: Operates from internal battery or line. Weighs less than twelve pounds.

Oscilloscope Jack • Remote Display • Stability

Specifications	Model 11100	Model 12100
Voltage Ranges	Peak kilovolts (single-ended) 0-10, 0-50 Peak kilovolts (double-ended) 0-10, 0-100	DC: 0-10KV, 0-50KV AC (RMS): 0-10KV, 0-35KV ACpk (+): 0-10KV, 0-50KV ACpk (−): 0-10KV, 0-50KV
Frequency Range	Flat from 10 Hz to 30 MHz at full rated voltage. Internal resonances are above 100 MHz	8 Hz to 100 KHz on AC peak measurements, 8 Hz to 20 KHz on AC RMS measurements
Accuracy	±1% of full scale on both ranges	DC & AC pk: 1% of reading ± digit (LSD), AC (RMS) 2% of full scale
Digital Display	3½ digit high intensity plasma	
Input Impedance	$2X10^{12}$ ohms and 4 pf single ended to ground, 2 pf double ended	10^{10} ohms and < 10 picofarads
Oscilloscope Connection	BNC connector, 600:1 division ratio approximate	BNC connector, output 1 volt for full scale reading
Power Supply	117 or 230 volts ±10%, 50/60 Hz, 5 watts or rechargeable battery, 8 hours recharge	
Dimensions	9″ x 16″ x 15″	6″ x 14″ x 11″
Net Weight	12 lbs. (approx.)	12 lbs. (approx.)

• DIGITAL AC/DC KILOVOLTMETER, MODEL 12100

Versatility: Reads average DC, peak AC or true RMS AC.

Accuracy: DC calibration better than 1% of reading ±1 digit (LSD).

Wide Range: 0-10, 0-50 kilovolts DC; DC and 8 Hz - 100 KHz.

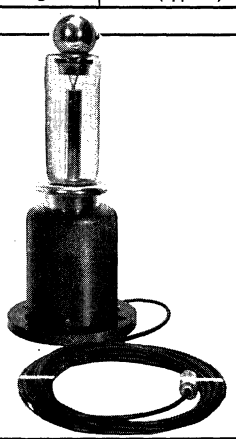
Bipolar: Automatically displays correct DC polarity.

Hi Input Imped. • Portability • Oscilloscope Jack

HIGH VOLTAGE AC DIVIDERS

MODELS JP-325 AND JP-2000

These dividers can be used with an oscilloscope to measure and observe voltages up to 60 kv at frequencies up to 20 MHz. Their low circuit loading design and shielded construction make them particularly suitable for rf measurement applications including tank circuit and transmission line voltages, pulse parameters, modulation voltages, and transient wave characteristics.



Specifications	Model JP-325	Model JP-2000
Voltage	40, 50, 60 kv peak	
Current	12.5 amperes RMS maximum through the voltage divider.	
Input Impedance	Above 10^{12} ohms, 4 pfd.	
High Frequency Response	Flat to 20 MHz at 50 kv peak; maximum frequency 50 MHz at 20 kv peak.	
Division Ratio	325:1 to termination of 3 ft. of RG-58A/U cable.	2000:1 to termination of 25 ft. of RG-58A/U cable.
Low Frequency Response When operated into shunt resistance of 1 megohm 10 megohms	1000 Hz 100 Hz	100 Hz 10 Hz
Weight	2 lbs. 4 oz.	4 lbs. 4 oz.

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990) **WRITE FOR CATALOG E3J100**

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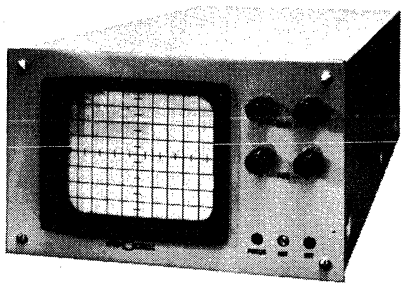
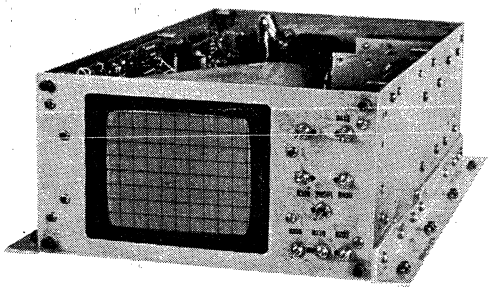
DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

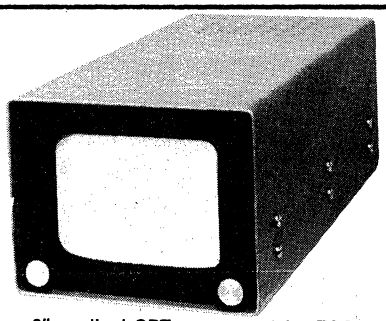
CRT DISPLAY for the OEM



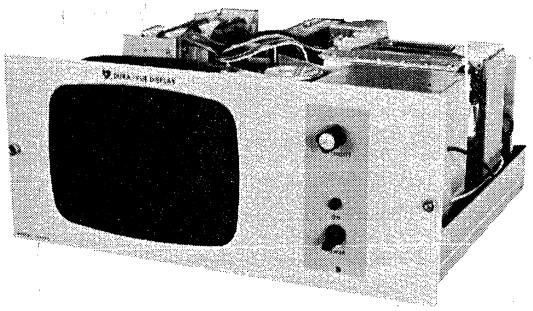
3" and 5" screen models; X-Y or with sweeps.



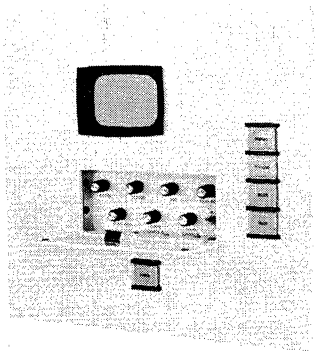
5" MIL SPEC oscilloscope.



6" medical CRT component for ECG and physiological monitoring.



8" display unit for non-fade ECG monitoring.



Used in biomedical instrumentation console.

Battery operated ECG monitor.

Infodex offers a standard line of 3" rectangular and 5" rectangular scopes. Each series embraces 22 standard models, ranging from X-Y indicators with AC-coupled Z axis for grey scale modulation, through a choice of 18 triggered sweep ranges, to three models with 12-step multi-range sweep. All sweep models have TTL-compatible Z axis control.

For the medical market Infodex offers a compact 6" screen display operating from 12VDC regulated, 15-30VDC unregulated, or 115VAC. Larger screen units include 8", 12", and 17" rectangular screen for conventional or "non-fade" trace presentation.

Infodex circuit design and packaging gives outstanding manufacturing flexibility so that we can provide specials with reasonable lead times and at reasonable prices. Be sure to consult us about your requirements.

INFODEX

INCORPORATED

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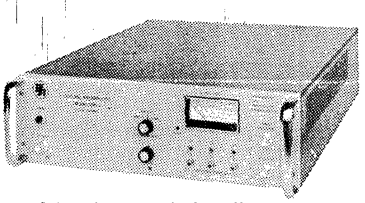
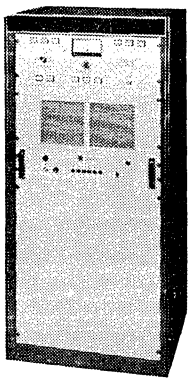
broadband power amplifiers

no tuning ■ no plug-in's ■ no bandswitching

- RFI Susceptibility Testing
- Nuclear Magnetic Resonance Research
- Drive Electro-Optical Laser Modulators
- Communications & Electronic Countermeasures
- Components Testing
- Filter, Attenuator & Screen Room Evaluation
- Antenna Research & Development Testing
- General Lab Applications Requiring High Power & Very Wide Instantaneous Bandwidth



LPA-1 Automatic Leveling Preamplifier
Features 40dB variable gain control from 10kHz to 220MHz. Reads directly in Volts/Meter for maintaining constant amplifier output as frequency is varied.



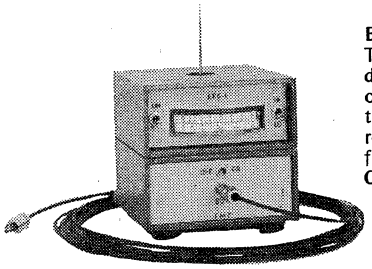
M406B Power Amplifier
Most versatile and powerful off-the-shelf broadband amplifier available today. Features 1kW output with 60dB gain from 10kHz to 220MHz. No tuning or bandswitching—amplifies all forms of modulation, linearly.

Power Output	Gain	Frequency Range	Model
100 Watts	50dB	10kHz to 220MHz	M403B
400 Watts	56dB	10kHz to 220MHz	M404B
1kW	60dB	10kHz to 220MHz	M406B

Instruments For Industry offers a complete line of high gain, high power, very wideband amplifiers from milliwatts to kilowatts and from Hertz to Gigahertz. Many standard systems are available from stock. Frequency range and outputs can be made to meet your specific requirements. A phone call to our Applications Engineering department will help to solve your broadband power problem.

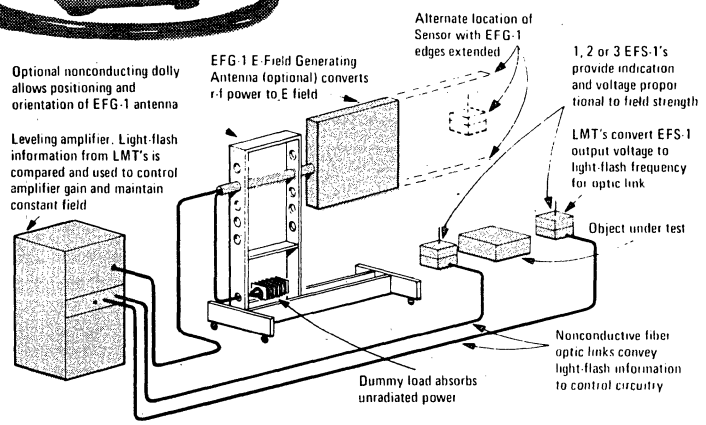
EMI meters/antennas/measuring systems

Instruments for Industry's new EFS-1 E-field sensor is widely used for RFI susceptibility testing, measuring field strength and for monitoring electromagnetic environments in hazardous areas. Reads directly in volts/meter and operates from two standard 9-volt batteries. When the application requires a low cost test instrument for measuring strong electric fields from 10kHz to 220MHz with no tuning or bandswitching or frequency related adjustments . . . use the EFS-1.



EFS-1 with LMT attached
The IFI Light Modulator-Transmitter attaches directly to the EFS-1 to convert the voltage output to an optical signal which is coupled through non-conducting fiber links for remote reading and control . . . without disturbing the field being measured.
Call or write today for full details.

Automatic Constant-Field Radiated Susceptibility Testing System.
Typical test set-up using IFI's broadband amplifiers, leveling preamplifiers, EFS-1 and LMT and Model EFG-1 E-Field Generating Antenna. The EFG-1 generates a strong electric field over the range from 10kHz to 220MHz with a continuous power handling capability of 500 watts. With the Model EFG-2, power can be increased to 1kW. This combination of IFI instrumentation can significantly reduce measurement time and improve the accuracy of test results. for help with your EMC measurement problems, call or write IFI Application Engineering Department for application bulletin "Automated Systems for RFI Susceptibility Testing".

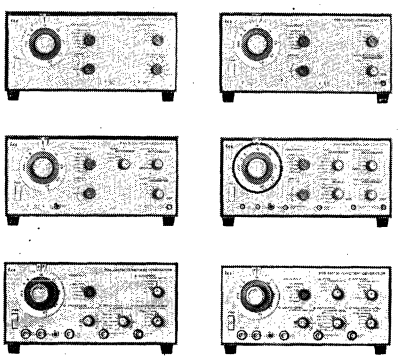


Got an Antenna Design problem? Ask for details about our new Antenna Testing Range and Design Capability.

INSTRUMENTS FOR INDUSTRY, INC.
151 TOLEDO STREET/FARMINGDALE/N.Y. 11735/516-694-1414 ■ Cable: Electronic Hallandale, Fla.
TELEX: 51-43-32

INTERSTATE'S RESOURCEFUL SIGNAL SOURCES

SERIES 30
FUNCTION GENERATORS
0.03Hz to 3MHz/ 20V p-p



Functional controls and operational accuracy combine to make any generator in the SERIES 30 line an excellent choice for your lab program. **F31 function generator is our answer to oscillator applications.** Like all SERIES 30 models, F31 outmaneuvers oscillators by producing square, triangle, and dc waveforms, as well as sinewaves, with sync output and continuously variable offset. The basic physical package includes plug-in IC's, calibrated fine and coarse tuning, and a 2-step 40 db output attenuator. (F31) $295

F32 adds 1000:1 VCG and replaces the F31 attenuator with a 5-step, 60 db version. The F32's unique output limit indicator (signal light) anticipates waveform clipping and tells the operator that offset and level dials are incorrectly set. (F32) $345.

F33 offers external sync input as well as external or manual pushbutton trigger and gate modes, while duplicating F32 capabilities. F33 also features the pulse waveform, and is one of the most inexpensive pulse-producing function generators available today. (F33) $395.

F34 gives you just about every test signal for basic laboratory applications. All F33 features are included, plus tone burst, continuous and triggered sweep, an easy-to-use direct reading sweep limit, and an analog voltage output in direct proportion to operating frequency. (F34) $495

F35 adds amplitude modulation with an internal 400 Hz oscillator to F32 function generator performance. A mode switch allows the operator to switch out the modulator when not needed, or select one of five modulation modes. Special AM techniques include suppressed carrier AM, and frequency doubling, which extends sinewave frequency to 6MHz. (F35) $595.

F36 is an AM/FM extension of F33. This versatile unit performs all the modulation applications offered by F35, and can gate or trigger, and produce variable width pulse in one economic package. (F36) $645.

SERIES 50A
FUNCTION GENERATORS
.0001Hz to 11MHz/ 30V p-p

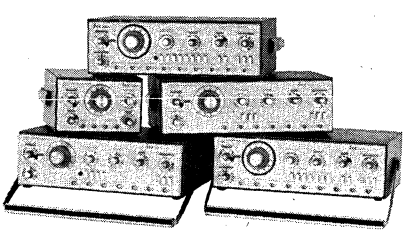
Interstate Electronics' "new generation" of exceptional signal-source instruments provide extended capability for almost every application need, immediate and long range. Waveforms include sine, square, triangle, 15/85% duty cycle ± pulses and ramps, plus variable width pulses. **The compact F51A doubles as a waveform generator and pulser,** sharing external pulse width modulation, 1000:1 VCG, sync input/output, and fixed and variable offset with all SERIES 50A models. (F51A) $680

F52A can be triggered and gated manually or externally with waveform start-stop over 180°. Along with all F51A capabilities, this unit features waveform inversion, simultaneous sine, square, and triangle monitor outputs, plus a wider-range, 70 db attenuator. (F52A) $910

The phase lock generator of SERIES 50A is F53A, offering coherent frequency multiplication or division. This unit also provides waveform inversion, monitor outputs, trigger, gate, and the 70 db attenuator. (F53A) $1025

F54A is the "sweep specialist," adding continuous, triggered, or frequency-shift sweep, and tone bursts to F52A performance. F54A sports a calibrated sweep width control on the frequency dial. (F54A) $1245

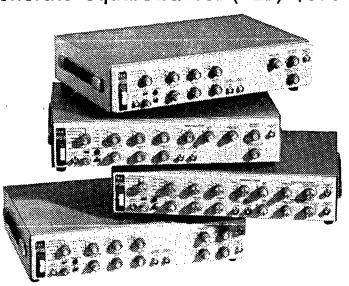
F55A is an outstanding laboratory resource. This instrument wraps up the special capabilities of F52A, F53A, and F54A, and is the industry's only function generator to offer the versatile combination of sweep and phase lock. (F55A) $1375



SERIES 20
PULSE GENERATORS
NEW!

1Hz to 50MHz/10V p-p

SERIES 20 pulse generators debut with a wide choice of capabilities including 100:1 continuously adjustable range controls plus a 10:1 vernier for pulse rep-rate, and a unique "constant duty cycle" (CDC mode) which establishes a constant timing ratio between pulse width and period even when rep-rate is varied. **P22 provides a single output pulse with fixed 3.5 nanosecond rise times,** full range offset, and trigger, gate, double pulse, triggered double pulse, pulse amplifier, and CDC modes. The "duty cycle" setting can also be used to generate squarewaves. (P22) $575



Two output channels with 3.5 nanosecond rise/fall are available on P23, which offers simultaneous positive and negative outputs and their complements, with a complete selection of operating modes. Simplified design conveniences included on all models are a master mode switch, "trigger" light, and single input BNC for all external drives. (P23) $625

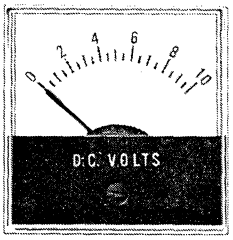
With P24, pulse rise/fall can be varied over a 100:1 range. Rise and fall times for P24's single output pulse are adjustable from 5 nanoseconds to 500 milliseconds, while all other controls are similar to P22. (P24) $875

P25 meets broad performance requirements with independently variable rise/fall controls for each of two output channels. Featuring rise times from 5 nanoseconds, P25 combines the versatility of adjustable rise/fall with the comprehensive output capabilities of P23's dual channel operation. (P25) $1095

- **For additional information or purchasing assistance, contact your Interstate Sales Representative or Interstate Electronics Corporation.**
- **Prices shown are FOB, Anaheim, California.**
- **All instruments are warranted against defects in material and workmanship for one year.**
- **Instruments are shipped with operation and maintenance manuals. Hardware for 19" rack mounting is stocked as an option at $35.00. Rear panel function generator BNC's in parallel with front panel BNC's are also optional for $35.00.**
- **Check representative or Interstate for GSA listing availability.**

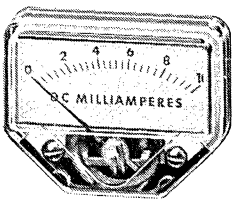
IEC INTERSTATE ELECTRONICS CORPORATION A Subsidiary of **A-T-O** Inc.
Dept. 7000, Box 3117, Anaheim, California 92803 (714) 772-2811
TWX 910-591-1197 TELEX 655443 & 655419

Jewell PANEL METERS



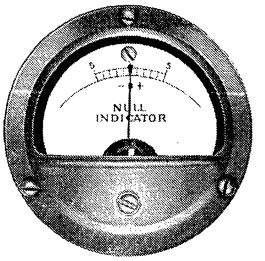
Series MS Meters

Clean straight lines and square corners make these meters perfect for use on contemporary equipment... crystal-clear Plexiglass covers . . . painted cover section can be color styled . . . three sizes 1½ inch (Model MS1), 2½ inch (Model MS2), 3½ inch (Model MS3) . . . the modern meter for the modern look.



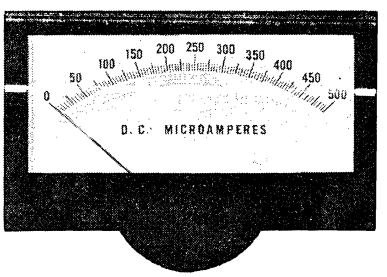
Series 80 Meters

Maximum display in a minimum of space . . . mounts from behind the panel without extra bezel . . . small mechanism attached directly to rear of dial greatly reducing behind panel space requirements . . . two sizes 1½ inch and 2½ inch.



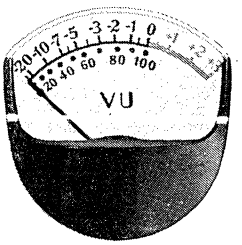
Null Indicators

Specifically designed to give Null determination over a wider range of unbalance than a standard zero meter . . . no danger of overloading the meter . . . shown in hermetically sealed ruggedized version . . . several case styles and sizes available to match conventional meters.



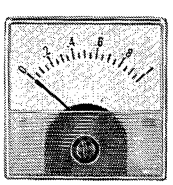
Model 65 Meters

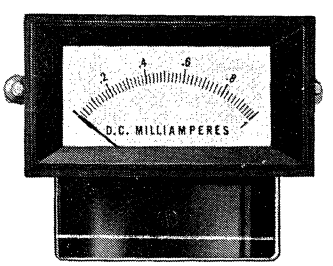
A beautifully-styled rectangular meter, the "65" is mounted from behind the panel . . . the zero adjustment screw is in front of the panel when the meter is in place . . . no additional holes to drill . . . dial is almost flush with panel avoiding any "tunneling" effect . . . knife-edge pointer, mirrored scale and fine division lines add to readability and appearance . . . dull black thermosetting plastic cover has glass window.



VU Meters

Jewell VU meters are rectifier type AC voltmeters for measuring frequency voltages . . . standardized dynamic characteristics permit uniform monitoring in broadcast, recording and communication applications . . . built to industry standards in various case designs.





Series 70 Meters

Five sizes, 1½ inch through 6 inches . . . behind panel mounting optional with bezel . . . bezel mounted meters can be illuminated . . . versatile, clean, clear look meter . . . interchangeable.

All standard ranges and styles in stock • Taut Band or Pivot-and-Jewel movements • AC Iron Vane Meters available in most styles.

JEWELL ELECTRICAL INSTRUMENTS, INC.

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The 53 Product Sections categorize related electronic components, equipment, materials, instruments and systems, and fabrication services, enabling you to quickly compare and evaluate similar items.

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Product Section	Volumes 1, 2, 3 Page	1973 Volume 4 Page	Products
1100	Vol.2•308	Vol.4•309	Amplifiers, Audio, Operational, etc.
1200			Antennas & Accessories
1300	Vol.1•308	Vol.4•310	Audio Equipment & Accessories
1400	Vol.3•308	Vol.4•311	Cabinets, Chassis, Containers, Racks, Boxes, etc.
1500	Vol.3•342	Vol.4•314	Capacitors (All Types)
1600	Vol.3•516	Vol.4•324	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
1700	Vol.2•323		Circuit Assemblies, Circuit Boards & Breadboarding Kits
1800	Vol.3•519		Coils (Inductors, Chokes), Assemblies, Forms
1900	Vol.1•319		Communications Equipment (Facsimile, Telephone, Television)
2000	Vol.1•321	Vol.4•325	Computing, Data Handling Equipment & Accessories
2100	Vol.3•544	Vol.4•356	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2200	Vol.2•326	Vol.4•386	Controls, Control Components & Systems
2300	Vol.2•379	Vol.4•389	Crystals & Mechanical Tuning Devices; Oscillators
2350	Vol.3•978	Vol.9•392	Delay Lines (All Types)
2400	Vol.2•456	Vol.4•397	Panel Components (Including Lighting & Readouts)
2500	Vol.3•1004	Vol.4•401	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
2550	Vol.1•382		Environmental Test Equipment
2600	Vol.3•1039		Fans, Blowers & Cooling Equipment
2700	Vol.2•544	Vol.4•403	Filters
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2900	Vol.1•386	Vol.4•404	Instruments, Measuring & Test
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3100	Vol.3•1074		Insulators, Insulating Materials & Parts
3130	Vol.2•588	Vol.4•432	Integrated Circuits & Hybrid Microcircuits
3150	Vol.3•1089		Manufacturing, Subcontracting, Custom Fabrication
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3450	Vol.2•607	Vol.4•438	Microwave, Laser & Radar (Components/Accessories)
3500	Vol.2•630	Vol.4•442	Motors, Rotating Components & Accessories
3600			Nuclear & Radiation Equipment
3700	Vol.2•670	Vol.4•443	Photoelectric Equipment & Components
3800	Vol.2•680		Optical Equipment & Accessories
4000	Vol.1•571	Vol.4•444	Power Supplies, Converters, Inverters, Batteries, etc.
4100	Vol.1•934		Production Machinery & Automation Equipment
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JULIE RESEARCH

SERIES DM1000 MULTIMETERS

PROGRAMMABLE AC/DC MULTIMETERS AND PRODUCTION CALIBRATORS
DM-1000 SERIES DIGITAL MULTIMETERS TO 1 PPM ACCURACY/RESOLUTION/STABILITY

JULIE RESEARCH, for 15 years the pioneer in the manufacture of Precision Standards, now leads the way in providing Multimodel automatic precision calibrators. The new approach to production measurements with three sigma certainty reduces test equipment costs and testing time. The DM-1000 Multimeter doubles as a Ratiometer and Voltage Source in addition to measuring Voltage, Resistance and Current to 1 ppm. Just a few of this amazing instrument's uses are:

- **CALIBRATING DVM's AND DMM's**—2½ digits to 5½ digits, with full confidence.
- **CALIBRATING A/D AND D/A CONVERTERS**—8-bit to 20-bit binary resolution.
- **CALIBRATING ANALOG TRANSDUCERS**—to unprecedented orders of precision.
- **MEASURING ZENER DIODES AND STANDARD CELLS**—1% to 0.0001%, automatically.
- **MEASURING RESISTORS AND NETWORKS**—both absolute resistances and ratios.
- **CALIBRATING POTENTIOMETERS AND ATTENUATORS**—both linear and nonlinear.
- **MEASURING POWER-SUPPLY CHARACTERISTICS**—absolute output, regulation, tracking, stability.
- **CALIBRATING AC SIGNALS AND GAINS**—over 30Hz-5KHz, with excellent linearity.
- **STANDARDIZING CURRENT SOURCES**—over wide ranges, to unprecedented accuracy.
- **MONITORING PROCESS VARIABLES**—electrical parameters, temperature, strain, pressure, etc.

These new calibrators are the ultimate in accurate D.C. measurements offering numerous benefits which yield the most reliable and flexible operation ever. Some of the more obvious benefits are low parts count for reliability, ease of programmable application for quality measurements with isolated data output with BCD input, and output options.

MODEL	VOLTAGE-RATIO RANGES	DC VOLTAGE RANGES	RESISTANCE RANGES	DC CURRENT RANGES	FUNCTIONAL MODES			CASE SIZE (see spacing for details)	UNIT PRICE
					Fully Automatic	Digitally Programmable	Manual Balancing		
DM1000	0.000000 to 1.199999 F.S. (1 range)	Obtainable with external EMF std: ±11.99999V F.S.	—	—	yes	Specify Suffix P, add $180.	Specify Suffix M, add $220.	A	$5500.
DM1010	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. and ±11.99999V F.S.	—	—	yes	Suffix P, add $180.	Suffix M, add $220.	A	$5800.
DM1020	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. to ±1199.999V F.S. (4 ranges)	—	—	yes	Suffix P, add $180.	Suffix M, add $220.	B	$6450.
DM1030	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. and ±11.99999V F.S.	119.9999 Ω F.S. to 11.99999 Meg Ω F.S. (6 ranges)	—	yes	Suffix P, add $180.	Suffix M, add $220.	B	$6650.
DM1040	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. to ±1199.999V F.S. (4 ranges)	119.9999 Ω F.S. to 11.99999 Meg Ω F.S. (6 ranges)	—	yes	yes	yes	B	$7700.
DM1050	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. and ±11.99999V F.S.	—	±1.199999mA F.S. to ±11.99999A F.S. (5 ranges)	yes	Suffix P, add $180.	Suffix M, add $220.	B	$6300.
DM1060	0.000000 to 1.199999 F.S. (1 range)	±1.199999V F.S. to ±1199.999V F.S. (4 ranges)	119.9999 Ω F.S. to 11.99999 Meg Ω F.S. (6 ranges)	±1.199999mA F.S. to ±11.99999A F.S. (5 ranges)	yes	yes	yes	B	$8200.

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JULIE AUTOMATED/PROGRAMMABLE SYSTEMS

COMPUTER CALCULATOR CONTROLLED PRECISION TEST SYSTEM — LOCOST 106*

DESCRIPTION AND APPLICATIONS

From the leading manufacturer of precision standards and measuring instrumentation, Julie Research, a new computer controlled test system is available at a low cost to fit into the budgets of even small calibration and testing laboratories.

LOCOST* features a combination of computer, data terminal, high speed thermal printer, programming cassette memory and a programming calculator which can be operated by lab technicians with little or no computer and programming experience. It uses BASIC language, has an alphanumeric keyboard and an interactive 32-character display, as well as a built-in 15K byte main-line memory. Cassette memory is 32,000 words. Capability of the calculator is equivalent to a 10K or 12K mini-computer.

A unique, labor saving feature of LOCOST* is its unique programmed software which makes it possible to generate, store, and carry-out test programs for new instruments efficiently. Simple questions concerning the specifications of the instrument under test are asked by the calculator and the operator answers these questions by typing specifications such as full-scale accuracy, etc. When completed, these specifications are then stored on cassette memory for future reference and use by the system's preprogrammed meter test routine. Programming costs are 80 to 90% lower than for conventional computer controlled systems.

A complete array of programmable DC and AC test instrumentation is available to satisfy even the most demanding testing and calibration applications. Sources and measuring instruments that are available include:

* LABOR OPTIMIZED COMPUTER OPERATED SYSTEM TEST

SYSTEM FEATURES

- Fully Automatic or manually operated modes of operation
- Computer Controlled System
- Programmable Calculator Capability
- BASIC Language for simplified programming
- Compact Portable Packaging
- Complete Array of AC/DC Standards & Measuring Instrumentation available
- Full Library of software test routines available

JRL AND OPTIMATION INSTRUMENTS

DM-1000	1 ppm Digital Multimeter
ACV-106	DC Current/Voltage Source
RVD-126	Six Digit Divider
AVP-1001J	Universal Potentiometer Adaptor
AND-106	Null Detector
ARB-205C	Resistance Bridge
ACS-106A	Precision DC Current Source
AVS-106A	Precision DC Voltage Source
SM-106	Scanning Matrix
ARB-205L	Low Range Resistance Adaptor
RVD-125	Five Digit Divider
PDB-104/6	Double Decade Resistance Box
AC-179	Precision AC Voltage Source
AC-129	Absolute AC Voltage Calibrator
PA-1182	1 KV AC Power Amplifier

COMPUTER CONTROLLED PRECISION TEST SYSTEM — LOCOST 1106

LOCOST 1106 SYSTEM FEATURES

- PDP-11/15 Digital Computer
- 16 K Core Memory
- 1.2 M Disk Memory
- High Accuracy
- Multi-Terminal Work Stations
- Uniquely Powerful User-Oriented Software System

DESCRIPTION AND APPLICATIONS

LOCOST-1106 features a system comprised of a PDP-11/15 Digital Computer, High Speed Photo-Electric Perforated Tape Reader, Magnetic Tape Cassette Unit, Cathode Ray Tube Terminal with Keyboard and a High Speed Thermal Printer. This fully integrated complement of control equipment permits high speed and reliable operation of the Julie LOCOST-1106 system.

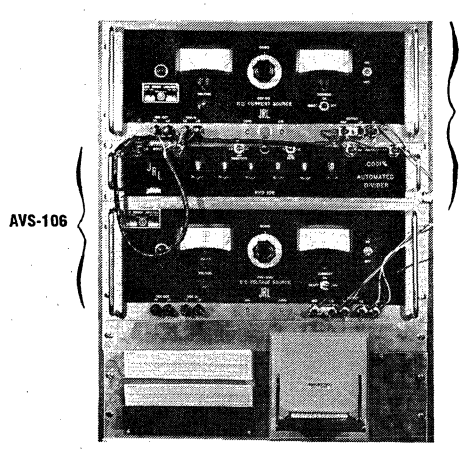
The LOCOST-1106 system performs high accuracy (1 part per million absolute) measurements quickly and easily. The minicomputer, coupled with the very powerful interactive software operating system allows test programs to be written by users with minimum training. Test results are presented on both a GO/NO-GO basis and on a parametric basis with a selection of data logging formats. Special applications and measurements can be accommodated wtih a minimum of hardware and software modifications, thus giving the system tremendous expansion capabilities, both before and after delivery. LOCOST-1106 can be used with compatible test instruments to automatically perform functions which are usually reserved for high-precision manual instrumentation. (See LOCOST-106 section above for a list of compatible Julie and Optimation instrumentation.) Please contact the JRL sales department for detailed information.

AUTOMATIC AND PROGRAMMABLE DC VOLTAGE, CURRENT AND RESISTANCE MEASUREMENTS TO 20 PPM ACCURACY, 1 PPM RESOLUTION

Compatible with all BCD and 10-line decimal program formats, the JULIE RESEARCH family of programmable Voltage and Current Sources employs the most accurate and reliable automatic Dividers and Scanners. All basic DC measurements are now programmable with incredible speed and accuracy. Manual Mode Override is also available at a slightly higher price.

MODEL	PROGRAMMABLE	RANGE	ACCURACY	PRICE
AVS-106	Voltage Source	0 ±1200v	.0015%	$5700*
ACS-106	Current Source	0 ±12A	.005%	$5200*
RVD-126	Divider	0 ±700v	.0001%	$2900
PDB-104/6	Decade Box	.01-10 Megohm	.1% or .01%	$1875
S106M or S106F	Scanner	100 Pts.	.0001%	$5200
ARB-205S	Resistance Bridge	.01 to 10 Megohm	.0005%	$6400

*Includes Price of Divider



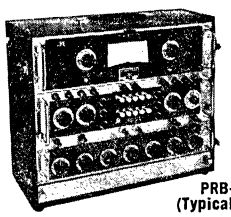
JULIE RATIOMETRIC® SYSTEMS

PRECISION RESISTANCE MEASURING SYSTEMS

Through the use of the RESISTANCE PLUG-INS, the multivider system is made into various precision resistance measuring systems.

When the PRB-205C bridge and range extenders PRB-205L and PRB-205H are used with the basic multivider detector and divider, the system is identified as the PRB-205S, and is capable of measuring resistance values from 0 to 10^{12} ohms. Zero offset circuitry establishes the true zero point and eliminates all test lead and fixture effects. Direct reading deviation dials permit measurement of deviation from 0 to ±1200 PPM in 0.1 PPM steps, with an accuracy of 0.1% of observed deviation or 0.2 PPM, whichever is larger. Resistance measurement accuracies obtained are tabulated below. All required resistance standards with NBS traceability are included. Model PRB-205C Plug-in includes Model MRS-106 Reference Resistorset, and the PRB-205L includes Model MRS-105 Reference Resistor set. See specifications in the resistance reference section.

When the Model DRRS-108 plug-in is used, the Multivider system is made into a Direct Reading Ratio Set, capable of measuring the Thomas pattern 1 ohm resistor with an accuracy and precision of .1 PPM. It also permits making 1:1, 1:9 and 1:10 comparisons of 2 and 4 terminal standard resistors.



PRB-205S
(Typical Layout)

MODEL PRB-205H

MODEL PRB-205L

PRB-205C PLUG-IN, $2650.	
0-1000	±1 ppm Setting ±1 ppm f.s.
0-10K	±1 ppm Setting ±1 ppm f.s.
0-100K	±1 ppm Setting ±1 ppm f.s.
0-1 Meg	±2 ppm Setting ±1 ppm f.s.
0-10 Meg	±3 ppm Setting ±1 ppm f.s.

PRB-205H EXTENDER, $1275.	
0-100 Meg	±.004% ±1 ppm f.s.
0-1 K Meg	±.009% ±1 ppm f.s.
0-10 K Meg	±.019% ±1 ppm f.s.
0-100 K Meg	±.04% ±1 ppm f.s.

DRRS-108 DIRECT READING RATIO SET, PLUG-IN, $1775.

Used for resistance comparison to accuracy of 0.1 ppm when ratio is 1:1 or 1:9 or 1:10.

PRB-205L EXTENDER, $1275.	
0-.1	±3 ppm Setting ±1 ppm f.s.
0-1	±2 ppm Setting ±1 ppm f.s.
0-10	±2 ppm Setting ±1 ppm f.s.
0-100	±1 ppm Setting ±1 ppm f.s.

Note: For System Accuracy add values shown to accuracy of reference resistor used.

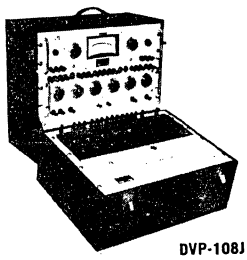
PRECISION VOLTAGE POTENTIOMETERS

Through the use of POTENTIOMETER Plug-ins, the Multivider system is made into various precision voltage measuring systems. (Systems listed in the table below include null detector and voltage divider).

PVP-110C Single Range Potentiometer Plug-in with 0.0002% ± digit accuracy, 0-1.1 VDC: **$1585.**

PVP-1000C Potentiometer/Voltbox Plug-in with ranges to 1000 volts and with accuracy as shown below for PVP-1000S: **$2500.**

PVP-1001J Universal Potentiometer Plug-in is used in the **PVP-1001JS** and **DVP-108JS** systems listed below: **$2660.**



DVP-108J

PVP-1001J
(Plug-in)

Range volts	PVP-1000S Accuracy (w/self cal.)	PVP-1001JS Ac'racy (w/self cal.)	DVP-108JS System Accuracy
1000	8 ppm ±1 ppm f.s.	—	—
300	8 ppm ±1 ppm f.s.	—	—
100	8 ppm ±1 ppm f.s.	—	—
30	8 ppm ±1 ppm f.s.	—	—
12	—	1 ppm ±1 uv	.5 ppm +.05 uv
10	5 ppm ±1 ppm f.s.	—	—
3	5 ppm ±1 ppm f.s.	—	—
1.2	—	1 ppm ±.1 uv	.5 ppm +.05 uv
1.1	±1 uv (cell compar.)	—	—
1.0	2 ppm ±1 ppm f.s	—	—
.12	—	2 ppm ±.02 uv	.75 ppm +.01 uv
.012	—	3 ppm ±.3 nv	1 ppm +.005 uv
.0012	—	4 ppm ±1 nv	2 ppm +.001 uv
Price	$4615.	$5055.	$8015.

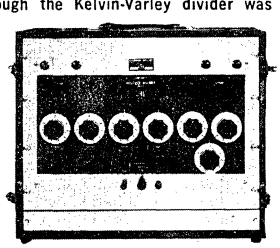
JULIE PRECISION MEASURING SYSTEMS

In Julie approach, use is made of very accurate resistance and voltage references. A voltage divider is used with associated circuitry, switches and a null detector, to interpolate and extrapolate the values of these references. Total measurement errors are reduced, very simply, to those produced by the voltage divider (usually 1 ppm f.s. at worst), switching and hook-up (usually 1 or 2 ppm) and reference voltage or resistance (1 ppm to typically 10 ppm for resistance).

The key to the Ratiometric™ approach is the stable Kelvin-Varley voltage divider. (See the table that follows.) Although the Kelvin-Varley divider was invented over 100 years ago, it was not used in high precision applications because of accuracy limitations. With the radical improvement in the accuracy of the Kelvin-Varley divider by Loebe Julie, founder of Julie Research Laboratories, Inc., the previously unrealized advantages of this divider were harnessed. Background information is available for the asking from the Julie Research home office in New York City.

These pages list only a basic sampling of Julie products. We welcome your request for detailed information.

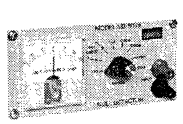
VOLTAGE DIVIDERS



Model	Accu. (ppm)	Lin. Resol. (ppm)	Stability (ppm/yr.)	Resistance (Kohms)	Max. Volts	Mode of Operation	Price
DVD-108J	1 (5 yr.)	.01	.2	100/110/120	1000	Manual	$4335
VDR-106/7	1 (5 yr.)	.1	.2	100	300	Manual	$2140
VDR-307	1 (5 yr.)	.1	1	100	700	Manual	$1065
VDR-327J	1	.1	1	100/110/120	700	Manual	$1345
*RVD-106	1	1	1	100	300	Prog./Manual	$2690
*RVD-126J	1	1	1	100/110/120	300	Prog./Manual	$2900

* All RVD Programmable Dividers are available with BCD input/output and/or 10 Kohm input impedance

NULL DETECTORS



Model	Ranges	Sensitivity	Dimensions	Price
ND-106	(9) 3 uv to 30 mv	.1 uv	19 x 5¼x 8	$1050.
ND-107	(3) 10 nv to 1000 nv	.3 nv	9½ x 3½x 5	$750.

OPERATIONAL AMPLIFIERS OA-601, output ±10 ma, 0-1000 ohms load ..... **$1050.**

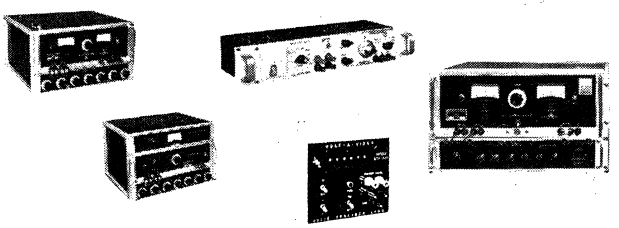
SYNCHRO-RESOLVER BRIDGES

MSB-5	$625.	±.002% (4 sec. arc) Accuracy.
MRB-5	$725.	Zero Harmonic Distortion. 800 Hz.

JULIE PRECISION MEASURING SYSTEMS

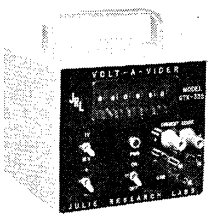
DC VOLTAGE AND CURRENT SOURCES

Julie precision voltage and current sources are the most accurate and most stable available. Many standard models are available as tabulated below. The Julie Engineering team is always pleased to design special configurations when special applications demand custom units. In general, highest quality precision sources are comprised of a stable voltage reference (such as ZVR-512), a 100K Kelvin-Varley divider (such as VDR-307H) for output control, and an ultra stable, low noise operational amplifier (such as OA-600 Series). All three basic modules are available from Julie and can be assembled as required.



Model	Outputs	Accuracy	Stability	Price
DVS-106	0 to ±12, 120, 1200 v at 35 ma, 7 digits	2 ppm	2 ppm/day	**$4100.**
DCS-105	0 to ±1.2, 12, 120 ma; 1.2, 12 Amps	10 ppm	3 ppm/day	**$4200.**
GTX Series	1 v and 10 v with 6 digits, 25 ma	10 ppm - 50 ppm	3 ppm/day	**$394-1000.**
NVS Series	1 nv to 1.1 v	.04%	30 day Acc.	**$ 825.**

DIALABLE PRECISION D.C. VOLTAGE SOURCES



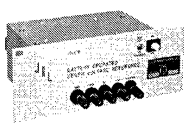
Model	Accuracy	Price
GTX-331	0.001%	**$1000**
GTX-332	0.0025%	**$ 950**
GTX-335	0.005%	**$ 855**

The GTX-300 Series is a high quality, compact, portable voltage source. Output settings on this 1 PPM resolution instrument range from 1 microvolt to 10 volts D.C. and can be made simply by dialing the desired value. Accuracies of from 0.001% to 0.005% can be ordered. Loads requiring up to 25 mA can be tolerated without accuracy deterioration. An output stability of ±3 PPM/24 hours is standard on all units.

SOLID STATE REFERENCES — ZENERS

SOLID STATE REFERENCES — ZENERS

Output: +1.018, +1.0 and −5.0 volts all models except ZVR-500 Series.
Room Temp. Effect: 5 ppm Total (−°C to 50°C) for ZRO-106 Series, 0.3 ppm/°C (20°C to 30°C) for ZVR-106 Series and 0.2 ppm/°C (20°C to 30°C) for ZVR-500 Series.
Line Regulation: 1 ppm for 10% line charge for all models.



Model		Size	Price
ZVR-106A/B		3½" h half rack	**$575** (Battery oper.)
ZVR-106B		6" x 6" x 4"	**$575** (Battery oper.)
ZVR-106MV (10V, 1V, .1V, .01V)		6" x 6" x 4"	**$952** (Line oper.)
ZVR-506 (6.3V)		.84" x .84" x .75"	**$150** (1-9 units
ZVR-512 (12.6V)		—	**$180** Quan. discounts
ZVR-518 (18.9V)		—	**$215** available)
ZTS-106	1.000, 1.018+Delta, 1.019+Delta VDC, 0 to 1000 μV (Delta); ±2 PPM Accur.; 1 μV Resol.; ±3 PPM/Mo. Stable		**$450** ($500 w/Bat.)

VOLTAGE REFERENCES

SATURATED STANDARD CELL OVENS

The best voltage reference possible must meet two basic critical requirements —

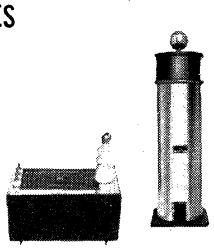
1. Time performance; the three saturated cells used must have minimum output voltage change with time.
2. The enclosure must maintain its nominal temperature with time.

Stability Specs*		Temperature	Time
SCO-106	cells	.64 ppm/.01°C	1 ppm/yr. max.
$1490.	oven	.01°C/day max	.05°C/yr. max.
SCO-107	cells	.064 ppm/.001°C	1 ppm/yr. max.
$1390.	oven	.001°C/day max.	.005°C/yr. max.

* Guaranteed

HIGH VOLTAGE DIVIDERS/VOLT BOXES

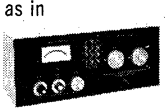
The Julie High Voltage Dividers and Volt Boxes on the table below are used to "drop" high voltages to a level that traditional precision potentiometers and high impedance electronic voltmeters can safely measure (such as the Julie models PVP-1000S, PVP-1001JS, the DVD-108J and the TDV-1000).



Model	No.	Input Ranges Lowest	Input Ranges Highest	Input Imped.	Output Taps	Acc. (%)	1 Year Stab. (%)	Price
DV-1500	11	1 v	1500 v	1 Kohm/v	1/1.5 v	.001	.001	**$1375.**
DV-1000	7	1 v	1000 v	1 Kohm/v	1/1.5 v	.001	.001	**$1050.**
DV-1000B	7	1 v	1000 v	1 Kohm/v	1 v	.001	.001	**$ 695.**
HV-100/w	1	100 Kv	100 Kv	1 Kohm/v	1 v	.05	.0015	**$2450.**
HV-100	1	100 Kv	100 Kv	4 Kohm/v	1 v	.05	.1	**$1850.**
KV-50/.01	1	50 Kv	50 Kv	1 Kohm/v	1/10 v	.01	.0015	**$1490.**
KV-25/.01	1	25 Kv	25 Kv	1 Kohm/v	1/10 v	.01	.0015	**$ 850.**
KV-10/.01	1	10 Kv	10 Kv	1 Kohm/v	1/10 v	.01	.0015	**$ 520.**
KV-10R	1	10 Kv	10 Kv	1 Kohm/v	1/10 v	.01	.0015	**$ 450.**
KV-VB/10	1	10 Kv	10 Kv	2 Kohm/v	10 v	.05	.005	**$ 220.**

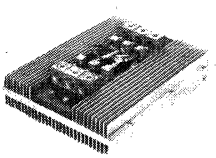
UPB-100 UNIVERSAL POTENTIOMETER/BRIDGE

A durable and economical potentiometer/bridge system designed for use in the college classroom as well as in industry.



The basic system is used to measure voltage, resistance, current, and ratio and is priced at $800. A 10% educational discount is available, where applicable, to produce a net price of **$720.**

For added convenience, optional accessories are available. These include a Lead Kit (**$25**), specially written instruction book for theory, experiments, and answers (**$25**), a Student Manual (**$5**). a Binary Series Resistor Set (16 Binary Bits) (**$75**) and a Binary Coded Decimal Resistor Set (5 decade) (**$75**).

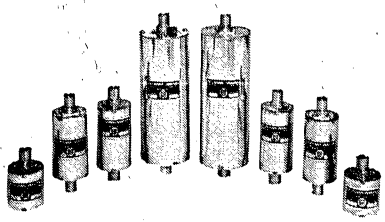


CURRENT SHUNTS

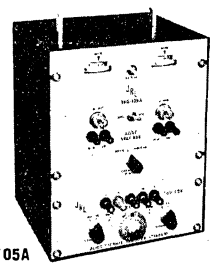
High quality shunts are high quality 4-terminal resistors especially designed to operate at relatively higher current levels without suffering appreciable resistance change. Most high ranges (50 A for example) are the finned heat-sink type. Most lower ranges are available in single and multiple-range (oil-filled) units. Accuracies up to .0025% are available although .05% or .01% are most typical. Yearly stabilities of .01% are typical and temperature coefficients are 5 ppm/°C or better. Ask for data sheet.

JULIE PRECISION MEASURING SYSTEMS

AC-DC THERMAL VOLTAGE TRANSFER STANDARDS



MODEL TNB-102 SERIES COAXIAL AC/DC TRANSFER STANDARDS



TRS-105A

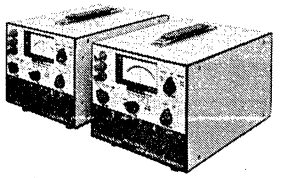
TRS-105A	Frequency	To 64 V	128-512 V	1024 V
$1825.	5 Hz - 10 KHz	.001%	.002%	.003%
	10 KHz - 20 KHz	.002%	.003%	.005%
200 ohms/volt	20 KHz - 50 KHz	.003%	.004%	.01%
	50 KHz - 100 KHz	.02%	.1%	.2%
	100 KHz - 1 MHz	.1% to 10 V		

Thermocouple Reversal Error: Zero ±2 ppm adjustable from front panel.

TNB-102 Series — Coaxial Type (Complete Set) ..... **$1500.**

This set of two Thermoelement Modules (2.5 ma and 5 ma) and six Resistor Modules provide highest available transfer accuracy from 0.5 v to 1000 v up to 50 KHz.

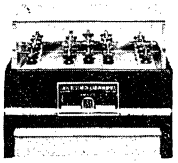
DIFFERENTIAL VOLTMETERS



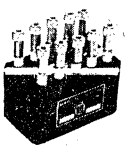
Model	DC %	AC %	Line	Bat.	AC input imped. *(DC see below)	Price
TDV-1000/0	.0025	—	Yes	No	DC only	$1050.
TDV-1000B	.0025	—	Yes	Yes	DC only	$1150.
TDV-1000A	.0025	.05	Yes	No	1 Meg, 40 Pf.	$1485.
TDV-1000	.0025	.05	Yes	Yes	1 Meg, 40 Pf.	$1585.
TDV-1000/1	.005	—	Yes	No	DC only	$ 885.
TDV-1000/1B	.005	—	Yes	Yes	DC only	$ 985.
TDV-1000/1A	.005	.1	Yes	No	1 Meg, 40 Pf.	$1285.
TDV-1000/1AB	.005	.1	Yes	Yes	1 Meg, 40 Pf.	$1385.
TDV-1000/2	.02	—	Yes	No	DC only	$ 685.
TDV-1000/2B	.02	—	Yes	Yes	DC only	$ 785.
TDV-1000/2A	.02	.2	Yes	No	1 Meg, 40 Pf.	$ 985.
TDV-1115/0	.0025	—	Yes	No	DC only	$1160.
TDV-1115/2	.01	—	Yes	No	DC only	$ 735.
TDV-1115/2B	.01	—	Yes	Yes	DC only	$ 835.
TDV-1115/2A	.01	.05	Yes	No	1 Meg, 20 Pf.	$1035.
TDV-1115/2AB	.01	.05	Yes	Yes	1 Meg, 20 Pf.	$1135.

* DC Input Imped: Infin. at null, to ±11 v on TDV-1000 Series and to ±1100 v on TDV-1115 Series.

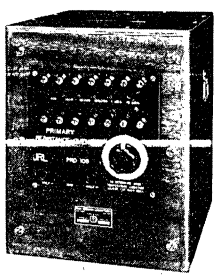
RESISTANCE REFERENCE



DMR



MRS-106

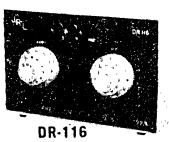


PRO-106

Model	Absolute Resistance Values	Accuracy (ppm)	Room Temp. Effect(ppm/°C)	Approximate Size (inches)
PRO-106*	10 ohms to 1 Meg	8	.1(0-28°C)	10 x 14 x 15
PRO-106L*	.001 ohms to 10 ohms	50-100	.1(0-28°C)	10 x 14 x 15
MRS-106	100 ohms to 1 Meg	15	2.5/°C	4 x 2 x 4
MRS-105	.1 ohms to 100 ohms	30-100	2.5/°C	4 x 2 x 4
DMR Series	10 ohms to 1 Meg	15	2-5/°C	5 x 4 x 3
RCO-105/7E	10 K	15	.05/°C	10 x 12 x 8
DTR Series	1 ohm to 100 K	15	2-5/°C	10 x 3 x 2
RCS-105/7	1 ohm to 10 Meg	15-100	2.5-5/°C	10 x 12 x 8
BMR Series	29,996,131,071 ohms	15-50	5/°C	5 x 4 x 3
BDR Series	100,000 ohms Max.	15	5/°C	5 x 4 x 3

* Ovenized. NOTE: Inquire about detailed specifications.

PRECISION SIX-DECADE RESISTOR BOXES

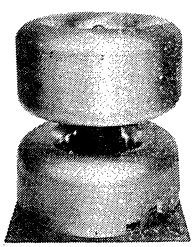


DR-116

ACCURACY: 0.01% of setting ±1 milliohm
(inquire about accuracies to .0025%)

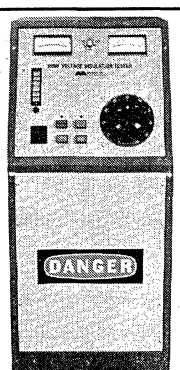
Model	DR-113	DR-114	DR-115
Total Resis. Price	1.11 K $315.	11.1 K $275.	111 K $270.
Model	**DR-116**	**DR-117**	
Total Resis. Price	1.11 M $275.	11.1 M $290.	

AC/DC HIGH VOLTAGE DIVIDERS



MODEL HV-100 SERIES AC/DC HIGH VOLTAGE DIVIDER

The HVA Series Dividers are designed to be used primarily as calibration standards of DC and 60 Hz voltages up to 300 KV. The HVA Series can be sent to the National Bureau of Standards in Washington, DC for testing. To date, all tested units have been found to be safely within ±0.05% on 60 Hz and ±0.01% on DC. Yearly stability is specified as better than 0.005.% Input resistance is 1000 ohms per volt and output taps can be provided for connection to readout instruments such as DVM's, Differential Voltmeters and other high impedance DC or AC/DC instrumentation.



FOR HIGH VOLTAGE-HIGH POWER SEE OUR MEGAVOLT SUBSIDIARY

SECTION 4000
VOL. 1
PAGE 1•761

FOR HIGH PRECISION AC CALIBRATION SEE OUR OPTIMATION SUBSIDIARY

SECTION 2900
VOL. 1
PAGE 1•492

JULIE RESEARCH LABORATORIES, INC. • 211 W. 61st ST., NEW YORK, N.Y. 10023 / (212) 245-2727 / CABLE: JULIELABS

SWEEP GENERATORS

Featuring

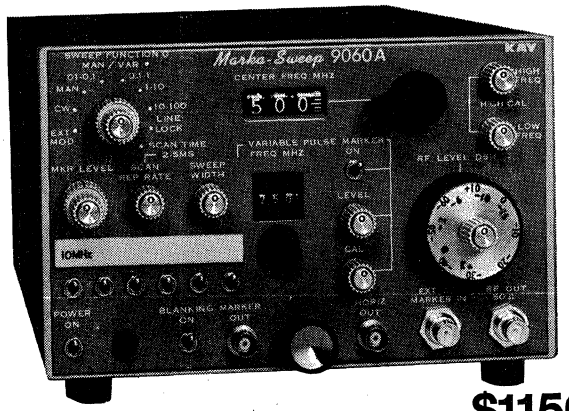
The Model 162A Wideband 1-1000 MHz Sweeper

- Full Range in One Sweep
- Flat Wide Sweeps
- Stable Narrow Sweeps
- Excellent Linearity
- Digital Frequency Readout

$1495.

A New Line of Compact Digital Sweepers

- Digital Readout of Frequency
- Extremely Flat and Linear
- Compact Size Lightweight
- High Output Low Distortion



$1150. Plus Markers

Plus...A Complete Line of Sweepers From 20Hz-4GHz

Model	Frequency Range	Sweep Width	RF Output	All with Digital Readout of Frequency Features	Price
154C	50KHz-110MHz	0-100MHz	1.0V	IF, Video & FM coverage	$ 995.00
159D	300KHz-300MHz	200KHz-300MHz	1.0V	Full VHF coverage. High, flat output.	995.00
160KE	500KHz-500MHz	500KHz-500MHz	1.0V	Low Cost. Internal provisions for fixed, harmonic & variable markers.	1095.00
160B	500KHz-600MHz	500KHz-600MHz	1.0V	Expanded frequency coverage, in one band. Excellent flatness, linearity & distortion levels.	1295.00
162B	1MHz-1000MHz	750KHz-1000MHz	0.5V	Full output range in one continuous sweep. Superb wide & narrow band operation.	1495.00
P9052	1KHz-20MHz	1KHz-20MHz	1.0V	Stable narrowing sweeping. Compact format.	950.00
P9054	50KHz-110MHz	50KHz-110MHz	1.0V	Linear IF and Video Sweeping. Low harmonic & spurious distortion.	995.00
P9059	1MHz-300MHz	0-300MHz	1.0V	High, flat start-stop VHF coverage. Compact size. Markers & precision attenuator optional.	895.00
P9060	500KHz-500MHz	0-500MHz	1.0V	Wide, ultra flat output. Compact size. Precision attenuation, with wide range vernier. Markers optional.	1150.00
P9062	1MHz-1000MHz	0-1000MHz	0.5V	Full sweep range in one band. Low distortion and spurious.	1395.00
P9063	1MHz-1700MHz	0-700MHz	0.7V	Wide frequency coverage. 3 overlapping bands.	1590.00

For complete information write or call

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(IN N. Y. STATE CALL COLLECT (516) 294-0990)

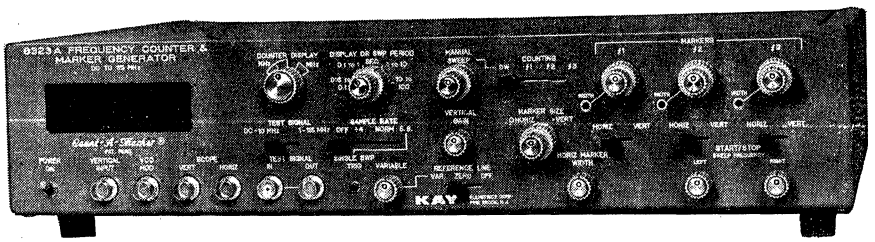
KAY Elemetrics Corp Maple Ave., Pine Brook, N. J. 07058 • 201-227-2000

MARKER GENERATORS

Featuring

The Model 8323A

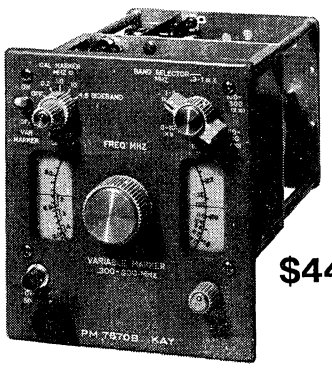
- Three Variable Markers
- Five Digit Counter
- Counts Marker Frequencies While Sweeping



$1295.

The PM7670

- Variable Birdie Marker Plug-In
- 300KHz-300MHz Utility Oscillator
- One Volt RMS Output



$440.

Plus . . . A Full Range of Plug-Ins For Kay's Sweep Systems

Pulse Marker Plug-Ins

For Model	Plug-In Model	Frequency Range	Maximum No. of Marks	Price
1500C	PCM7631	10KHz-2MHz	6	$160 plus $ 18 per marker
1500C	PCM7632	1KHz-1MHz	6	$160 plus $ 18 per marker
1500C	PCM7633	1KHz-110MHz	12 (2 bands)	$250 plus $ 18 per lo freq. $ 35 per high freq.
1500C	PCM932	2-220MHz	30 (5 groups)	$160 plus $ 18 per marker
154C	PM7650	1-110MHz	8*	$100 plus $ 35 per marker

*Standard low-cost set available at 2, 5, 10, 15, 20, 40, 60, 80 MHz – $245.00

Variable Pulse Plug-Ins

For Model	Plug-In Model	Frequency Range	Features	
154C	PM100	DC-100MHz	Dual variable pulse plus 1 and 10 MHz harmonic combs	$395.00
159D	PM300	DC-300MHz		
160B	PM600	DC-600MHz	Dual variable pulse Plus 5 and 50 MHz harmonic combs	
162A	PM1000	DC-1000MHz		

Birdie Marker Plug-Ins

For Model	Plug-In Model	Frequency Range	Maximum No. of Marks	Price
1500C	PCM861	200KHz-1GHz	6 single 5 harmonic	$160 plus $ 45 per single freq. $ 55 per harmonic comb.
154C, 159D, 160B	PM7660 PM7660	500KHz-1GHz 500KHz-1GHz	8 single* 7 harmonic	$ 50 plus $ 45 per single freq. $ 55 per harmonic comb.
162A	PM7661	1MHz-1.5GHz	1, 10, 100 MHz Harmonic	$250

*Standard low-cost set available at 1, 2, 5, 10, 20 MHz harmonic – $275.00

Variable Birdie Plug-Ins

For Model	Plug-In Model	Frequency Range	Features
1500C	PCM7670	300KHz-300MHz	Six band variable birdie marker 10, 54 MHz harmonic marker, 4.5 MHz sideband variable (OPT), CW output
159D	PM7670*		

Price: $395.00
Also available in MR76 carrying case for use as portable CW oscillator.

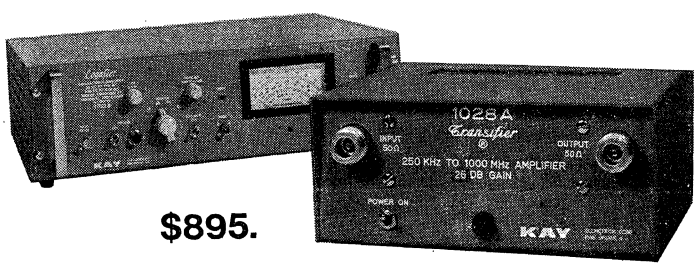
AMPLIFIERS

Featuring

- Wideband Lab Amplifiers 200Hz-1GHz

Model 1025B

- Wideband Log Amplifier • 80DB Log Range
- 20KHz-220MHz • Built-In Linear Amplifier



$895.

	1022A	1023A	1024A	1026B	1027A	1028A
Frequency Range	50KHz-8MHz	1KHz-150MHz	200Hz-300MHz	200KHz-300MHz	250KHz-600MHz	1MHz-1000MHz
Gain	34 db	40 db	30 db	20 db	30 db	30 db
Flatness	±0. 25 db	±1 db	±0.5 db to 1KHz ±3 db to 200 HZ	±0.5 db	±0.6 db	±0.6 db
Maximum Output	15 VRMS	0.5 VRMS	0.5 VRMS	3 VRMS	0.7 VRMS	0.7 VRMS
VSWR	< 1.2:1	< 1.3:1	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1
Impediance	50 ohms or 75 ohms	50 ohms or 75 ohms	50 ohms or 75 ohms	50 ohms or 75 ohms	50 ohms or 75 ohms	50 ohms 75 ohms
Price	$525	$320	$315	$395	$345	$390

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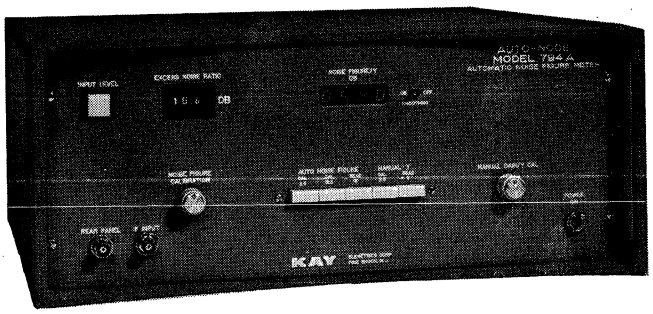
AUTOMATIC NOISE FIGURE METERS

Featuring

The New Model 794A

- Four Place LED Readout
- Extremely Accurate
- Pushbutton Operation
- Pushbutton Calibration
- Reads Noise Figure or Y-Factor



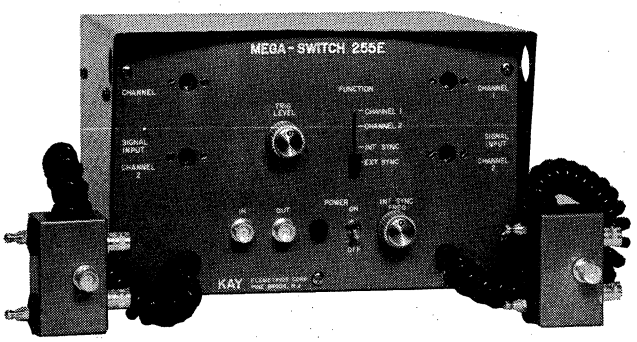
Also the Model 792B for general purpose noise measurements and the Model 793A for CATV active and passive devices.

Model	NF Range	Readout	Dynamic Range	Bandwidth	Price
792C	0-20DB	Meter	0- – 70DBM	6 MHz	$ 840.
793B		Meter			
794A		LED	+7- – 72DBM	5 MHz	$1495.

Model 255E Solid-State Electronic Switcher

- Pin Diode Switching
- Coverage to 1GHz
- Low SWR

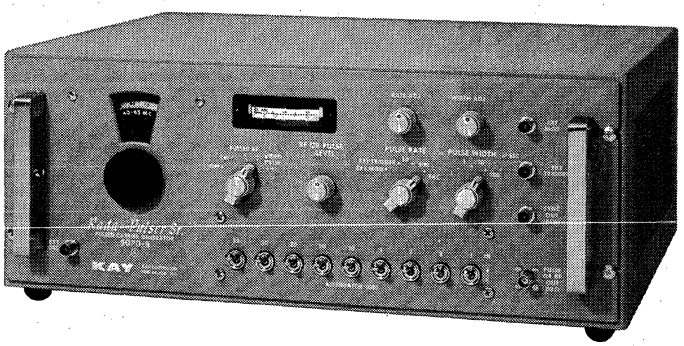
$295.



Models 5070B and 5071B RF Pulse Generators

- Frequencies to 250MHz
- Off Levels to 95DB
- Fast Rise and Decay
- Variable Pulse Rates and Widths

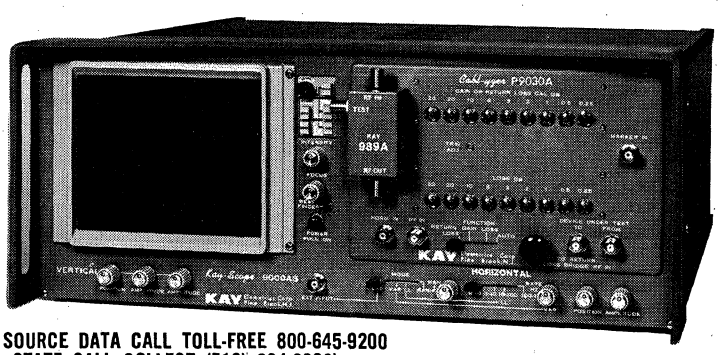
$1295.



CATV System Test Set

Optional Plug-Ins

P9020A: Summation Sweep Receiver
P9030A: Gain Loss and Return Loss Plug-In
P9040A: .5 - 300 MHz Spectrum Analyzer
P9059A: 1 - 300 MHz Sweep Generator/Summation Transmitter



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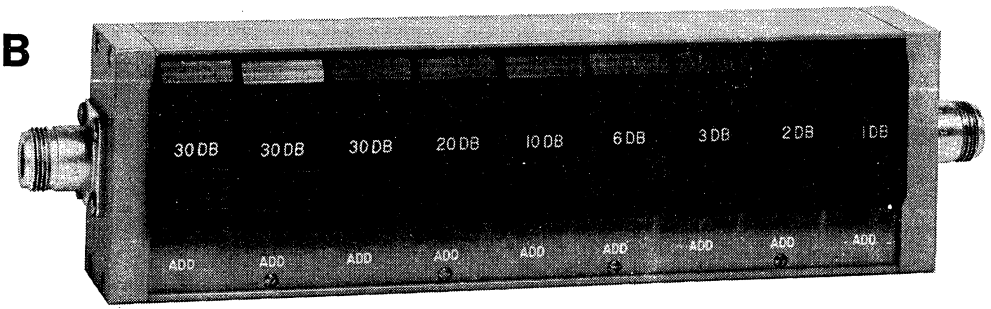
ATTENUATORS

Featuring

The Model 461B

- DC-4 GHz
- 132DB in 1DB Steps
- Positive Slide — Switch Operation
- High Accuracy
- Low Phase Shift



$350.

Also...A complete line of toggle, rotary and programmable models from DC-12.4GHz.

Model	431-C	432-D	1/432-D	439-A	460-A	437-A	1/439A	433-A	434-A	464-A
Attenuation Range	0-41DB in 1DB steps	0-101DB in 1 DB steps	0-22.1DB in 0.1DB steps	0-101DB in 1 DB steps	0-132DB in 1DB steps	0-102.5DB in 0.5DB steps	0-22.1DB in 0.1DB steps	0-119DB in 1 DB steps	0-99DB in 1 DB steps	0-120DB in 10DB steps
Freq.	DC-1GHz	DC-1GHz	DC-.5GHz	DC-1GHz	DC-1GHz	DC-1GHz	DC-1GHz	DC-500MHz	DC-1GHz	DC-1.3GHz
Controls	In-line toggle switches	In-line toggle switches	In-line toggle switches	Miniature In-line toggle switches	Miniature In-line toggle switches	Miniature In-line toggle switches	Miniature In-line toggle switches	Rotary-Digital	Rotary-Digital	Rotary Step
Typical Cverall Accuracy DC-250MHz	0.5	0.6	0- .5DB steps: ±.5DB/step 1 -10DB steps: ±.2DB/steps	0.5	0.5	0.5	0- .5DB steps: ± .05DB/step 1- 10DB steps: ± .3DB/step	0.6	0.6	1% ±.1
Typical VSWR DC-250MHz	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1
Typical Insertion Loss DC-250MHz	.1	.1	.2	.1	.1	.25	.1	.1	.1	.1
Power (watts)	1	1	1	1	1	1	1	½	1	1
Dimensions (inches)	2 x 7 x 2	2 x 9 3/4 x 2		1¼ x 6¼ x 7/8				5 x 2¼	5 x 2¼ x 2¾	1¾ x 3
Price	$80	$99	$99	$109	$145	$145	$109	$265	$240	$150

Model	467-A	435-A	436-B	1/435-A	400-B	461-B	424-B	414-A	495-A	411-A
Attentuation Range	0-12DB in 1 DB steps	0-10DB in 1 DB steps	0-70DB in 10DB steps	0-1DB in 0.1DB steps	0-70DB in 10DB steps	0-132DB in 1DB steps	0-90DB in 10DB steps	0-130DB in 10DB steps	Single step switched coax pads	Single step switched coax pads
Freq.	DC-1.5 GHz	DC-2 GHz	DC-2GHz	DC-1GHz	DC-2GHz	DC-4GHz	DC-6GHz	DC-12.4GHz	DC-4GHz	DC-12.4GHz
Controls	Rotary-Step	Rotary-Step	Rotary-Step	Rotary-Step	Miniature Rotary-Step	Slide Switches	Slide Switches	Slide Switches	Slide Switches	Slide Switches
Typical Overall Accuracy DC-250MHz	.2	0.1	1% ±.1	.025	±1%,	1% ±.1	1% ±.2	1DB or 5% whichever is greater	1% ±.1	1DB or 5% whichever is greater
Typical VSWR DC-250MHz	1.2:1	1.1:1	1.1:1	1.1:1	1.1:1	1.05:1	1.05:1	1.1:1	1.05:1	1.1:1
Typical Insertion Loss DC-250MHz	.15	.1	.1	.1	.1	.1	.1	.1	.1	.1
Power (watts)	1	1	1	½	¼	1	1	2	1	2
Dimensions (inches)	7/16x2 11/16	2 dia. x 2 1/8	2 dia. x 2 7/8	2 dia. x 2 1/8	1¼ dia. x 2 3/16	8 3/8 x 2 3/8 x 1 5/8	2 3/8 x 4¼ x 1 5/8	2 3/8 x 5 1/8 x 1 5/8	2 3/8 x 1½ x 1 5/8	
Price	$150	$90	$90	$90	$125	$350	$195	$395	$50	$95

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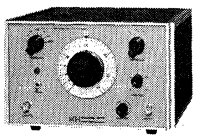
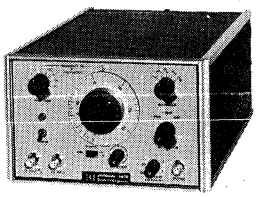
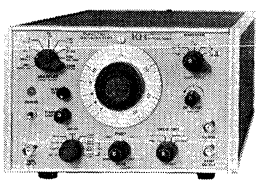
Function Generators & Oscillators



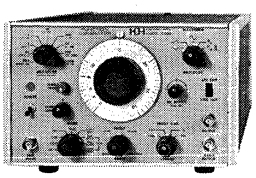
MODEL 5000 $295
0.2Hz to 3MHz
∿⊓∿
D.C. Offset: ±5V



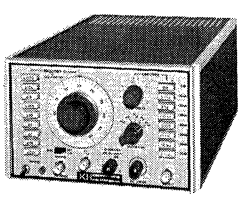
MODEL 5100A $395
0.002Hz to 3MHz
∿⊓∿⌐¬⎍⎍^^
V.C.O.: 1000:1
D.C. Offset: ±5V
db Attenuator



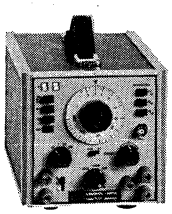
MODEL 5200 $495
0.002Hz to 3MHz
∿⊓∿⌐¬⌐⎍
1000:1 Sweep
Triggered/Gated/Burst
V.C.O.: 1000:1



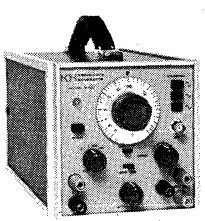
MODEL 5300 $695
0.002Hz to 3MHz
∿⊓∿⌐¬⌐⌐⎍
1000:1 Lin-Log Sweep
Triggered/Gated/Burst
V.C.O.: 1000:1



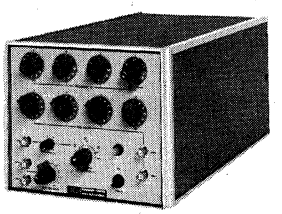
MODEL 5400A $575
0.002Hz to 5MHz
∿⊓∿⌐¬⎍⎍^^
V.C.O.: 1000:1
D.C. Offset: ±10V
db Attenuator



MODEL 5600 $395*
0.002Hz to 2MHz
∿⊓∿
D.C. Offset: ±5V
Line or Battery Operation
*Battery Option Add $70

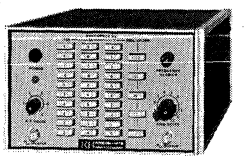


MODEL 5700 $295
0.002Hz to 2MHz
∿⊓∿
D.C. Offset: ±5V
1000:1 Tuning



MODEL 4024 $1200
0.001Hz to 100kHz
0.01% distortion
∿⊓⎍
0.5% Freq. acc.

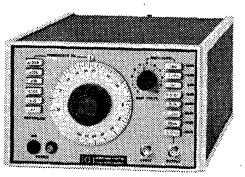
MODEL 4025 $1950
0.1% Freq. acc.



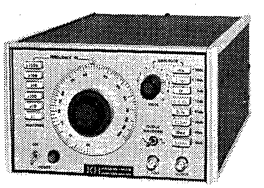
MODEL 4100A $595
0.01Hz to 1MHz
0.02% distortion
∿⊓
0.5% Freq. acc.

MODEL 4000 $895
0.01Hz to 100kHz
0.01% distortion
Sine and quad.
0.5% Freq. acc.

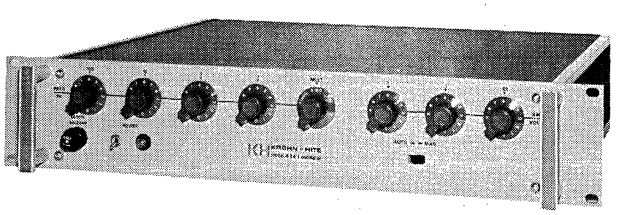
MODEL 4001 $1450
0.1% Freq. acc.



MODEL 4200 $395
10Hz to 10MHz
0.1% distortion
0.025 db Response
db Step Attenuator



MODEL 4300 $475
10Hz to 10MHz
∿⊓
0.1% distortion
0.025 db Response
db Step Attenuator



PROGRAMMABLE OSCILLATORS
Digitally programmable series for automatic and remote operation.

Frequency Range	Model	Freq. Acc. %	Dist. %	Price
0.1Hz to 100kHz	4030R	0.5	0.01	$1495 (base price)
0.1Hz to 100kHz	4031R	0.1	0.01	$2145 (base price)
1Hz to 1MHz	4131R	0.1	0.02	$1495
1Hz to 1MHz	4141R	0.1	0.02	$1695
1Hz to 1MHz	4130R	0.5	0.02	$1195
1Hz to 1MHz	4140R	0.5	0.02	$1395

KROHN-HITE CORPORATION
580 Massachusetts Ave., Cambridge, Mass. 02139, (617) 491-3211, TWX 710-320-6538

SALES OFFICES: ALA., Huntsville (205) 534-9771; CAL., Santa Clara (408) 243-2891, Inglewood (213) 674-6850; COLO., Littleton (303) 795-0250; CONN., Glastonbury (203) 633-0777; FLA., Orlando (305) 894-4401; HAWAII, Honolulu (808) 941-1574; ILL., Des Plaines (312) 298-3600; IND., Indianapolis (317) 244-2456; MASS., Lexington (617) 861-8620; MICH., Detroit (313) 526-8800; MINN., Minneapolis (612) 884-4336; MO., St. Louis (314) 423-1234; N.C., Burlington (919) 227-2581; N.J., Bordertown (609) 298-6700; N.M., Albuquerque (505) 255-2440; N.Y., E. Syracuse (315) 437-6666, Rochester (716) 328-2230, Wappingers Falls (914) 297-7777, Vestal (607) 785-9947, Elmont (516) 488-2100; OHIO, Cleveland (216) 261-5440, Dayton (513) 426-5551; PA., Pittsburgh (412) 371-9449; TEX., Houston (713) 468-3877, Dallas (214) 356-3704; VA., Springfield (703) 321-8630; WASH., Seattle (206) 762-2310; CANADA, Montreal, Quebec (514) 636-4411, Toronto, Ontario (416) 444-9111, Stittsville, Ontario (613) 836-4411, Vancouver, British Columbia (604) 688-2619.

Kurz-Kasch, Inc. Digital Test Equipment

1421 S. BROADWAY, DAYTON, OHIO 45401

Now... you can check logic levels in virtually any (DTL, TTL) IC system quickly and accurately. The small shirt pocket size Logic Probes indicate "Highs", "Lows", and "Dead Band" readings precisely through color-coded readouts in the probe tip. Detects unterminated pins also. All probes are rugged, solid-state instruments in attractive chrome-finished steel cases. Power is derived from the equipment being tested. All probes are overvoltage tip protected to intermittent ±100VDC, power lead reversal protected. Use logic probes for field service testing, inspection, monitoring, production line checkout, or Engineering Lab circuit design.

LOGIC PROBE MODEL LP-510 (DTL, TTL COMPATIBLE) FOR 4.75-5.5VDC LOGIC SYSTEMS

SPECIFICATIONS

Probe Power Requirements: 4.75 to 5.5VDC

Voltage: all logic voltage levels from 4.75 VDC, to Vc.

Input Impedance: Greater than 150K ohms for logic "1" level

Logic Voltage Level Response: 0-0.8VDC = logic "0" readout (white) at tip

0.8-2.4VDC = no readout

2.4-Vc = logic "1" readout (red) at tip

No readout in case of missing pin or unconnected wire

Size: 5/16" dia., 6" long, 26¾" leads with clip-on terminals. Price $44.95

LOGIC PROBE MODEL LP-520 (DTL, TTL COMPATIBLE) FOR COMPLETE ADVANCED TESTING OF 4.75-5.5VDC LOGIC

This advanced Model LP-520 offers complete logic analysis capability, plus high speed pulse detection with separate readout.

Three color-coded readouts located at the probe tip for fast, easy testing. Pulse readout illuminates to display high speed pulse trains, or single cycle (— or +) pulse of 50 nanoseconds duration or greater. LP-520 is the only test instrument that will perform all necessary IC Logic test functions at an economical price.

Even more useful with G-S&M options.

SPECIFICATIONS

Probe Power Requirements: 4.75 to 5.5VDC

Voltage: all logic voltage from 4.75VDC to Vc.

Input Impedance: greater than 150K ohms for logic "1" level

Logic Voltage Level Response: 0-0.8VDC = logic "0" readout (white) at tip

0.8-2.4VDC = no readout

2.4-Vc = logic "1" readout (red) at tip

No readout in case of missing pin or unconnected wire

Pulse Detection Response: high-speed pulse trains, or single cycle (negative or positive pulse of 50 nanoseconds duration or greater) = blue readout at tip. Pulse stretcher remains on for 200 milliseconds

Size: 5/16" dia., 6" long, 26¾" leads with clip-on terminals. Price $69.95

LOGIC PROBE MODEL LP-530 (HTL COMPATIBLE) FOR ADVANCED TESTING OF 12-15VDC LOGIC

SPECIFICATIONS

Probe Power Requirements: 12 to 15VDC

Voltage: all logic voltage levels in the 12-15VDC range.

Input Impedance: greater than 100,000 ohms for logic "1" level

Logic Voltage Level Response: 0-1.5VDC = logic "0" readout (white) at tip 1.5-10VDC = no readout

10-Vc = logic "1" readout (red) at tip

No readout in case of missing pin or unconnected wire

Size: 5/16" dia., 6" long, 26¾" leads with clip-on terminals. Price $44.95

LOGIC PROBE MODEL LP-540 (HTL COMPATIBLE) FOR COMPLETE ADVANCED TESTING OF 12-15VDC LOGIC

This advanced Model LP-540 offers complete logic analysis capability, plus high speed pulse detection with separate readout.

Three color-coded readouts located at the probe tip for fast, easy testing. Pulse readout illuminates to display high speed pulse trains, or single cycle (— or +) pulse of 50 nanoseconds duration or greater. LP-540 is the only test instrument that will perform all necessary HTL IC logic test functions at an economical price.

SPECIFICATIONS

Probe Power Requirements: 12 to 15VDC

Voltage: all logic voltage levels in the 12-15VDC range.

Input Impedance: greater than 100,000 ohms for logic "1" level

Logic Voltage Level Response: 0-1.5VDC = logic "0" readout (white) at tip 1.5-10VDC = no readout

1.5-10VDC = no readout

10-Vc = logic "1" readout (red) at tip

No readout in case of missing pin or unconnected wire

Size: 5/16" dia., 6" long, 26¾" leads with clip-on terminals. Price $69.95

(G-S-M OPTIONS) ADD THESE OPTIONS:

G-S-M: Gating Feature (-G) — 3 Channel input for timing. Pulse indicator displays only when probe tip and gate gates are in coincidence. Memory & Stretch (-M) — Push-pull switch for selecting stretch or latch mode. Stretch mode detects high speed pulse and displays blue "P" lamp for 200 mS. Latch mode captures high speed pulse/trains and latches blue "P" on until reset. 5 nanosecond capability (-S) — Allows detection of pulses up to 10 x faster than standard probes. Each option $10.00.

LOGIC GENERATOR MODEL LG-580 FOR DIGITAL CIRCUITRY

Model LG-580 is new shirt pocket size, all solid-state logic (square wave) generator for trouble-shooting, testing, or inspection of digital circuitry. Signal injection is made through the metal probe tip to the IC under test. Power is provided by the system under test.

SPECIFICATIONS

Model LG-580

Power Requirements: 4.75-5.5VDC (built-in power regulator)

Voltage: All logic systems from 4.75 to Vc compatible with DTL, TTL and similar families (cannot be damaged by hooking up power leads backwards) Output: Greater than 2.5 volts into 660 ohms (5.5 volt power). Cannot be damaged by short circuiting output.

Generator Response: Symmetrical wave output

Rise Time: Less than 25 Ns, typically 15 Ns. (10% to 90% points)

Fall Time: Less than 25 Ns, typically 15 Ns. (90% to 10% points)

Frequencies: 100 Hz, 1 KHz, 100 KHz and MHz or a single pulse (one shot mode).

To select the clock frequencies of the one shot mode, rotate the output tip. In the one shot mode, depressing the switch at the end of the probe generates a 1μ sec. pulse.

Frequency Accuracy: Typically 10-15%

Size: 5/16" dia., 6½" long, 26¾" dual leads with clip-on terminals. Price $79.95

MODEL LG-581 FOR 12-15VDC, OTHER FEATURES AS LG-580. Price $89.95

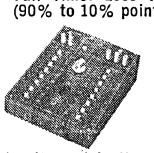
KURZ-KASCH NEW PORTABLE DIGITAL IC TESTER

Completely Portable

The Model IC-590 is a portable battery powered Digital IC tester for static and dynamic testing of all 14 and 16 pin dual in-line IC modules of the DTL and TTL, 5 and 15 volt families. Flat pack and TO-5 Modules may be tested by using appropriate adapters.

Set Up From Factory Specs

The Model IC-590 is designed to be used in conjunction with published IC specification sheets for proper programming of the IC under test. Four-position, high quality, slide switches for each of sixteen pins allow the selection of Vcc, Gnd, Clock or Nc (no connection) for each pin. A single selector switch for 5 to 15 volt logic changes all input and output monitoring circuits. A three-position switch selects one of two internal clock frequencies or an external mode. All input and output conditions are displayed by two lamp indicators marked level "0" and "1". The same patented* circuit used in Kurz-Kasch logic probes, instantly displays the logic condition on any pin of the IC selected by a seventeen position rotary switch. The "0" and "1" indicators uniquely remain off on any non-terminated pins.



SPECIFICATIONS

Input: Internal square wave of 2 Hz or 15 KHz or external input applied to 5-way binding post.

Level Indicator Thresholds:

	5 Volts	15 Volts
Logic "0" =	0 to 1.0VDC	0 to 1.5VDC
Logic "1" =	2.4VDC to Vcc	10.0VDC to Vcc

Indicators remain off in case of open pins or improper logic levels

Test Voltages:

5 or 15VDC selected by Vcc switch.

5 Volt = 5.0VDC ±.3VDC

15 Volt = 14.5VDC ±.3VDC

Accommodates all 14 and 16 pin devices

Battery Requirements:

6 "C" size cells are used if testing 5 volt logic only. 12 "C" size dry cells if both 5 and 15 volt logic are to be tested. Set test select switch to "BAT" position. Level "1" light illuminates if batteries are good. IC-590 Price $169.95

Model IC-591 with internal power supply and cable adapter for 'firing up' card assemblies. Price $295.00

JUNCTION VERIFIER MODEL JV-1505

All new solid state Junction Verifier Model JV-1505. This unit verifies the operating condition of any junction on most solid-state, semi-conducting junction type electronic devices in use today.

The JV-1505 determines: a. Junction open, b. Junction shorted, c. Junction conducting, and d. Direction of current flow. The JV-1505 is usable in-circuits of 10 microfarads shunt capacitance or less and 1500 ohms shunt resistance or more. This includes most solid-state circuitry in use today.

The JV-1505 verifies all junction type devices such as: conventional silicon, germanium and selenium diodes, zeners, rectifier assemblies, transistors (NPN & PNP) L.E.D.'s, F.E.T.'s tunnel diodes and other devices.

The tester uses a unique digital technique that samples both forward and reverse current. A new circuit (patent pending) using the latest digital IC technology, pulse syncs current in both directions, samples, compares and then displays on the diode symbol screen located on the front panel.

Size: Approximately 4¾" x 4¼" x 2¾".

Case: Rugged sixteen gauge aluminum, coated with durable, textured polyurethane in instrument blue.

Front Panel: Contemporary brushed aluminum.

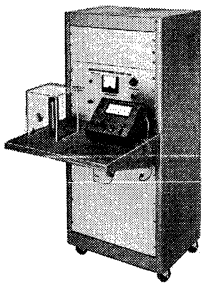
The Kurz-Kasch Junction Verifier is ideal for quality control inspection, bench, laboratory, production, final inspection and field service uses. Warranted for one year. AC Model JV-1505 with tilting bail, priced at $44.95. Battery Model JV-1506, priced at $30.95.

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N.Y. STATE CALL COLLECT (516) 294-0990)

MAGNETIC INSTRUMENTATION SPECIALISTS

MAGNETIZERS

LOW COST

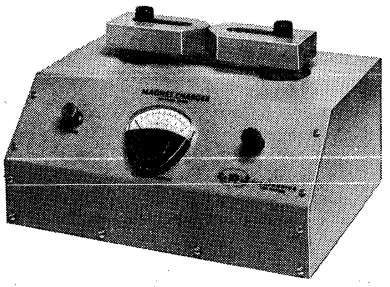


LDJ MODEL 450-20

Produces 500 to 2000 watt-seconds and can magnetize almost any shape of magnet or magnetic assembly. A portable magnetizer requiring 115 VAC @ 15 amps, capable of charging Alnico magnets up to 60 lbs., and ceramic magnets up to 20 lbs. Bench or console cabinet.

Price: From $1,835.00

GENERAL PURPOSE

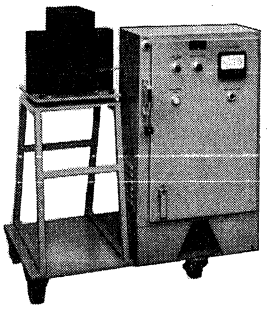


LDJ MODEL EM 250

Low cost electromagnet which produces a magnetic field across movable and/or reversible pole pieces. Adaptable to any size of magnet less than 5" long, and 1" x 2" cross section. Solid state offers maintenance-free operation. Field of 100,000 oersteds produced by 25,000 N I.

Price: $310.00

HI-SPEED

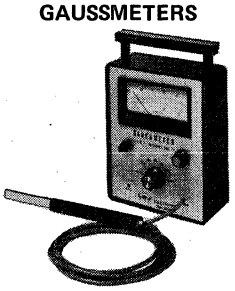


LDJ MODEL 1001

Cycle rates of 7200 per hour with an energy storage in excess of 400 watt-seconds for high speed magnetizing. Produces up to 1000 watt-seconds. Automatic programming to stop the magnetizing cycle, if a sensor does not receive a signal from the magnetic field.

Price: $3,425.00

GAUSSMETERS

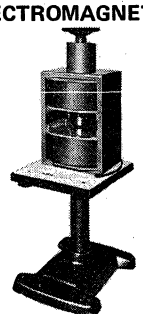


LDJ MODEL 101

Economy gaussmeter, that provides sensitivities and flexibility usually found on the more expensive instruments. Six ranges from 100 to 30,000 gauss, full scale. Readout is a 4" panel meter with a mirror scale. Accuracies of 2%. Includes precalibrated Hall probe.

Price: $195.00
including probe

ELECTROMAGNETS

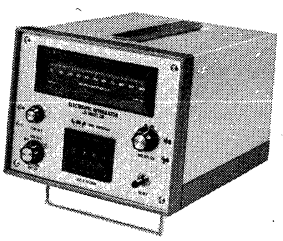


LDJ MODEL EM 6004

Adjustable air gap electromagnet capable of producing a 12,000 oersted field in a 4" dia. pole. With tapered iron cobalt pole pieces, fields of greater than 20,000 oersteds can be produced. Power supply produces 75,000 amp-turns. Uses 115 VAC @ 15 amps, 50-60 Hz.

Price: $2,565.00 to $4,550.00

ELECTRONIC INTEGRATORS FLUXMETER

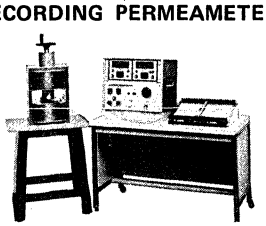


LDJ MODEL 701

A precision instrument for research and development of magnetic materials. It can be used as a fluxmeter, as a gaussmeter, or as voltage integrator. Output signal of 1 volt, readout is Weston Lightbeam Meter, or digital voltmeter. Range of 100 maxwell — turns to 100 x 10^5 maxwell-turns.

Price: From $605.00

RECORDING PERMEAMETER

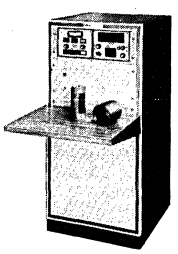


LDJ MODEL BH 5000

Recording Permeameter, versatile enough to permit both the absolute calibration required for research and the high speed comparative testing required for production quality control. Plots both intrincic and normal hysteresis curves, (2nd quadrant, or full curve), in less than 15 seconds, and consists of modular components. Utilizes 11" x 17" direct inking X-Y recorder. Maximum sensitivity on B-axis of 100 maxwell-turns/div. and H-axis of 10 oersteds, full scale. Magnetic field variable from 0 to 12,000 oersteds at 1" air gap.

Price: From $7,500.00

MAGNET PROCESSING SYSTEMS

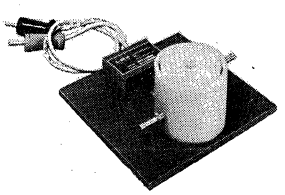


LDJ MODEL 2001

A Magnet Processing System for automatic charging and stabilizing or calibrating of permanent magnets assemblies, and permanent magnets, where speed, accuracy and precision are needed. It is capable of handling a wide variety of magnets and magnet assemblies. Typical cycle time will run as low as three seconds. The charging energy is 1800 watt-seconds, with a maximum charging current of 3500 amps. The demagnetizing range is approximately 50% of the saturated value. The accuracy of the final field value is 0.1% relative to the standard.

Price: $1,500.00 to $7,500.00

TEST AND MAGNETIZING FIXTURES



Design parameters are dependant upon the contraints imposed by the application. Optimum design require the following information: 1. Materials to be magnetized, or tested, 2. Configuration of assembly and magnet material, 3. Any unique, or special problems.

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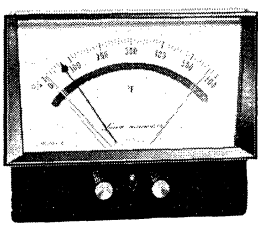
1064 Naughton • Troy, Michigan 48084 • (313) 689-3623
Specialists in Magnetic Equipment

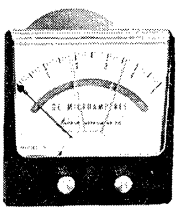
Larson CONTACTLESS METER CONTROLLERS

Where there is INDICATION, there is a need for CONTROL

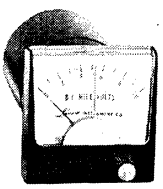
Wide View



4½″



3½″



2½″

This is exactly what the Larson Controller offers you. Our instruments are designed to indicate and control any electrical variable from:

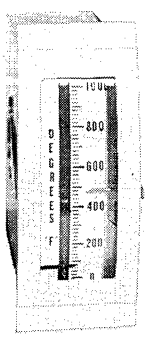
5 μa up to 1000 μa, dc
1 ma to 1000 ma, dc or ac
5 mv to 1000 mv
1 amp to 1000 amps dc or ac
1 volt to 1000 volts dc or ac

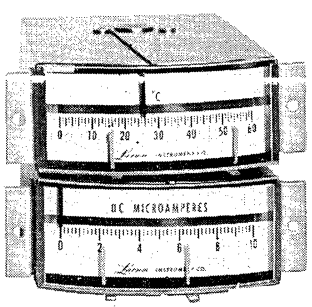
The variety in models and ranges continues... AC Volts Rectifier, RF Amps, Watt meters, Expanded Scale and Temperature Controllers from 100°C to 3000°F plus the newest design which features a Temperature sensitivity of 60°C f.s. with Thermistor or Thermocouple output amplifier.

Features:

- Overall depth, ONLY 3.95″
- No moving wires — no failures
- Continuous indication beyond set point
- Fail-safe circuit
- Repeatability ¼%
- Relay contacts 10 Amps 115V
- Amplifier for 115V AC or 24V DC input

Space Saver





2½″ and 3½″

For your design, we have a selection of styling and sizes. The Wide Vue, available in 2.5″, 3.5″ and 4.5″; single or dual limits. Shadow box optional.

The Space Saver, in 2.5″ and 3.5″, for vertical or horizontal mounting; single or dual limits.

The method of operation is an optical system, consisting of a miniature light source with a life expectancy of 100,000 hours. Each set pointer is equipped with a photo-electric sensing device. The indicating pointer has a segment which actuates the sensing elements precisely at the control point. They will remain actuated anywhere beyond the set point.

Control is established by means of a transistorized electronic circuit. The transistor amplifier and load relay are continuously energized up to the control point. In the event of power or light failure, the fail-safe circuit will de-energize the relays.

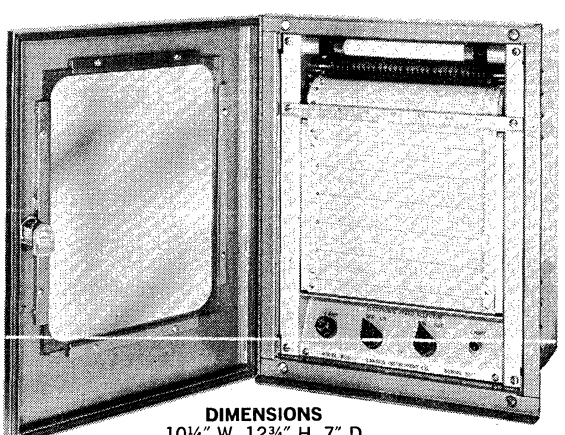
In the Larson Meter Relays, we designed for you, **our** Customer, modern styling, incorporating components obtaining top reliability...to give **your** Customer the best in Quality.

Inkless Event Recorder

The Larson Model ROS instrument will continuously record the time, sequence and duration of as many as 30 different events on one chart. The record is made on electro-sensitive paper, by a stylus which marks only when current flows through the paper. The recording is instantaneous, accurate and permanent.

RESPONSE and **RESOLUTION.** The recorder can remain on stand-by for an unlimited length of time, yet be ready to respond within 1 Millisecond when a signal is applied. The instrument will record up to 60 pulses per second for each stylus. Response time of the styli is 1 Millisecond.

CHART SPEEDS. Are available for ½″ per hour to 10″ per second. Standard speeds are ½″, 1″, 2″, 3″, 4″, 6″, 8″ and 10″ per hour, minute or second.

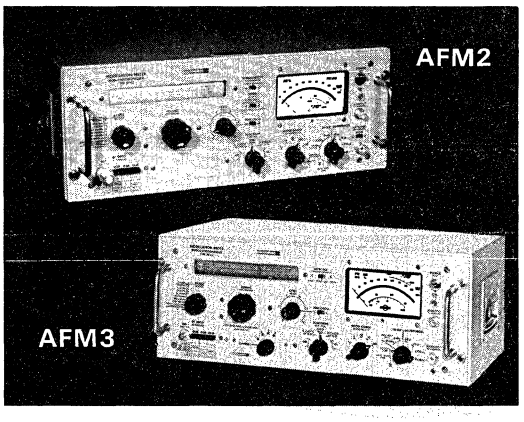


DIMENSIONS
10¼″ W, 12¾″ H, 7″ D.
WEIGHT 20 Lbs.

Larson INSTRUMENT COMPANY, INC.
GREENBUSH RD. • ORANGEBURG, N.Y. 10962 • 914 EL 9-3800

TEST INSTRUMENTS by RADIOMETER COPENHAGEN

AM/FM MODULATION METERS



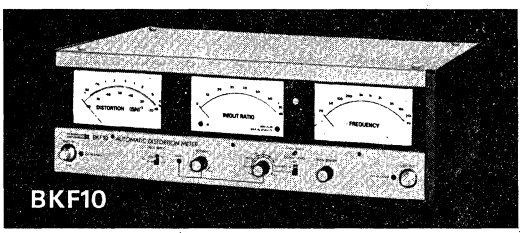
WIDE BAND, TYPE AFM2

For complex mod. signals, multiplex stereo, etc. RF coverage from 5 to 1002 MHz. Sensitivity: 3mV to 10 V into 50Ω. Automatic level control. FM Dev. ranges from ±3 to 300 kHz f.s. Xtal oscillator plug-ins.

NARROW BAND, TYPE AFM3

Special features for comm. work including filters and deemphasis networks. RF range from 6 to 1001 MHz. Sensitivity 3 mV to 10 V. Automatic level control. FM Dev. ranges ±1 to 100 kHz f.s. AM Mod. from ±1 to 100% f.s.

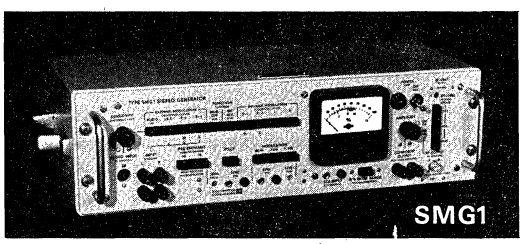
AUTOMATIC DISTORTION AND FREQUENCY RESPONSE ANALYZER



DISTORTION ANALYZER, BKF10

A unique instrument providing simultaneous measurement of distortion and amplitude response vs frequency. Incorporates low distortion sweep generator from 20 Hz to 20 kHz. Outputs for automatic recording.

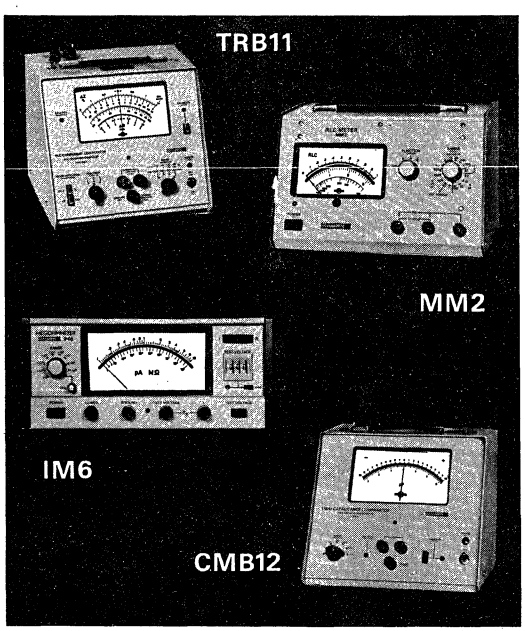
STEREO SIGNAL SOURCE



STEREO GENERATOR, SMG1

Exceptionally stable stereo signals with push button selection of all combinations. Both composit and RF outputs. Extremely low distortion. Excellent channel separation.

COMPONENT TEST INSTRUMENTS



R-L-C COMPONENT COMPARATOR, TRB11

Compares magnitude and phase angles at 1 kHz. 200 pF to 20μF, 10Ω to 10 MΩ, 1 mH to 10 H. Magnitude Deviations: ±1.5 to 100% f.s. Phase Angle Deviation: ±.015 to 0.6 radian f.s.

R-L-C METER, MM2

Direct measurements of Resistance: 0.1Ω to 1MΩ, Inductance: 3μH to 100 H., Capacitance: 3 pF to 5000 μF, five test frequencies from 160 Hz to 1.6 MHz. Provision for Ext. DC Bias.

MEGOHM METER, IM6

High resistance measurements from 1 to 10^9 megohms. Current measurements from 1 pA to 1 mA. Readings on single 9 decade range or 8 dual decade ranges.

CAPACITANCE COMPARATOR, CMB12

Checks capacitance directly or against a standard. 7 ranges from ±1 to ±1000 pF f.s. Test frequenc 1 MHz. Ext. bias to ±60 V.

Continual improvement is a Radiometer tradition. They reserve the right to change specifications without notice.
Send for latest detailed information.

THE LONDON COMPANY / 811 SHARON DRIVE / CLEVELAND, OHIO 44145 / (216) 871-8900

LogiMetrics Wide Range Signal Generator with FM, AM and Pulse Modulation

The model 750A AM-FM signal generator covers the full range of 4.5 MHz to 520 MHz. It offers direct 5-digit frequency readout with variable resolution on its LED display. This instrument is the lowest price generator in its range class to provide this important feature.

The 750A provides excellent FM, with deviation to ±300 kHz. It also provides 100% AM and a wide range pulse modulation. All modes can be used either independently or simultaneously for developing complete modulation patterns on the RF carrier.

The instrument is all solid state and features accuracy levels of ±0.0002% to 0.005%—at least one order of magnitude better than the accuracy available on previous instruments in this price range. RF output is 1 volt and is automatically leveled to within ±½dB.

LogiMetrics, INC.

100 Forest Drive
Greenvale, New York 11548
(516) 484-2222 • TWX: 510-223-0646

PARTIAL SPECIFICATIONS

FREQUENCY:

Range: Continuously tunable from 4.5 to 520 MHz.

Readout: 5 digit LED display with variable resolution of 1 kHz, 10 kHz, or 100 kHz

Accuracy: ±½ the resolution plus the reference frequency accuracy. Internal Reference Frequency is typically less than 1 PPM at room temperature.

Spectral Purity:

Harmonics: At least 30 dB below carrier.

AM Hum & Noise Sidebands: At least 70 dB below the carrier.

RF OUTPUT:

Level: Continuously adjustable from 0.1uV (—127 dBm) to 1V RMS (+13 dBm) into 50 ohms resistive load.
Leveling is less than ½ dB variation with frequency.

MODULATION: AM, FM, Pulse, Simultaneous AM-FM, Pulse-FM.

Amplitude Modulation:

Range: 0 to 100%.

Meter Accuracy: ±5% of full scale (20 Hz to 20 kHz).

Distortion: Less than 1% for 30% AM, 3% for 70% AM.

Internal: 400 & 1000 Hz (±5%).

External: Frequency: DC to 20 kHz.

Frequency Modulation:

Deviation: 0 to 300 kHz peak, in five ranges: 0 to 3 kHz; 0 to 10 kHz; 0 to 30 kHz; 0 to 100 kHz and 0 to 300 kHz.

Distortion: Less than 0.5% at 75 kHz deviation.

Internal: 400 & 1000 Hz

External: Frequency: DC to 100 kHz. Level: 3V RMS into 600 ohms.

General

Weight: 27 lbs.
Price: $3100.

Logimetrics AM and FM Signal Generators

SIGNALOCK® FOR ±10 Hz STABILITY

Model: 925
Frequency Range: 50 kHz to 80 MHz
Frequency Display: 6 digits

SPECIAL FEATURES

- Synthesizer-like stability at signal generator prices
- Internal counter available for independent, external use
- Calibrated RF output from 3 volts to 0.1 microvolt leveled to within ± 0.5 dB

PARTIAL SPECIFICATIONS

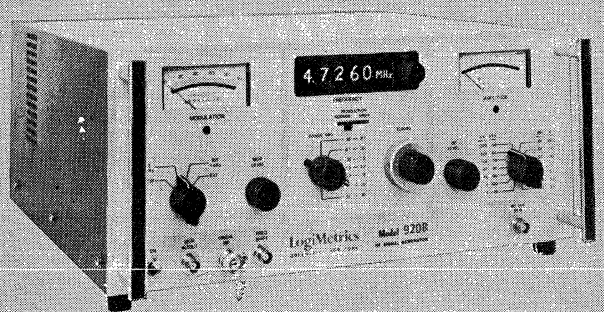
FREQUENCY

Range: 50kHz to 80 MHz
Readout: 6 digit; 10 kHz, 1kHz and 100 Hz resolution
Fine Tuning: to 1 PPM
Accuracy: Locked: ± 10 Hz
Unlocked: ± 50 Hz
RF Stability Locked: Long Term = reference frequency stability
Short Term = ± 10 Hz averaged over 1 second
Internal Reference Frequency
Stability-Temperature: Less than 2×10^{-7}/°C
Aging Rate: Less than 1×10^{-6} per year
Accepts External Frequency

EXTERNAL COUNTER OPERATION

Frequency Range: 50 kHz to 80 MHz
Resolution: 100 Hz, 1 kHz, and 10 kHz
Count Accuracy: ± 1 count ± reference frequency
Maximum Sensitivity: 50 mV rms
Input Impedance: 50 nominal
Price: $2975.
All other specifications same as 920B

MODERATE PRICE, 5 DIGIT DISPLAY



Model: 920B
Frequency Range: 50 kHz to 80 MHz
Frequency Display: 5 digits

SPECIAL FEATURES

- Frequency accuracy up to 0.001%
- All solid state
- RF output up to 3 volts (+ 23 dBm), leveled to within ± 0.5 dB

PARTIAL SPECIFICATIONS

FREQUENCY

Range: 50 kHz to 80 MHz
Readout: 5 digit
Accuracy: ±500 Hz from 3.2 to 80 MHz
±50 Hz below 3.2 MHz
RF Stability: Typically 20 PPM + 5 Hz per 10 minute period

RF OUTPUT

Level: Continuously adjustable from 0.1uV (−127 dBm) to 3V RMS (±23 dBm).
Accuracy: Better than ±1.0 dB at any frequency.
Leveling: Frequency change is less than ±0.5 dB.
Impedance: 50 ohms.

SPECTRAL PURITY

Harmonics: At least 30 dB below carrier.
AM Hum and Noise Sidebands: At least 70 dB below carrier.
Residual FM: Less than 1 PPM + 10 Hz.

AMPLITUDE MODULATION

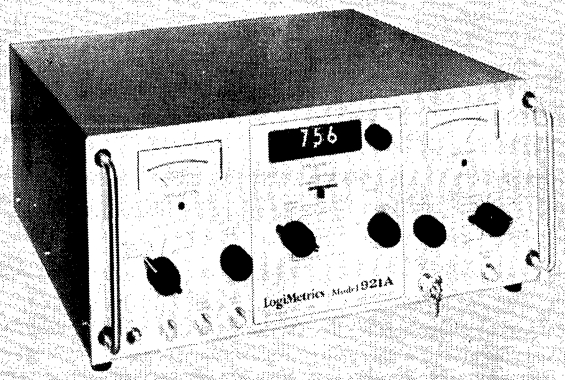
Distortion: On 1 volt range and below, less than 1% distortion for 30% modulation, and less than 3% distortion for 70% modulation.
Meter Accuracy: ±5%
Internal: 400 and 1000 Hz.
External: DC to 20 kHz.

GENERAL

Dimensions: 7"H x 16¾"W x 18⅜"D.
Weight: 27 lbs.
Price: $2175.

LogiMetrics INC
100 Forest Drive • Greenvale, New York 11548
(516) 484-2222 • TWX: 510-223-0646

Logimetrics AM and FM Signal Generators



LOW COST SPECIAL!

Model: 921A
Frequency Range: 50 kHz to 80 MHz
Frequency Display: 3 digits

SPECIAL FEATURES

- Same price as the H-P 606, but this unit is all solid state, has digital display and a wider frequency band
- Compatible with all frequency synchronizers
- Accuracy to 0.01%

PARTIAL SPECIFICATIONS

FREQUENCY:
Range: 50 kHz to 80 MHz
Readout: 3 digit. X100 Cal switch for increased frequency resolution.
Accuracy: 0.01% at 100 kHz intervals
Stability: 50 PPM or 5 Hz per 10 minute period
Frequency Analog: to operate with any synchronizer

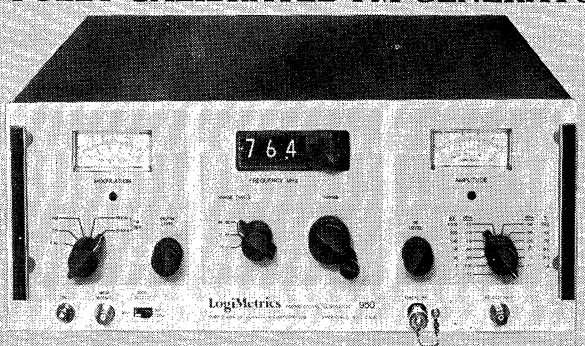
RF OUTPUT:
Level: 0.1 microvolt (–127 dbm) to 3 volts (+23 dbm)
Accuracy: within ±1 db
Leveling: Less than ± 0.5 dB
Impedance: 50 ohms
Auxiliary RF Output: Fixed CW signal of 200 mV RMS

SPECTRAL PURITY
Harmonic Output: At least 30 dB below carrier
Residual FM: Less than 1PPM
AM Hum and Noise Sidebands: At least 70 dB below carrier

AMPLITUDE MODULATION
Distortion: 1% at 30% AM and less than 3% at 70% AM
Meter Accuracy: ±5%
Internal: 400 Hz and 1 kHz (±5%)

GENERAL
Dimensions: 7" H x 16¾" W x 16⅜" D
Price: $1730.

FULLY CALIBRATED FM GENERATOR



Model: 950
Frequency Range: 10 to 80 MHz
Frequency Display: 3 digits

SPECIAL FEATURES

- Calibrated FM, AM and CW with full 1 volt output
- Output automatically leveled to within 0.5 dB
- Accuracy to 0.002%

PARTIAL SPECIFICATIONS

FREQUENCY
Range: 10 to 80 MHz
Display: Three digit with X100 expander
Accuracy: ±0.002% to ±0.006%
Stability: 50 PPM per 10 minute period

RF OUTPUT
Level: 0.1 microvolt (–127 dBm) to 1V (+13 dBm)
Accuracy: Better than ±1 dB
Leveling: ±0.5 dB
Impedance: 50 ohms
Auxiliary RF Output: 100mV RMS

FREQUENCY MODULATION
Deviation: 0 to 20 kHz
Deviation Accuracy: ±10%
Distortion: Less than 3% at 10 kHz and 5% at 20 kHz

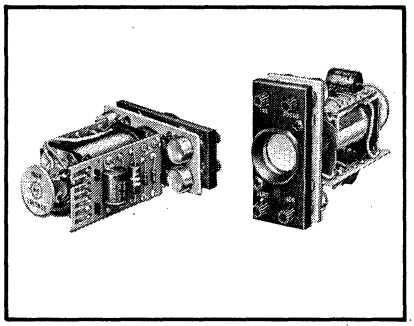
AMPLITUDE MODULATION
Range: 0 to 30%
Meter Accuracy: ±3%
Distortion: Less than 1%

SPECTRAL PURITY
Harmonics: At least 30 dB below carrier
Residual FM: less than 2PPM

GENERAL
Dimensions: 7" H x 17⅝" x 17" D
Price: $1975

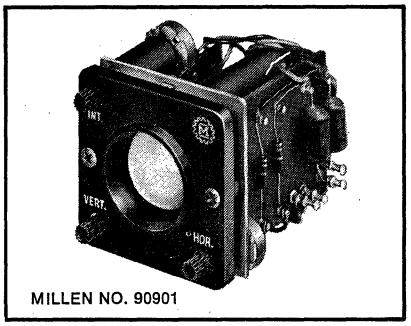
LogiMetrics INC
100 Forest Drive • Greenvale, New York 11548
(516) 484-2222 • TWX: 510-223-0646

SCOPE MODULES TO BUILD INTO EQUIPMENT



¾ Inch Round Tube/Flat Face

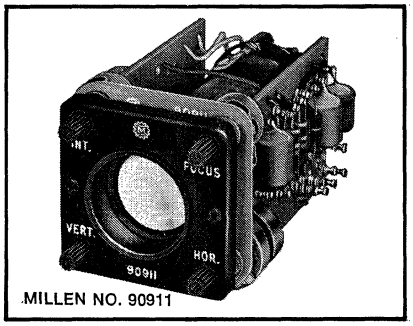
The Millen No. 90975 is an ultra-small, economical 'Scope with a flat face shielded 1DP1 C.R.T. that requires little power. Mounts on your panel and has a plug on rear for all input connections. Height: 2¾ inches overall. Depth: 3½ inches behind panel. Width: 1¼ inches overall. Weight: 5½ ounces, including tube. Uses Millen No. 90202 Module Plug-in High Voltage Power Supply. Sensitivity: Vert. 158, Hor. 184 v. per cm. defl.



MILLEN NO. 90901

One Inch Round Tube

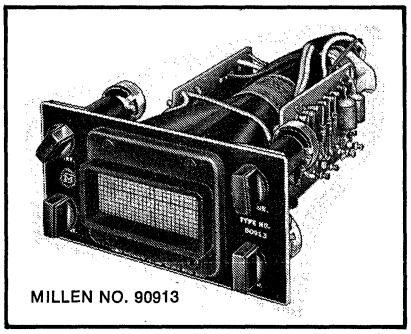
The Millen No. 90901 is the most economical of the module oscilloscopes. It uses a type 1CP31 one inch diameter cathode ray tube with fixed focus. Requires little power. Mounts on your panel. Height: 2¾ inches overall. Depth: 4⅝ inches behind panel. Width: 2⅞ inches overall. Weight: 10 ounces. Uses Millen No. 90202 Module Plug-in High Voltage Power Supply. Sensitivity: Vertical: 48, Horizontal: 71 v. p-p per cm. defl.



MILLEN NO. 90911

1¼ Inch Round Tube/Flat Face

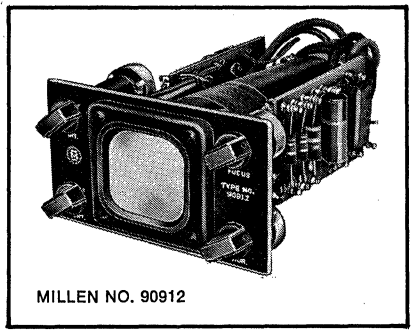
The Millen No. 90911 is a small module oscilloscope using the American-made type 1EP1 1¼ inch diameter cathode ray tube. The No. 90911 has balanced deflection, focus control and provisions for blanking or intensity modulation. Requires little power. Mounts on your panel. Height: 2⅝ inches overall. Depth: 4⅜ inches behind panel. Width: 3⅛ inches overall. Weight: 12 ounces. Uses No. 90202 Plug-in High Voltage Power Supply.



MILLEN NO. 90913

3 x 1½ Inch Rectangular Tube

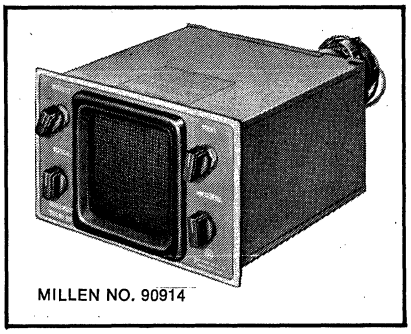
The Millen No. 90913 is a small module oscilloscope providing the larger rectangular display of a three inch tube, but requiring only the panel space used by a two inch tube. The No. 90913 has balanced deflection and has provisions for intensity modulation or blanking. Requires little power. Mounts on your panel. Height: 3 inches. Depth: 9½ inches behind panel. Width: 6 inches. Weight: 1½ pounds. Uses No. 90202 Power Supply.



MILLEN NO. 90912

Two Inch Round Tube

The Millen No. 90912 is a panel mounting module oscilloscope intended to be built into the customer's equipment. It is complete with bezel and panel, control of intensity, focus, vertical centering and horizontal centering. It requires only 3 x 5 inches of panel space but provides a 1¾ x 1⅝ inch display. Requires little power. Mounts on your panel. Height: 3 inches. Depth: 7¼ in. behind panel. Width: 5 in. Weight: 1¾ pounds.



MILLEN NO. 90914

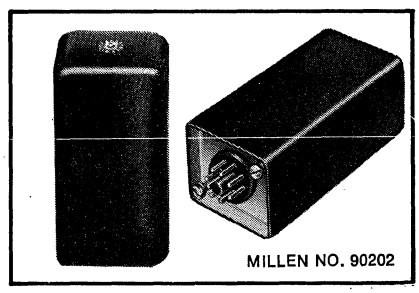
3½ Inch Square Tube

The Millen No. 90914 is a panel mounting module oscilloscope intended for monitoring applications. This oscilloscope indicator is complete with front panel, bezel and front panel controls consisting of Intensity, Focus, Vertical Centering and Horizontal Centering. The No. 90914 uses a 4KP-square face cathode ray tube. Requires little power. Mounts on your panel. Height: 3⅞ in. Depth: 11¾ in. Width: 6⅝ in.

MILLEN NO. 90652

Solid-State Dipper

The Millen No. 90652 Solid-State Dipper introduces a new dip oscillator with performance comparable to that of the best vacuum-tube grid dip meters previously available, but with the universal advantage of battery power which eliminates the power cord and provides a portability which is not restricted by the requirement for a-c power. The operating features of the No. 90652 Solid-State Dipper include (1) a sensitive oscillator-dipper for checking resonant frequencies of non-energized resonant circuits, and (2) an absorption type wavemeter with the oscillator circuit arranged to act as a Q-Multiplier Amplifier, providing both a sharp tuning response and great sensitivity. The frequency range of 1.6 to 300 MHz is covered by 7 plug-in coils, with some overlap between ranges. The lowest frequency coil (1.6 to 3.3 MHz) is wound on a powdered-iron core to increase Q and improve coupling to circuits being checked. The circuit of the No. 90652 Solid-State Dipper is reliable and straightforward, making use of standard semi-conductor elements. The oscillator is a 3N128 MOS-FET in a Colpitts circuit. The r-f voltage across the tank circuit is rectified by 2 1N3604 diodes in a full wave connection to develop a d-c voltage proportional to the r-f present in the coil.

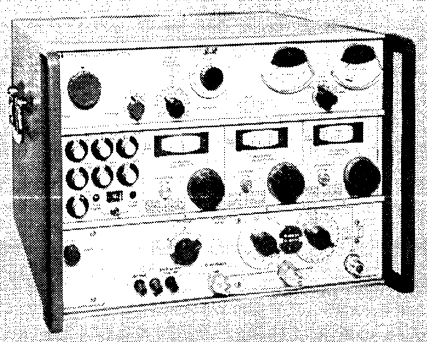


MILLEN NO. 90202

Module Power Supplies

The Millen No. 90202 Plug-in High Voltage Module for use with the Millen Module Oscilloscopes supplies both high voltage and heater power. Input: 105-125 volts, 60 Hz. Output: 750 volts d.c. at 3 ma. to 1140 volts d.c. at 1 ma. and 6.3 volts a.c. at 0.6 ampere, Physical Data: 1⅞" x 2⅛" x 4⅝". The Millan No. 90202-C is similar to No. 90202 except recommended for continuous duty and for 50 Hz. applications.

JAMES MILLEN MFG. CO., INC.
MAIN OFFICE AND FACTORY
150 EXCHANGE ST., MALDEN, MASSACHUSETTS 02148, U.S.A. – TEL. (617) 324-4108



MODEL 2006/1 DIGITALLY TUNED PRECISION FM GENERATOR — This generator employs a digital synchronizer to achieve a frequency stability of 2 in 10^7. The generation of the signal over the range 10 to 500MHz gives spectral purity and low noise not to be found in synthesizers yet provides digital accuracy, convenience and full FM capability.

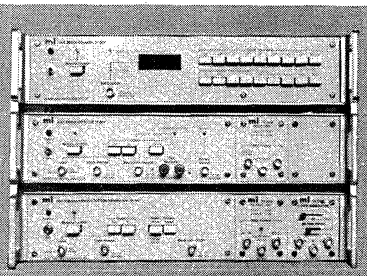
MODEL 2015 LOW COST, HIGH PERFORMANCE AM/FM GENERATOR — Model 2015 is the latest Marconi Instruments solid state AM/FM Signal Generator. The design objective of a low cost, simple to use unit, has been achieved with a performance equal to the test and service requirements of modern receivers in the range 10-520MHz. Fundamental frequency generation is by voltage tuned oscillators. Special tuning controls permit easy tuning to narrow band communication receivers even at the highest frequencies.

FM/AM SIGNAL GENERATORS

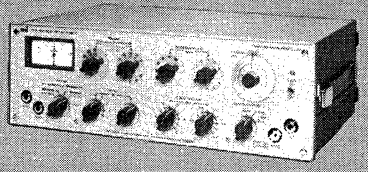
DESCRIPTION	FREQUENCY	FEATURES
FM/AM SIGNAL GENERATOR Model 2002B	10KHz to 88MHz	0.1μV to 1V ±1dB, fully solid state, AM variable to 100%, FM deviation ±1KHz to ±50KHz max. dependent upon range. Incremental frequency controls with discrimination of 0.025% and direct readout in KHz. Xtal calibrator. External frequency shift permits phase mod. or phase locking.
DIGITAL SYNCHRONIZER Model 2170B	32KHz to 88MHz	Used with Model 2002B Generator to lock frequency in steps of 10Hz frequency stability 1 x 10^{-6}. Permits full modulations ideal for SSB applications.
AM/FM SIGNAL GENERATOR AND SWEEP GENERATOR Model 2008	10KHz to 510MHz	This unique combination Generator/Sweeper provides both facilities without sacrifice to the precision quality of either function. Eleven bands with 1 : 1.5 cover span from VLF thru UHF. Output 0.1μV to 100mV into 50Ω. Stability 5 p.p.m. FM deviation ±3KHz ±10KHz ±30KHz ±100KHz and above 45MHz ±300KHz. Mod. frequency to 125KHz. AM to 80%. Comprehensive sweep facilities on all bands. Full Modulation facilities may be retained in sweep mode. Xtal calibrator and markers.
AM/FM SIGNAL GENERATOR AND SWEEP GENERATOR Model 2008/1	10KHz to 510MHz	Same as Model 2008 but with built in counter, 6 digit display of carrier frequency, automatic operation of display. Integral RF screening of entire system gives leakage performance far superior to external counter techniques.
FM/AM SIGNAL GENERATOR (6625-913-7223) Model 995B/Series	200KHz to 220MHz	0.1μV to 100mV. Calibrated ΔF. Step attenuator, Crystal standardized; extremely stable. Deviation ±600KHz on top bands. Has simultaneous FM & AM. Also available for narrow band working FM spurious less than 25Hz. Model 995B/5.
FM SIGNAL GENERATOR (6625-929-4277) Model 1066B/1	10MHz to 470MHz	0.1μV to 100mV. 50Ω, f_m at 1KHz and 5KHz internal, deviation to ±100KHz, ΔF to ±100 KHz, both meter monitored. Stability .0025% 10 min.
FM SIGNAL GENERATOR (6625-937-2801) Model 1066B/6	10MHz to 470MHz	Similar to 1066B/1 but, wider deviations to 400KHz f_m 30Hz to 100KHz, also incorporates xtal calibrator.
FM GENERATOR/SYNCHRONIZER Model 2006/1	10MHz to 500MHz	Special high stability version of 2006, fitted with digital synchronizer which locks carrier and gives 7 digit readout of frequency. Receiver bandwidth measurements can be made rapidly, repeatably and accurately on even the narrowest response curves by adjusting synchronizer alone. See illustration above and 2006 details below.
FM/AM SIGNAL GENERATOR Model 2015	10MHz to 520MHz	Covers 10MHz to 520MHz in 11 bands with descrimination permitting tuning to narrow band (±3KHz) receivers. FM deviation 10KHz and 100KHz. AM to 80%. Precision ALC eliminates need for external set carrier control. Fundamental signal with low spurious content. Will also operate from external 24VDC. Portable, 5½" high 11" wide. Lowest cost for performance generator on USA market today. See illustration above and on cover.
LOW NOISE VHF FM SIGNAL GENERATOR Model 2011	130MHz to 180MHz	Highly stable low noise unit for testing VHF narrow band mobile receivers. Velvet vernier tuning. Infinitesimal leakage. Noise less than —140dB/Hz. 20KHz from carrier. Output level 0.01μV to 100mV into 50Ω FM deviation to ±30KHz f_m 300Hz to 3KHz.
LOW NOISE UHF FM SIGNAL GENERATOR Model 2012	400MHz to 520MHz	Highly stable low noise unit for testing UHF narrow band mobile receivers. Velvet vernier tuning. Infinitesimal leakage. Noise less than —140dB/Hz. 20KHz from carrier. Output level 0.01μV to 100mV into 50Ω FM deviation to ±30KHz f_m 300Hz to 3KHz.
LOW NOISE FM SIGNAL GENERATOR Model 2013	800MHz to 960MHz	Highly stable low noise unit for testing high band UHF mobile receivers. Velvet vernier tuning. Infinitesimal leakage. Noise less than —125dB/Hz. 20KHz from carrier. Output level 0.01μV to 100mV into 50Ω FM deviation to ±30KHz f_m 300Hz to 3KHz.
SOLID STATE PRECISION FM SIGNAL GENERATOR (6625-491-7755) Model 2006	4MHz to 1000MHz	Solid state precision FM unit accepts any 4 of 5 oscillators with bands 4 to 10MHz; 10 to 90MHz; 88 to 220MHz, 215 to 500MHz and 440 to 1000MHz. Output 0.1μV to 100mV into 50Ω. FM ±100KHz to ±300KHz max. dependent on frequency. Mod frequencies 20Hz to 125KHz internal or external.

mi MARCONI INSTRUMENTS
DIVISION OF MARCONI ELECTRONICS INC.

111 CEDAR LANE □ ENGLEWOOD, NEW JERSEY 07631
TELEPHONE (201) 567-0607 □ TWX 710-991-9675



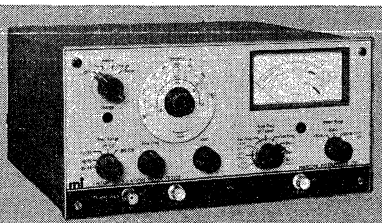
VHF DIGITAL ERROR TEST SET — This high speed PCM test set comprises of VHF Pseudo Random Pattern Generator, Error Detector and Error Counter Display. Test patterns 2^{10} -1 sequence are generated at rates up to 281Mbit/s. Important applications include development and testing of coaxial and digital Microwave Radio Systems.



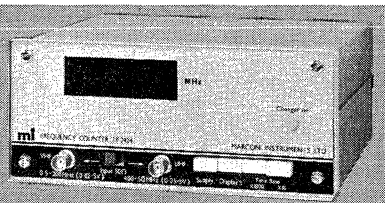
PCM MULTIPLEX TEST SET — Embodies in one convenient field portable package, are all the necessary functions to completely maintain or commission PCM Multiplex. Sine wave and pseudo random noise test signals provide testing to latest International Recommendations. Configurations available for domestic and military systems, alternate versions for international and satellite requirements.

DIGITAL COMMUNICATIONS – P.C.M. TEST GEAR

DESCRIPTION	FREQUENCY	FEATURES
MULTIPLEX TEST SET Model 2807	Voice Channel	Both sinewave and pseudo random noise stimulus available to measure channel gain, frequency response, idle channel noise, gain linearity, quantization distortion and interchannel crosstalk. National and International models available.
PATTERN GENERATOR AND ERROR DETECTOR Model 2808	1.536 to 8.448 Mbit/s	Generates pseudo random test signal in AMI, RZ or NRZ formats. Errors and blanking can be introduced to test regenerator clock recovery. Automatic locking of pseudo random signal in receiver. Performs bit by bit analysis of received signal.
DATA LINE ANALYZER Model 2809	300Hz to 3400Hz	Used for testing data transmission lines and links; measures peak-to-average rating (PAR), frequency response and system noise level. Has correction for phase-intercept distortion.
VHF DIGITAL ERROR TEST SET Model 2813-19	8.5Mbit/s to 281Mbit/s	System provides pseudo random test pattern 2^{10} -1 sequence in true or complement (invert) NRZ format. Internal or external clock inputs. Individual errors detected up to maximum error density. Employs MECL III circuitry. Recorder output and remote operation facilities.



MODEL 2303 MOBILE RADIO DEVIATION METER. This new modulation meter is a portable instrument, designed for measuring FM in all mobile bands up to 520MHz and up to 95% AM on carriers to 225MHz. It operates off rechargeable battery or AC. Weighs only 13 lbs. See other mobile instruments below.



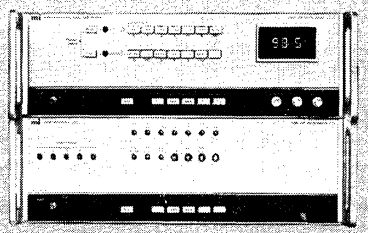
MODEL 2424 MOBILE RADIO FREQUENCY COUNTER — A small field portable counter especially designed for mobile radio users in the VHF/UHF band. An eight digit display of frequency is achieved by alternate LED display of first or last four digits. Operates from NiCads or A.C. Field carrying case and full range of attenuators, loads and sampling unit available.

MOBILE RADIO TEST GEAR

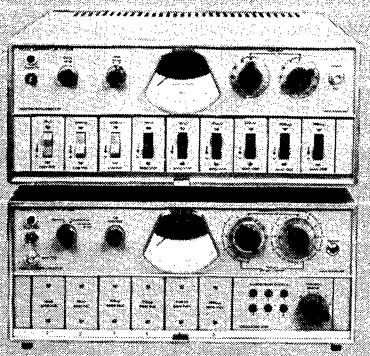
PORTABLE MODULATION METER Model 2303	25 to 520MHz	Measures FM on all mobile bands thru 520MHz deviations 15, 5 and 1.5KHz. Accuracy 3%. Low noise. AM measurements to 225MHz. 95% depth. 3% accuracy. AC or battery operated. 13 lbs.
PORTABLE MOBILE RADIO COUNTER Model 2424	VHF & UHF Bands	Covers 500KHz to 250MHz, 400MHz to 520MHz bands. Sensitivity better than 60mV. Can measure eight digits, displays first or last four as required. AC or battery. Portable. 6½ lbs.
MOBILE RADIO SIGNAL GENERATORS	All Mobile Bands	Special low noise signal generator series for all bands. 130MHz thru 960MHz. See Signal Generator Section, Models 2011, 2012, 2013.
MOBILE RADIO TEST SET Model 2950	Low and High Band	Test set comprises an FM/AM Signal Generator covering low and high bands, FM/AM modulation meter, RF power meter terminated and through line with forward and reflected power, 1KHz audio oscillator and AF voltmeter.

FM DEVIATION METERS

FM DEVIATION METER (6625-060-3320) Model 791D	4MHz to 1024MHz	Deviation ranges, ±5, ±25, ±75 and ±125KHz full scale. Accuracy 3%. Crystal standardized. Local oscillator can be xtal controlled for measuring deviations down to 10Hz.
FM DEVIATION/ AM MODULATION METER Model 2300A	4MHz to 1000MHz to 2500MHz using ext. oscillator	Wide range, mod. freq. up to 200KHz; deviation ranges ±1.5, ±5, ±15, ±50, ±150, ±500KHz. Local oscillator can be xtal locked, external oscillator can be used. De-emphasis 50μsec. 75μsec. switch selected. FM accuracy ±3% for deviation up to ±500KHz f_m 30Hz to 150KHz. AM modulation two ranges 30% and 100% mod. freqs. 30Hz to 50KHz (carrier 4 to 350MHz).
PROGRAMMABLE FM/AM MODULATION METER Model 2301	4MHz to 1000MHz	FM deviation in six ranges from ±1.5KHz to ±500KHz FS. f_m 30Hz to 200KHz demodulated output distortion 0.25%. AM 30% and 100% FS. Automatic internal carrier level setting.
MOBILE RADIO MODULATION METER Model 2303	25 to 520MHz	See Mobile Radio Test Gear Section above.



MODELS 2914 and 2915 TV AUTOMATIC MONITORING SYSTEM — This automatic monitoring system can provide the necessary executive control over remote TV Transmitters or microwave links by analysis of signal path degradations. The system performs simultaneous measurements of twelve or more critical parameters using the vertical interval test signals and then compares the results with pre-determined limits. A data output gives the conditions of these limits, allowing immediate report of transmitter failure or severe transmission impairment.



MODEL 2090B NOISE LOADING TEST SET — This new unit measures Noise Power Ratio directly in db and picowatts. A standardizing noise generator is built into the receiver to facilitate out of — band measurements. Band limiting and slot filters for all CCIR/CCITT and D.C.A. recommendations. Special frequencies to order.

INTERMODULATION AND BASEBAND TEST GEAR

DESCRIPTION	FREQUENCY	FEATURES
NOISE LOADING TEST SET TRANSISTORIZED (6625-965-8625) (AN/GSM 161A) Model 2090A	12KHz to 12.388MHz (i.e. up to 2700 channels)	Solid state unit has built-in standardizing noise source in receiver for gain setting, out-of-band testing, etc. Includes noise generator, receiver and a choice of many different filters. NPR measurements can be made up to 75 dB.
NOISE LOADING TEST SET Model 2090B	12KHz to 12.388MHz	Designed to meet latest CCIR and CCITT requirements (Recommendation 399-1 Oslo 1966). Operation similar to model 2090A.
Model 2099AB		This filter extension box can be added to any 2090A or 2090B system to provide accommodation for up to nine extra high, low or band stop filters and six extra band pass filters with oscillators. Minor modification required to existing generators and receivers to provide access. Simple field modification kits available.
TWELVE CHANNEL NOISE GENERATOR (6625-948-4724) Model TM7816	300Hz to 3400Hz	Generates twelve non-related channels of Gaussian noise from twelve separate solid state sources. Output: each channel 1mW in 600Ω balanced, 300Hz to 3400Hz. Attenuation to −32 dbm in 2 db steps. Spurious noise in OFF channel (all other channels ON) is less than 10 dba (−75 dbm FIA weighted).
TV AUTOMATIC MONITORING SYSTEM Models 2914 and 2915		Automatically analyzes and displays all essential parameters including: amplitudes of bar, sync, various T pulses, and noise; luminance linearity, chrominance gain, chrominance/luminance crosstalk, etc., all measured in the most suitable units of measure and presented digitally when under manual control (see also illustration above). Versions for national and international systems.

BRIDGES AND Q METERS

UNIVERSAL BRIDGE Model 1313A	1KHz and 10KHz 20Hz to 20KHz External	0.1μh to 110h, 0.1pf ⌒ 100μf, 0.003Ω to 110MΩ. Accuracy 0.1%. Built-in osc. and det. Direct reading; simplest possible operation. Uses adapter TM6113 for biasing inductors to 200ma.
PORTABLE UNIVERSAL BRIDGE Model 2700	1KHz internal 20Hz to 20KHz External	0.2μh to 110h, 0.5pf to 1100μf, 0.01Ω to 11MΩ. Accuracy 1%. Transistorized, simple. Measures incremental L, electrolytics & non-linear resistance using external bias supplies.
Q METER Model 1245A	1KHz to 300MHz	Q ranges 5 to 1000, △Q 25-0-25. Accuracy 5% to 100MHz, 20% to 300MHz. Calibrated capacitor 7.5 to 500pf, △C ranges ±1 and ±5pf. Extremely stable and easy to operate. Uses separate oscillators. Dielectric and Series Loss Test Jigs available. Also HF & LF inductors.

MICROWAVE SIGNAL SOURCES

Model 6055	0.85 to 2.15GHz	A unique series of transistor and gunn diode microwave signal sources covering 400MHz to 18.0GHz. Digital display of frequency, accuracy typically ±1%. Variable output levels typically 10mW on gunn diode sources. Up to 150mW on transistor models, Gunn Diode Models are 6057, 6058 and 6059. Model 6551 has FM. Special frequency coverages on request.
Model 6056	2.0 to 4.0GHz	
Model 6057	4.5 to 8.5GHz	
Model 6058	8.0 to 12.5GHz	
Model 6059	12.0 to 18.0GHz	
Model 6070	0.4 to 1.2GHz	
Model 6551	1.4 to 1.7GHz	

COMMUNICATIONS RECEIVERS

Model 850/4	10KHz to 600KHz	A unique series of communications receivers covering 10KHz thru 870MHz. All feature superb construction and top performance. Low frequency models provide AM/CW/SSB. 990 series offer AM/FM. Xtal locking facility optional on all models to enhance stability.
Model 1830	120 KHz to 30MHz	
Model 990R	27MHz to 240MHz	
Model 990S	230MHz to 870MHz	

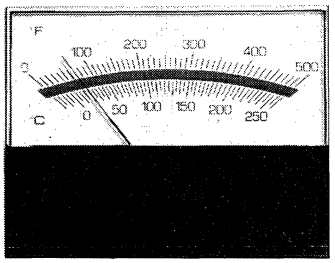
mi MARCONI INSTRUMENTS
DIVISION OF MARCONI ELECTRONICS INC.

111 CEDAR LANE □ ENGLEWOOD, NEW JERSEY 07631
TELEPHONE (201) 567-0607 □ TWX 710-991-9675

MODUTEC

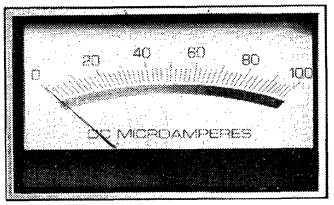
PANEL METERS • CONTROL METERS
PYROMETERS & THERMOCOUPLES

featuring fast delivery from factory modification centers

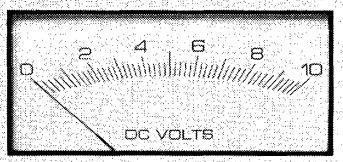


S Series
Surface mount, black cover

C Series
Surface mount,



BA Series
Bezel mount, with black or clear cover meter



W Series
Windo-Mount (flush with panel)

MIL SPEC, ruggedized versions of S, C, BA, or W Series meters

K Series

PANEL METERS
Designed for the 70's

Contemporary styling

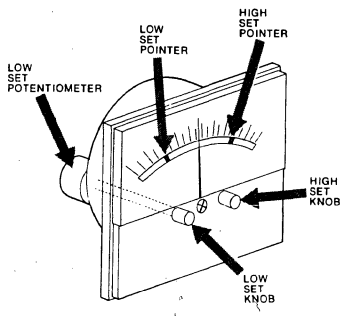
Technically advanced movement, improved taut-band suspension

Six sizes:
1½" through 8"

Flat 100° arc, linear scales

Many options and modifications available

See following pages for RANGES & PRICES



CONTROL METERS
A New Approach to Actuating and Monitoring IC Control Circuits

Fast, precise response
Reliable
Economical
Available in S, C, BA, and W Series, 3½", 4½", 5½" sizes

See following pages for RANGES & PRICES

PYROMETERS

Available in S, C, BA, or W Series, 1½" through 5½" sizes.
±2% accuracy full scale at 77°F standard.
Greater accuracy at customer's option.
Thermistor copper error compensation.
Adjustable resistor supplied for external resistance matching.

See following pages for RANGES & PRICES

THERMOCOUPLES

Many types and styles for a wide range of applications.

Connectors, terminals, insulators, TC wire, TC extension wire also available.

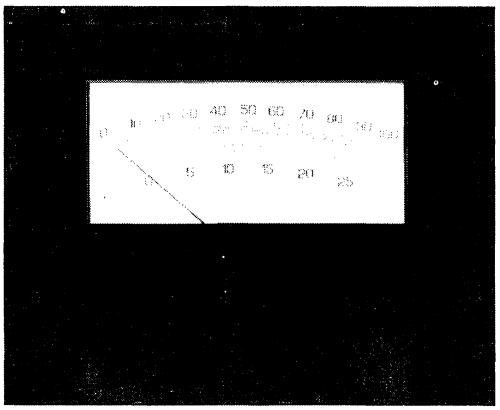
See following pages for RANGES & PRICES

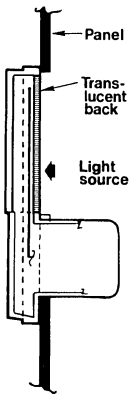
MODUTEC, INC.
18 Marshall St., Norwalk, Conn. 06854
203-853-3636 TWX: 710-468-2039

CALL YOUR MODUTEC REP FOR INFORMATION, LATEST CATALOGS

NEW ADDITIONS to the MODUTEC LINE

L Series Trans-Lit™ Panel Meters

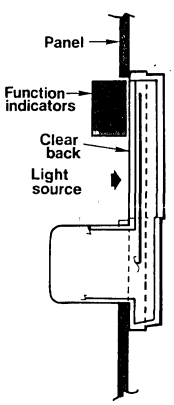


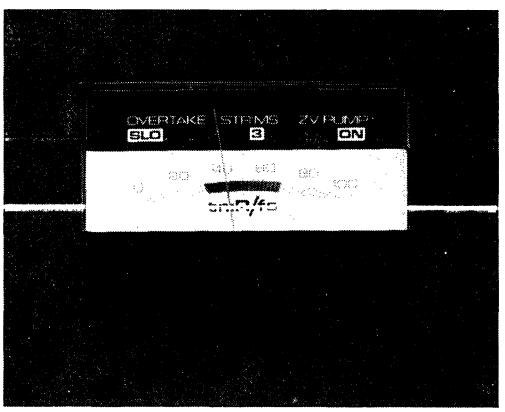


- Illuminated *through* the meter dial — highest quality lighting of any meter.
- Optional smoke-grey covers bring "blackout technology" to panel meters for the first time.
- Save money in installation and illumination accommodations.
- Available in Surface Mount, Bezel Mount, and Windo-Mount styles.

See following pages for SIZES, RANGES, PRICES

V Series Thru-Vue™ Panel Meters

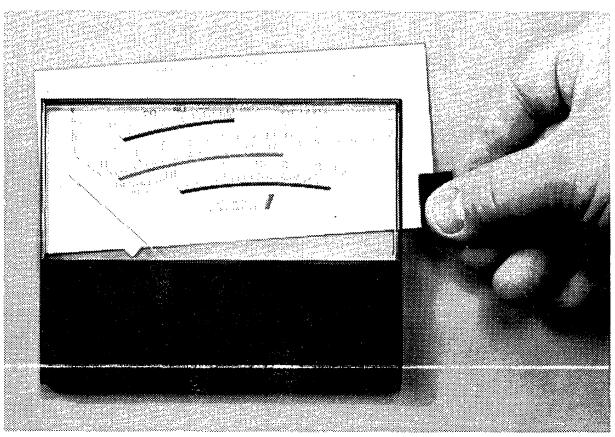




- Provide a "window into the product".
- Multiple metering functions visible through one cutout.
- Smoke-grey covers available for "meter blackout" effect.
- Bring high volume design advantages to custom and small run units.
- Save space and installation costs.

See following pages for SIZES, RANGES, PRICES

R Series Multi-Dial™ Panel Meters

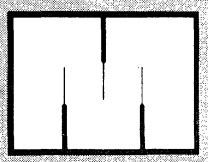


- Dials can be quickly switched — lift one out and drop another in!
- Accurate dial positioning is "built in".
- 1½% tracking standard.
- Entire meter remains sealed during dial replacement.
- Wide selection of dials available.
- Meter can be installed for trans-lighting, using translucent or transparent dials.

See following pages for SIZES, RANGES, PRICES

STANDARD UNITS SHIPPED FROM STOCK
FAST DELIVERY OF OPTIONS & SPECIALS
FROM FACTORY MODIFICATION CENTERS

MODUTEC, INC.
18 Marshall St., Norwalk, Conn. 06854
203-853-3636 TWX: 710-468-2039



MODUTEC

PANEL METERS • CONTROL METERS
PYROMETERS & THERMOCOUPLES

See preceding pages for styles & descriptions

PANEL METERS Ranges, Sizes, Prices* (Request Modutec Catalog 622 for detailed information)

Note: Prices are approximately median; catalog prices for specific ranges may differ somewhat. SIZE:	1½"	2½"	3½"	4½"	5½"	8"
DC MICROAMMETERS (Available in all series)						
Zero left — 5 ranges: 0-20μA to 0-500μA	$19.80	$18.85	$19.80	$21.05	$25.20	—
Zero center — 5 ranges: 10-0-10μA to 500-0-500μA	20.55	19.60	20.55	21.90	26.10	—
Logarithmic, zero left — 4 ranges: 0-100μA to 0-1000μA	—	—	30.50	31.95	38.70	52.55
Logarithmic, suppressed zero — 4 ranges: 10-100μA to 100-1000μA	—	—	33.45	35.05	42.45	58.20
DC MILLIAMMETERS (Available in all series)						
Zero left — 15 ranges: 0-1mA to 0-750mA	18.40	17.50	18.40	19.50	23.25	29.35
Zero center — 8 ranges: 1-0-1mA to 500-0-500mA	18.85	18.00	18.85	19.60	23.80	30.20
DC AMMETERS (Available in all series)						
Zero left — 22 ranges: 0-1A to 0-2000A	17.60	16.85	17.60	18.75	22.40	28.10
Zero center — 13 ranges: 1-0-1A to 500-0-500A	18.45	17.70	18.45	19.65	23.50	29.75
DC MILLIVOLTMETERS (Available in all series)						
Zero left, ranges 0-50mV and 0-100mV	17.60	16.85	17.60	18.75	22.40	28.10
Zero center, 50-0-50mV and 100-0-100mV	18.05	17.35	18.05	19.25	23.00	29.00
DC VOLTMETERS (Available in all series)						
Zero left — 23 ranges: 0-1V to 0-1000V	17.60	16.85	17.60	18.75	22.40	28.10
Zero center — 10 ranges: 5-0-5V to 600-0-600V	18.05	17.35	18.05	19.20	22.95	28.95
Expanded scale, volts — 8 ranges: 5V to 300V ±10%, ±.05% acc.	—	60.80	63.80	66.85	69.80	—
Exp. scale, % deviation — 3 ranges: 12,28,120V ±10%, ±.05% acc.	—	60.80	63.80	66.85	69.80	—
AC MILLIAMMETERS (Available in all series)						
8 ranges: 0-15mA to 0-500mA	24.50	22.95	24.50	26.95	30.85	—
AC AMMETERS (Available in all series)						
24 ranges: 0-1A to 0-2000A	24.50	22.95	24.50	26.95	30.85	40.75
AC VOLTMETERS (Available in all series)						
11 ranges: 0-3V to 0-600V	22.80	21.75	22.80	24.10	29.15	38.20
Expanded scale, volts: 105-125V or 210-250V at ±.5% acc.	—	63.75	66.85	69.80	72.80	—
Expanded scale, volts: 95-135V or 190-270V at ±1.0% acc.	—	63.75	66.85	69.80	72.80	—
NULL METERS (Available in all series)						
35Ω, 640Ω, 2550Ω resistance	24.80	24.10	24.80	—	—	—
ELAPSED TIME METERS (Series S, C, BA, W)						
AC, non-resettable; 0-99,999.9 mins. or hrs.	—	29.50	28.50	—	—	—
AC, front-resettable; 0-99,999.9 mins. or hrs.	—	—	38.50	—	—	—
DC, non-resettable; 0-9,999.9 hrs.; 4-10, 10-20, 20-30, 104-120VDC	—	—	39.50	—	—	—
RF AMMETERS (Series S, C, BA, W)						
6 ranges: 0-1A to 0-10A	—	—	23.95	27.25	32.45	—
FREQUENCY METERS (Series S, C, BA, W)						
7 ranges: 47-53Hz to 380-420Hz	—	—	38.00	—	—	—
VU METERS (Available in all series)						
Per USA Std. C-16.5-1954	24.80	23.85	24.80	25.65	—	—
VU type DC Microammeters	18.55	18.10	18.55	19.70	—	—
S, C, and W Series — Prices are listed above.						
BA Series Panel Meters — Add to the prices listed above:	2.20	2.20	2.20	2.35	2.50	3.50
K Series Panel Meters — Add to the prices listed above: (plus bezel mount adder if desired)	6.60	6.05	6.60	7.70	8.80	—
R Series Panel Meters — Add to the prices listed above:	—	—	3.00	3.50	4.00	7.00
L & V Series Panel Meters — Add to the prices listed above: (plus bezel mount adder if desired)	—	—	2.00	2.50	2.50	3.00

DISCOUNT SCHEDULE, PANEL METERS: 1-9 NET; 10-24 15%; 25-49 35%; 50-99 45%, on total PANEL METERS ordered.

OPTIONS & MODIFICATIONS: Improved accuracy; colors; blank dials; custom resistance; fast response; custom pointers; high temperature cases & covers; dead set pointers; illumination; custom dials; mirror scales; heavy damping; single point calibration; smoke-grey covers; improved resistance; sealed cases; temperature compensation; unit meter packaging; high resistance voltmeters; rear zero adjust; custom dials; special marking.

CONTROL METERS Ranges, Sizes, Prices*

(Request Modutec Catalog CM-486 for detailed information)

*Prices listed are median, may be slightly lower or higher than catalog prices, and are subject to change without notice.

	3½″		4½″		5½″	
	Single Set Point	Dual Set Point	Single Set Point	Dual Set Point	Single Set Point	Dual Set Point
DC CONTROL METERS						
Microammeters:						
Zero Left: 0-20μA to 0-500μA	$43.00	$58.00	$44.00	$59.00	$47.50	$62.50
Zero Center: 10-0-10μA to 500-0-500μA	44.00	59.00	45.00	60.00	48.50	63.50
Milliammeters:						
Zero Left: 0-1mA to 0-750mA	42.00	57.00	43.00	58.00	46.00	61.00
Zero Center: 1-0-1mA to 500-0-500mA	42.50	57.50	43.50	58.50	46.50	61.50
Ammeters:						
Zero Left: 0-1A to 0-1000A	42.00	57.00	43.00	58.00	46.00	61.00
Zero Center: 1-0-1A to 25-0-25A	42.50	57.50	43.50	58.50	46.50	61.50
Millivoltmeters:						
Zero Left: 0-50mV to 0-100mV	41.50	56.50	42.50	57.50	45.50	60.50
Zero Center: 50-0-50mV	42.00	57.00	43.00	58.00	46.00	61.00
Voltmeters:						
Zero Left: 0-1V to 0-1000V	41.50	56.50	42.50	57.50	45.50	60.50
Zero Center: 5-0-5V to 500-0-500V	42.00	57.00	43.00	58.00	46.00	61.00
AC CONTROL METERS						
Milliammeters: 0-25mA to 0-500mA	47.00	62.00	49.00	64.00	52.00	67.00
Ammeters: 0-1A to 0-500A	47.00	62.00	49.00	64.00	52.00	67.00
Voltmeters: 0-3V to 0-500V	45.50	60.50	47.00	62.00	51.00	66.00

DISCOUNT SCHEDULE—CONTROL METERS: 1-9 NET; 10-24 15%; 25-49 30%; 50-99 40%, on total CONTROL METERS ordered.

OPTIONS & MODIFICATIONS: In general and as applicable, same as PANEL METERS.

PYROMETERS Ranges, Types, Sizes, Prices

(Request Modutec Catalog PYR-583 for detailed information)

Temperature Range °F	Temperature Range °C	Thermocouple Type*	1½″	2½″	3½″	4½″	5½″
−150/+250	−100/+120	T	$33.50	$32.50	$33.50	$34.50	$35.50
−75/+225	−60/+105	E or J	33.50	32.50	33.50	34.50	35.50
−100/+600	−70/+310	E	32.50	31.50	32.50	33.50	34.50
−100/+1100	−70/+600	E	32.50	31.50	32.50	33.50	34.50
0/+300	−20/+150	E or J	33.50	32.50	33.50	34.50	35.50
0/+500	−20/+260	E or J	32.50	31.50	32.50	33.50	34.50
0/+800	−20/+430	E or J	32.50	31.50	32.50	33.50	34.50
0/+1000	−20/+540	E, J, or K	32.50	31.50	32.50	33.50	34.50
0/+1500	−20/+820	E or K	32.50	31.50	32.50	33.50	34.50
0/+2000	−20/+1100	K	32.50	31.50	32.50	33.50	34.50
0/+3000	−20/+1650	R	34.00	33.00	34.00	35.00	36.00

*E=chromel/constantan; J=iron/constantan; K=chromel/alumel; T=copper/constantan; R=platinum/platinum-10% rhodium.

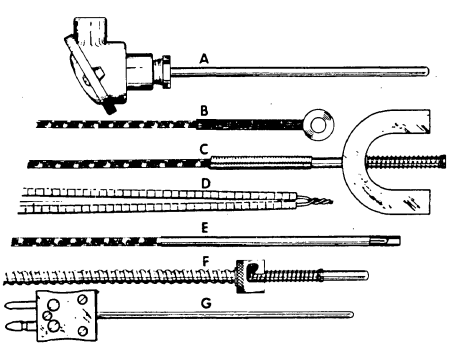
OPTIONS & MODIFICATIONS: Improved accuracy; colored cases, including custom colors; high temperature cases & covers; illumination; sealed cases; rear zero adjustment; custom dials and/or scales; hot-stamp case marking.

THERMOCOUPLES

(Request Modutec Catalog PYR-583 for detailed information)

Modutec Thermocouples are available from stock in a useful variety of types and configurations. A few examples are shown. Consult catalog for complete listings, together with wire and related hardware.

DISCOUNT SCHEDULE—PYROMETERS & THERMOCOUPLES: 1-9 units NET; 10-24 10%; 25-49 20%; 50-99 30%, applicable to combined total.



A—T/C head with probe $30.00
B—Washer type $8.25
C—Magnet clamp type $15.00
D—Ceramic insulated type $5.95
E—Spade tip type $15.00
F—Bayonet type $13.50
G—Male plug with probe $13.75

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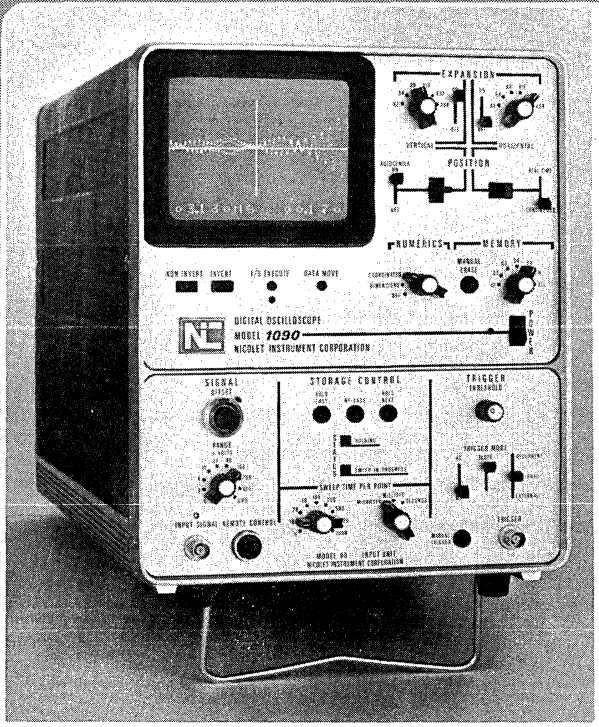
18 Marshall Street, Norwalk, Conn. 06854 / Phone 203-853-3636 / TWX 710-468-2039



Compare the new Nicolet 1090 DIGITAL STORAGE OSCILLOSCOPE with any analog storage oscilloscope...

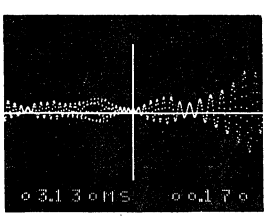
- It is a hundred times as accurate.
- It has vastly increased resolution.
- It is much easier to use, and
- it provides digital information to both you and your computer.

The new 1090 digital storage oscilloscope is operated in the same manner as an analog storage oscilloscope, except that to capture a particular signal, you just press a pushbutton. No screen erasure, no mode changing, just press a button. To again view each waveform (the "non-storage" mode) you just press another. No enhancement controls, no mode changing. It is so easy that we have provided remote control input terminals. Let your external apparatus do your selecting for you; since there is instantaneous response to external store and release commands, and since there is instantaneous choice of storing either the last signal to have started, or the next, you can do things you have never before been able to do.

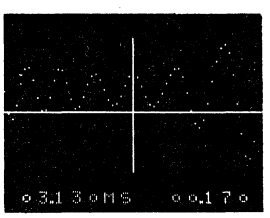
Store waveforms as long as you like, and examine them in great detail by use of the excellent waveform expansion facilities. The expansion controls are easy to use; they are necessary because the model 1090 stores as much information about a single signal as can be stored on the screens of 250 well adjusted analog storage oscilloscope screens. Use the instrument as a high precision waveform comparator; the expansion controls automatically expand and center equivalent time and voltage regions for both the standard and the new waveform. You can move either up or down to facilitate easier comparisons.

WAVEFORM EXPANSION

Moveable crosshairs are used to select any region of the stored waveform for closer inspection. This selected area can then be expanded in voltage and/or time dimensions, in steps of two, up to a factor of 64x.



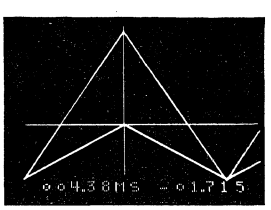
4x expansion on X axis, 1x on Y axis.



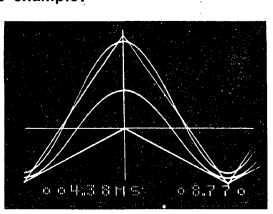
32x expansion on X axis, 8x on Y axis.

THE 1090 AS A COMPARATOR

The 1090 can compare up to four waveforms simultaneously in a variety of applications. Here is one example:



Standards. In one application you can store upper and lower limit waveforms in two memory quadrants . . .



Comparison. And then compare these standards with one or two measured waveforms to see if they fall within the prescribed time and/or voltage limits.

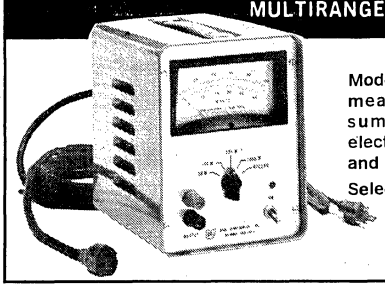
Call or write Nicolet for full details or to arrange a demonstration.

NICOLET INSTRUMENT CORPORATION

5225 Verona Road, Madison, Wisconsin 53711
Phone 608/271-3333 TWX: 910-286-2713

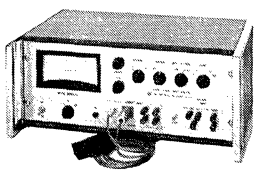
EQUIPMENT FOR CURRENT, POWER AND MAGNETIC FIELD MEASUREMENT

MULTIRANGE A.C. WATTMETER



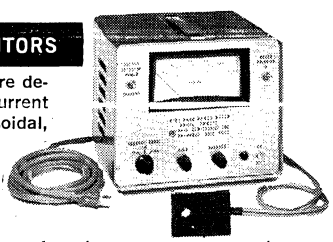
Model WM1000 wattmeter meaures real power consumed by small motors, electronic test equipment and other electrical loads. Selectable full scale ranges are 50, 100, 500 and 1000 watts with an accuracy of ±3%.

WIDEBAND WATTMETER



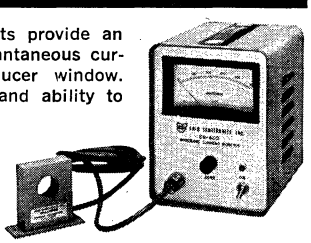
PM-4004 Wideband Pulse Power Monitors provide the unique ability to measure power in solid state switching circuits. The d.c. response and 30 nanosecond risetime insures accurate determination of instantaneous power waveform. Power input, power output, or power dissipated in solid-state devices may be readily determined. Built-in meters provide average or peak power reading. Instantaneous power, current, or voltage may be observed by connecting an oscilloscope to "monitor output" jack.

WIDEBAND POWER MONITORS



PM-6010 Series Power Monitors are designed to provide power or current measurements where d.c., sinusoidal, non-sinusoidal or pulse power is delivered to a load. Currents up to 1000 Amperes can be handled with negligible circuit interaction due to the use of circuit isolated transducers. Meter display of peak or average power is provided. 0 to 1 volt output proportional to instantaneous power or current is available for oscilloscope monitoring of detailed waveforms with risetimes less than 1 microsecond in the d.c. to Megahertz frequency range.

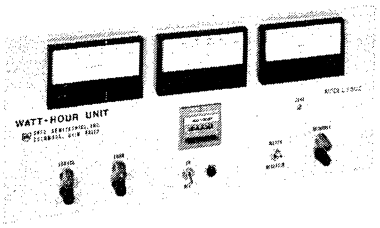
WIDEBAND d.c. to Megahertz CURRENT MEASURING EQUIPMENT



CM Series current measuring units provide an output signal proportional to instantaneous current flowing through the transducer window. The d.c. to Megahertz response and ability to faithfully reproduce 1 microsecond transients provide an ideal way to monitor critical circuits without electrical connection and with minimum interaction caused by measurement. The panel meter provides a display of direct current while the +1 to −1 volt output can be used for monitoring or control purposes with current flow in either direction.

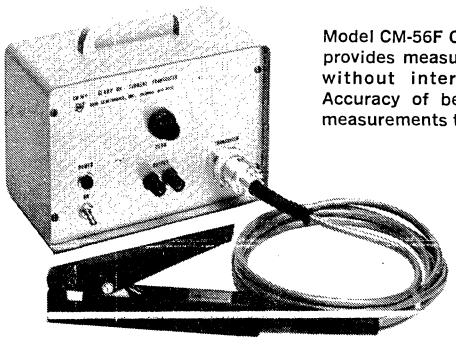
MODEL	PEAK CURRENT AMPERES	METER RANGE AMPERES	OUTPUT-VOLTS
CM-30	30	0 - 30	0 - 1
CM-100	100	0 - 100	0 - 1
CM-200	200	0 - 200	0 - 1
CM-600	600	0 - 500	0 - 1
CM-1000	1000	0 - 1000	0 - 1

WATT-HOUR AND AMP-HOUR METERS



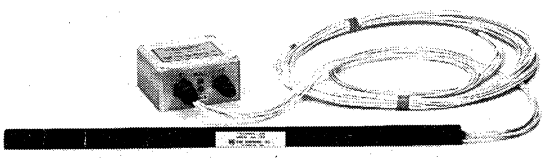
Registration of total energy consumption of motors, processes and equipment in a.c. or d.c. circuits is available on resettable counters. Other units provide a registration of charge flow, or Ampere-Hours, into or out of battery systems. Multiple measurement panels are available which provide display and electrical outputs related to instantaneous current, voltage and power in addition to energy registration.

CLAMP-ON CURRENT TRANSDUCER



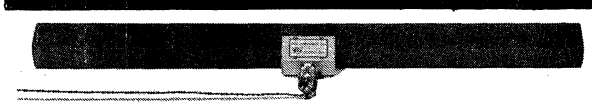
Model CM-56F Current Transducer provides measurement of current without interrupting circuit. Accuracy of better than 0.50%, measurements to 50 Amperes and d.c. to Kilohertz response are featured. An electrical output providing an analog 0.1 Volt/Ampere signal is available for use in control systems, computer interfacing or recording.

POSITION AND PROXIMITY MEASURING EQUIPMENT



MS-1100/MA-1100 Displacement and Proximity Monitors provide non-contacting measurement of position over a 20 inch range. Custom designed units can be fabricated for a variety of position, counting, and velocity determining applications.

BROADBAND MAGNETIC ANTENNAS



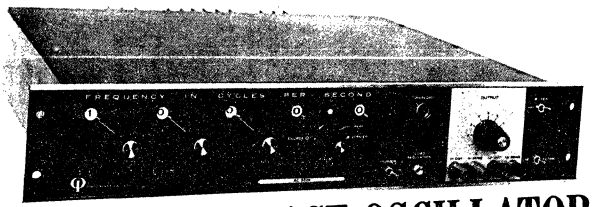
The MS-1000 Magnetic Antenna offers outstanding VLF and ELF sensitivity. Its unique frequency independent properties offer versatility for ELF, VLF and LF detection applications in communications, interference location and reduction, as well as other applications where detection of low level magnetic or electromagnetic fields is necessary. The unique broadband properties make the MS-1000 ideally suited for transient magnetic investigations such as those related to lightning and low frequency variations in the earth's magnetic field.

OHIO SEMITRONICS, INC.
1205 CHESAPEAKE AVENUE • COLUMBUS, OHIO 43212 • PHONE: 614-486-9561
PIONEER IN SOLID STATE ENERGY CONVERSION MATERIALS, DEVICES and SYSTEMS

PRECISION AC INSTRUMENTATION

Since 1961 Optimation has been manufacturing innovative precision AC instrumentation . . . Why not give us a call or send for specifications on products to satisfy your applications today.

WATTMETER CALIBRATION SYSTEMS

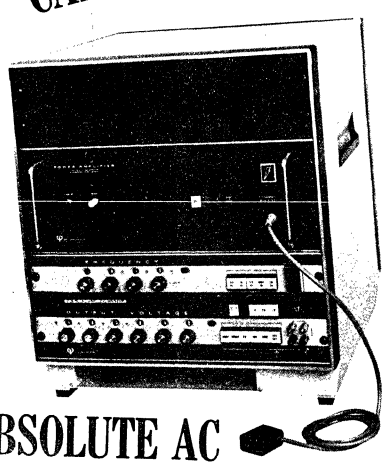


POWER & POLYPHASE OSCILLATORS

GENERAL PURPOSE OSCILLATORS

AC CALIBRATION SOURCES

PRECISION CRT GRAPHIC DISPLAY



ABSOLUTE AC CALIBRATORS

AC CURRENT SOURCES

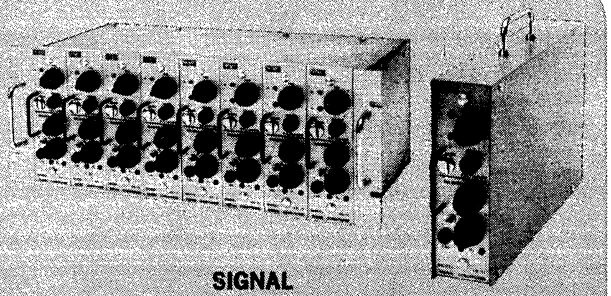
POWER AMPLIFIERS

PRECISION GYRO EXCITATION SOURCES

OPTIMATION INC. 9259 Independence Ave., Chatsworth, Calif. 91311 (213) 882-6490
SUBSIDIARY OF JULIE RESEARCH LABORATORIES, INC.

PPM, INC.

A subsidiary of TORO



SIGNAL CONDITIONERS

THE SG-11 IS A PLUG-IN MODULE with power supply, balance calibration and monitoring circuits. The power supply circuit offers high temperature and time stability, providing line and load regulation of 0.01%; excitation voltage is adjustable from 0 to 16 volts at 0 to 150 mA. Featured is a self-restoring current limit circuit. All units may be wired for constant-current operation.

THE SG-11 has very high isolation to line—under 0.03 pF coupling capacitance from power line to DC output—SG-11 performance approximates battery operation.

All controls are 10 turn potentiometers of very high resolution. Calibration is bipolar single shunt.

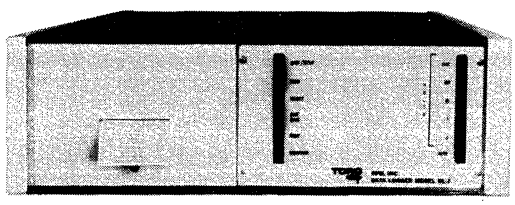
Two types of enclosures are available: A 19" relay rack that permits the mounting of eight units side-by-side and a portable enclosure accepting a single plug-in unit. A plug-in power supply is also available.

MODEL SG-11 PLUG-IN UNIT (eight shown in rack) $187.50

PORTABLE ENCLOSURE (MODEL SG-11-P as shown) ..... $ 39.50

RELAY-RACK MOUNTING ENCLOSURE (MODEL SG-11-R as shown) $129.00
with solder terminals only

RELAY-RACK MOUNTING ENCLOSURE (MODEL SG-11-RC as shown) $395.00
with MS connectors (mating connectors included)



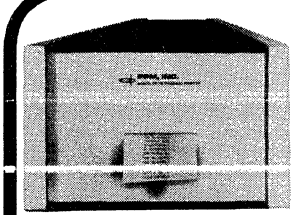
DATA LOGGER

THE MODEL DL-2 IS A COMPLETE DATA ACQUISITION SYSTEM in a compact, portable package. It scans up to 100 differential signals, digitizes them and a new thermal printer records their values. Options include floating decimals, internal digital clock, conditioning for thermocouple or strain-gage transducers and punched paper or magnetic tape recording.

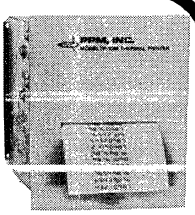
Input signals include DC voltage, resistance and frequency. Write for Bulletin DL-2.

Data Logger with 10 Channels $2320.00

Data Logger with 100 Channels $3220.00



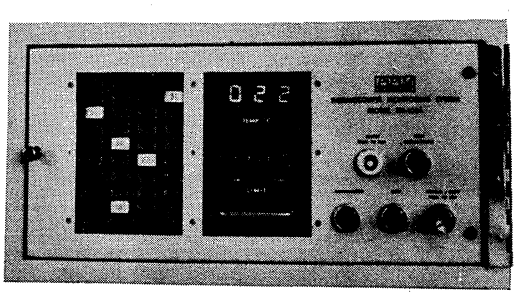
NEW SILENT THERMAL DIGITAL PRINTER



MODEL TP-10 IS A COMPLETE INSTRUMENTATION PRINTER accepting parallel data in BCD form at DTL/TTL levels. Model TP-10-M is the mechanism alone, for OEM applications. The THERMAL PRINTER is a solid-state, medium speed, moderately priced, fully buffered unit for data acquisition and similar applications.

Prints on standard thermal actuated paper . . . with only one moving part. Printing contrast is excellent and the paper can't be marred. Speed: 10 lines/sec., data independent; capacity is 20,000 lines up to 12 columns, **with optional floating decimal & symbols.** Paper feed mechanism, printer and PC cards are accessible from the front. The TP-10-M is used in the Model DL-2 Data Logger.

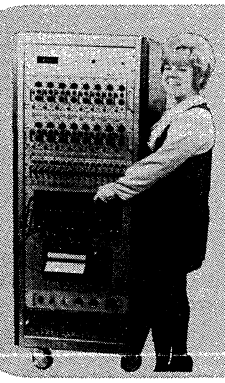
Quantity Priced from $190.00



THERMOCOUPLE MONITOR

THE TM 100A SCANS UP TO 100 THERMOCOUPLES, displaying temperature in digital form. A high-low limit circuit compares temperature with preset thumbwheel switches; a lamp matrix displays all out-of-limit channels. Interface provides for auxiliary printout or computer entry of data.

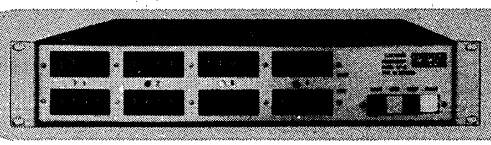
Priced from $3900.00



PPM SYSTEMS

PPM OFFERS CUSTOM SYSTEMS AND SYSTEMS COMPONENTS for data acquisition, process and speed control. PPM Data Acquisition Systems will accept as many as 1000 individual signals; these signals are scanned, digitized and recorded in printed form or on punched or magnetic tape. Alarm outputs are available for signals falling outside of the preset limits. For systems applications we offer several Systems Components, such as: Printers, Scanners, and Digital Clocks.

For comprehensive information, write us or call us collect today.



ELECTRONIC PROGRAMMER

MODEL EP-2 SERIES OF ELECTRONIC PROGRAMMERS provide relay (or solid-state switch) operation at digitally-preset start and stop times with independent operation of all channels.

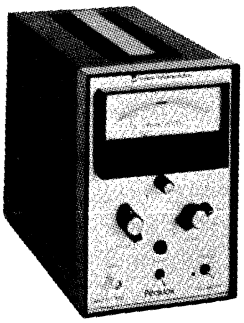
4 Channel EP-2 (Pictured) ..... **Priced from $1200.00**

Prices subject to change without notice.

PPM, INC. 32 WEST MONROE STREET • BEDFORD, OHIO 44146 • 216/232-1880

Pioneer/Instrumentation

DIVISION OF PIONEER-STANDARD ELECTRONICS, INC. / 4800 EAST 131ST STREET / CLEVELAND, OHIO 44105 / (216) 587-3600

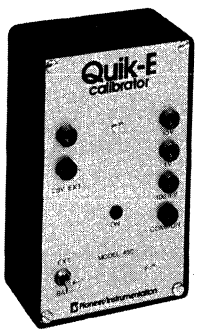


MODEL 800 PEAKLOK®
TRANSIENT VOLTMETER
$850.00

Peak Reading Voltmeters

Unique design enables it to display and retain the highest peak of any voltage applied. Any display is maintained indefinitely until reset is performed either electronically or by front panel pushbutton. Applications include: Transient measurement, peak stress or weight measurement, peak current or peak shock measurement. **Range:** Nine ranges from 100 mV to 1000 VDC or VAC. **Accuracy:** ±1% electronic output; ±2% visual display. **Response Time:** Rated accuracy at 1 μsec. **Impedance:** 1 megohm. **Polarity Selection:** +, − or ±. **Output:** 0–5 VDC at 2 mA max.

MODEL 810 DIGITAL PEAKLOK®
$1190.00



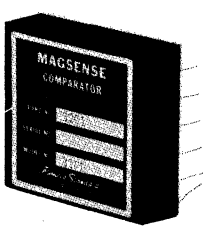
Voltage Calibrator

Battery-powered Quik-E calibrator provides three output voltages; 10 vdc, 1 vdc, and 100 mvdc with ±0.05% accuracy between 15° and 35°C. It is useful in checking recorders, oscilloscopes and instruments whose accuracy depends on voltage level.

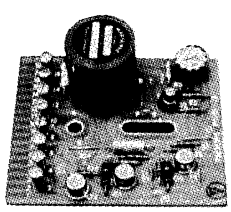
Comparators

- **INPUT ISOLATION**
- **SOLID STATE RELIABILITY**
- **HIGH SENSITIVITY**
- **VARIABLE HYSTERESIS**

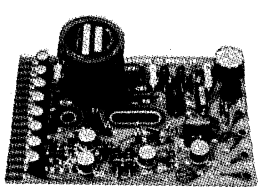
High gain, 10^{-10} watt sensitivity, current and voltage comparators compare input signal in an isolation winding to a stable adjustable set point current. Various output actions can be derived from the relationship of these signal levels.



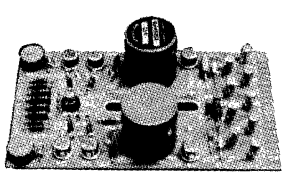
32



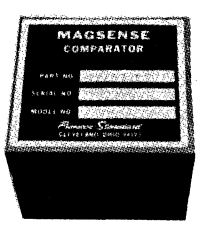
70



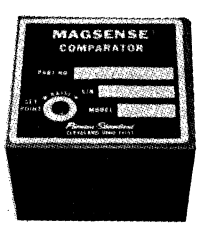
73



77



80



82, 85

MODEL 32 VOLTAGE COMPARATOR

Input Range	Input, Ohms	Hys-teresis	Power Required	Type Output	Net Each
0-1V	>1MΩ	less than 2%	15VDC nominal	Latching: Non-latch:	$35.00 $35.00

MODEL 70 CURRENT COMPARATOR

Input Range	Input, Ohms	Hys-teresis	Power Required	Type Output	Net Each
0–20 μA	2300	0.6 μA	+12 VDC		$71.00
0–100 μA	105	3.0 μA	+12 VDC	Latching:	66.00
0–1 mA	2	30.0 μA	+12 VDC	Non-latch:	66.00
0–10 mA	1	0.3 mA	+12 VDC	Pulse:	82.00
0–100 mA	1	3.0 mA	+12 VDC		

MODEL 73 TEMPERATURE ALARM/CONTROLLER

Input Range	Input, Ohms	Hys-teresis	Power Required	Type Output	Net Each
0–50 mV From I/C, C/A or C/C Thermo-couple	Cali-brated for 24	2% or less	+12 or +28 VDC, ±10%	Latching: Non-latch: Pulse:	$84.00 84.00 96.00

MODEL 77 DUAL SET-POINT COMPARATOR

Input Range	Input, Ohms	Hys-teresis	Power Required	Type Output	Net Each
0–20 μA	4600	0.6 μA			$138.00
0–100 μA	210	3.0 μA	+12 VDC,		108.00
0–1 mA	5	30.0 μA	±10%	Non-latch:	108.00
0–10 mA	1	0.3 mA			108.00
0–100 mA	1	3.0 mA			108.00

MODEL 80 FIXED SET-POINT COMPARATOR

Input Range	Input, Ohms	Hys-teresis	Power Required	Type Output	Net Each
0–100 μA	105	3.0 μA or less	+28 VDC, ±10%	Latching: Non-latch:	$125.00 125.00

MODEL 82 ADJUSTABLE SET-POINT COMPARATOR

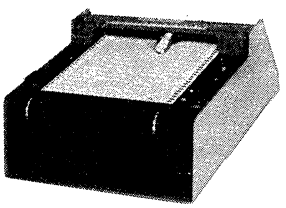
Input Range	Input, Ohms	Hys-teresis	Power Required	Type Output	Net Each
0–100 μA	105	3.0 μA or less	+28 VDC, ±10%	Latching: Non-latch: (SPDT Action)	$220.00 220.00

MODEL 85 TEMPERATURE ALARM/CONTROLLER

Input Range	Input, Ohms	Hys-teresis	Power Required	Type Output	Net Each
0–40 mV	Cali-brated to 24	Less than 0.5 mV	+28 VDC, ±10%	Non-latch: (SPDT Action)	$240.00

All in the Family of Modestly-Priced High-Precision Recorders and Test Instruments

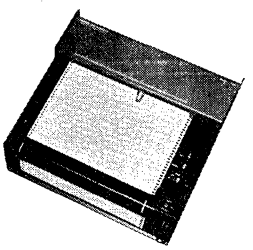
PSC Strip Chart Recorders are precision instruments which embody the newest technology in IC circuitry design. Modestly priced, the PSC line offers a wide scope of recorder capabilities to meet virtually every laboratory requirement, at prices to fit every budget. Each recorder carries a full year's warranty, backed by a nationwide service organization. Light in weight, PSC recorders have amazing versatility and a wide range of optional features and accessories. Generous O.E.M. discounts are available.



PSC General Purpose recorders give maximum performance at lower-than-average prices. They combine basic potentiometric accuracy with the latest IC designs to provide an extremely high input resistance. Floating inputs and **zero** adjust permit recording of positive or negative signals referenced anywhere on the chart.

LOW-COST GENERAL PURPOSE RECORDERS

Model 701 — 4″ Chart $255
Model 702 — 5″ Chart $275
Model 703 — 10″ Chart $350

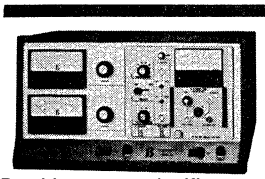


Unsurpassed values in potentiometric Strip Chart Recorders. Each model offers 12 separate chart speeds, fast 30 in/sec pen response, superior electronic shielding, high input resistance of more than 10 megohms, with accuracy ranges of from 0.5% of F.S. to 0.25%. Long-life disposable felt pens are standard, and can be ordered with remote pen lift.

LOW-COST LABORATORY RECORDERS

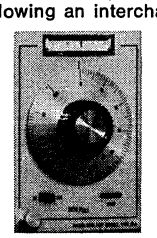
Model 714 — 4″ Chart $450
Model 726 — 5″ Chart $495
Model 736 — 10″ Chart $595
Model 746 — 10″ Dual Pen $895

OPTIONAL ACCESSORIES: Include Event Marker, Remote On/Off Chart Control, Alarm/Control Switch, Shunt Resistors, Battery Power Capability, Integrator, Chart Paper and others.



Semiconductor Test Sets

Provides every significant semiconductor test function by allowing an interchange of modules for specific test operations. PSC Model 70 ($795) is the basic unit into which all modules plug. This master module is a low-cost, flexible station which features both automatic and resetable overload protection. Meter accuracy is ±1%, and contains power supplies and metering circuitry for setting up bias conditions.



PLUG-IN MODULES

(Prices From $475 To $895 Each)

These plug-in modules give the low-cost Model 70 the range and parameters of a much more expensive test system. The modules include: 10A Pulsed Beta (100 V, 30 Amp); 10-AC-1 Hybrid Parameter; 10-B V_{cb} (SAT), V_{be} (SAT) (10V, 30Amp); 10-CD Low Leak and Breakdown; 10 FET Field Effect Parameter; 10-E Multi-Parameter (300V, 1 Amp); 10-L Pulse Breakdown (1000V, 1 Amp); 10-Z Zener Parameters.

INTEGRATED CIRCUIT TEST SETS

The Series 800 (From $2500 to $4500) provides pushbutton test sequencing. Similar parameters may be tested sequentially without reprogramming. Standard modules include a 5-unit power supply (constant current source with digital programming); matrix; and readout. Also available, a dual-channel pulse generator module for dynamic testing. Unique matrix system allows up to 40 separate pins/contacts to be independently programmed.

DIFFERENTIAL VOLTMETERS

Model 1002 ($1450) provides DC accuracy of 0.001% of reading, with an internally-guarded input. Ranges: 1000, 100, 10, 1.0V AC and DC with 10% overranging. Null detector provides for zero check. Ratio measurements attainable through 3-position REFERENCE control (positive, negative, external). Six-digit Kelvin Varley Voltage Divider provides resolution of 1 part per million. 12 different models.

DC VOLTAGE CALIBRATORS

PSC Model 462A ($595) with 0.005% of setting accuracy, is a precision DC calibrator with two ranges. An output current of 20 milliamperes can be drawn on the 11-volt range. A 100:1 precision divider provides a simultaneous output of 0 to 100 millivolts at 10 OHM output resistance, with better than 0.05 microvolts resolution. Stability assured with stable zener reference, and high-gain, wide band amplifier.

CALL TOLL-FREE

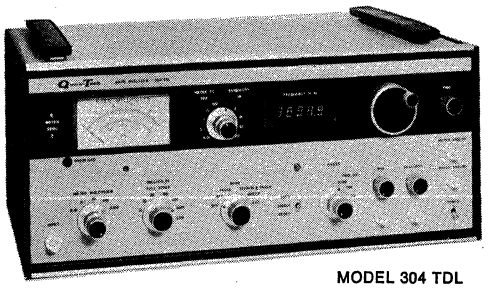
800/854-3253

PSC

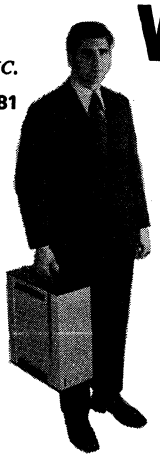
Precision Standards Corporation
1701 Reynolds, Santa Ana, California, 92705
(714) 546-0431

Quan-Tech
Division of KMS INDUSTRIES, INC.
43 SOUTH JEFFERSON ROAD, WHIPPANY, N.J. 07981
TELEPHONE: (201) 887-5508

WAVE & SPECTRUM ANALYZERS



MODEL 304 TDL



- ***HIGH PRECISION***
- ***SELECTABLE BANDWIDTHS***
- ***AUTOMATIC TRACKING***
- ***FREQUENCY FROM 1 Hz TO 10 MHz***
- ***LARGE DYNAMIC RANGE***
- ***LOG AND LINEAR OUTPUTS***
- ***PORTABILITY/BATTERY OPERATION***

MODEL	303	2156	2223	2449	304DL	304TDL	306TDL	350
PRICE	$1700	$2375	$3525	$2050	$3200	$3875	$3875	$3950
FREQUENCY Range (Hz):	30 to 100 K	10 to 30 K	10 to 200 K	10 to 50 K	1 to 5 K		10 to 50 K	10 K to 10 M
Resolution:	20 Hz			1 Hz	0.1 Hz		1 Hz	1 KHz
Accuracy:	±5% or 10 Hz	±5% or 3 Hz	±5% or 10 Hz	±0.01% or ± 1 Least Significant Digit				
Readout:	Mechanical Dial			5 Digit Led Display				5 Digit Nixie
SELECTIVITY Bandwidths (Hz):	10, 30, 100, 1 K	3, 10, 100, 300	10, 100, 750, 1 K	7, 100, 1 K	1, 3, 10, 30, 100		10, 30, 100, 300, 1 K	4 K, 40 K
Filter Rolloff:	18 dB/Octave			24 dB/Octave				Note 1
Selectable Meter TC:	0.01 and 1.0 Sec.			.1, 1, 10 Sec.	.01, .1, 1, 10, 100 Sec.		.01, .1, 1, 10 Sec.	———
INPUT Maximum Amplitude:	300 Volts RMS			300 VRMS	100 VRMS			10 V
Minimum Detectable:	10 Microvolts (μV)			1.0 μV	0.3 Microvolts (μV)			10 μV
Dynamic Range:	>70 dB	>70 dB	>60 dB	>75 dB	>70 dB			>55 dB
ANALOG OUTPUTS Frequency:	—20 V to 0 VDC (Freq. Range)			1.0 Millivolt Per Hz				
Linear Amplitude:	0 V to + 1 V (Meter Full Scale)			0 V to + 1 V (Meter Full Scale)				
Log Amplitude:	———			———	0 V (—80 dB) to + 1.0 V (0 dB)			———
BFO:	———			0 V to 1.0 VRMS (Variable)				0-30MVRMS
Restored Signal:	———			0 V to 1.0 VRMS (Variable)				Note 2
Sweep:	———			0 V to + 5.0 VDC (Sweep Increment)				———
MODES Sweep (Increment-Hz):	———			5 K, 50 K	50, 100, 500, 1 K, 5 K		.5 K, 1 K, 5 K, 10 K, 50 K	———
AFC (Hold-in):	———			±15 B.W.	± 4 B.W. (Bandwidths)			———
Automatic Track:	———			———	———	Note 3		———
PHYSICAL Weight:	28 Lbs.			20 Lbs.				33 Lbs.
Bench Model Dimensions:	15" W x 11-1/16" H x 11¼" D			16½" W x 8" H x 12" D				17" x 11" x 11"
Rack Mount Dimensions:	19" W x 10½" H x 11¼" D			19" W x 7" H x 12" D				19" x 10½" x 11"
OPTIONS AVAILABLE	R (Rack Mount Panel) $50			A, B, C, D, F, I, L, P, R, S				R

NOTES:

1. Shape factor less than 2 for 4 KHz, shape factor 4.3 for 40 KHz.
2. Detector output on front panel.
3. Track range is determined by the selected sweep range.
4. All models have meters for tuned signal amplitude.
5. A.C. line power 115/230 Volts, 50-400 Hz.

OPTIONS AVAILABLE

- **A** — Audible detector signal, front panel jack for earphones; approx. 1000 Hz detector signal — $350
- **B** — Battery or A.C. power operation — $225
- **C** — Covers; front and rear for easy transportable field use, includes handles and feet — $ 75
- **D** — Digital output of frequency, BCD format, specify interface requirements — Varies
- **F** — Non-standard frequency bandwidths, consult factory for availability — Varies
- **I** — Isolation Amplifier, input analog — $350
- **L** — Log sweep, analog output — $300

(OPTIONS continued)

- **P** — Programmable, remote capability — $300
- **R** — Rack mounting, adapters supplied at time of order. (Replacement $15.00) — N/C
- **S** — Squared amplitude. analog output — $350

Model 1304L is an accessory unit providing dual channel spectrum analysis and phase measurements.

Model 3304 increases system capability to include cross-spectral density analysis.

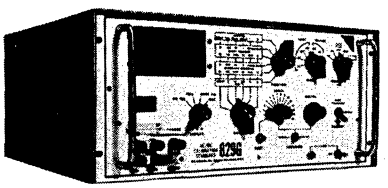
QUAN-TECH COMPONENT NOISE ANALYZERS ARE THE INDUSTRY STANDARD FOR LAB STUDIES, QUALITY INSPECTION & PRODUCTION TESTING OF SEMI-CONDUCTORS AND RESISTORS. SEND FOR "NOISE FILE".

All prices shown are F.O.B. Whippany, N.J. Prices and specifications subject to change without notice. Phone (201) 887-5508.

INSTRUMENTATION DIVISION

Since 1922

AC/DC Voltage, Current and Power Standard



Model 829G	Measure & Deliver
Full-scale ranges	AC/DC Volts 0.01 — 1400V AC/DC Current 10 μA—14A Ohms 0.1-10 meg.
Accuracies of reading	±0.05% DC ±0.08% AC ±0.06% Ohms
AC Frequencies	50, 60 400, 1000 Hz
Price	$3,600.00

Model 5058A

Model 5058A Wattmeter Calibration Module for use with two Model 829G's. For calibration of four-terminal wattmeters ranging from 0.05 watt to 14,000 watts. Price: **$995.00**

Magnet Chargers and Treaters

Model 747

High energy magnet charger covers full range of charging applications, from the lowest to the highest coercive forces, in all configurations.
Available in five separate energy-storage capacity levels from 2,000 to 10,000 watt-seconds.
$2,420.00 to $3,885.00

Model 107A

Saturates most medium size and instrument magnets, including core types, using variety of fixtures. Two output ranges: Maximum 18-watt-seconds. Booster unit also available. **$975.00**

Model 3260

First all solid-state impulse charger variable output to 54 watt-seconds. Capable of magnetizing a wide range of materials and configurations. **$775.00**

Model 1500

Produces 225 watt-seconds for large Alnico meter magnets plus cobalt platinum and barium ferrite materials. Wire-wound fixtures plug into front panel through safety interlocks. **$1,425.00**

Model 2470-350

Variable output voltage with energies up to 440 watt-seconds for saturating up to 4 lbs. of Alnico V using wire-wound fixture. Bench or rack mounting available. Accessory Booster available for doubling output. **$1,145.00**

Model 942

Saturate Alnico magnets to 34 lbs. and high coercive force barium ferrite compounds of any shape or number of poles. Outputs to 3,600 watt-seconds. Safety interlocked. **$2,400.00 to $3,000.00**

Model 580

Magnetreater®/Charger
Combination Magnet Charger and Magnetreater capable of charging and stabilizing permanent magnet materials and assemblies. Completely solid-state, pro-

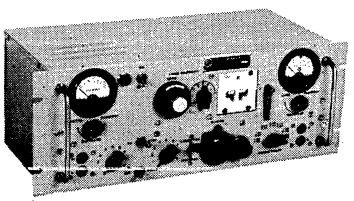
viding high reliability. Energy storage for the charging mode is 105 watt-seconds; Magnetreater mode is 54 watt-seconds. Can be combined with RFL Gaussmeter for automatic or semiautomatic operation. **$1,100.00**

Model 990

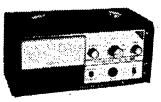
Magnetreater®
Completely solid-state demagnetizer for stabilization of permanent magnets. Power continuously variable from less than 1 VA to in excess of 80,000 VA. Resolution 0.1%. Can be programmed for automatic or semiautomatic operation. **$790.00**

Crystal Impedance Meters

Model	Frequency Range	Impedance Range	Price
459A	800KHz-15 MHz	0-9,900 ohms	$1495.
531	10-140 MHz	10-150 ohms	$1150.
541C	2.5-1100 kHz	200 ohms-0.5 megohms	$1460.
1207	75-200 MHz	10-125 ohms	$1595.



Reference standards for measuring resonance and anti-resonance of quartz crystals in determination of capacitance, inductance and performance index. Meet U.S. MIL-C-3098E/Amd. 1 and U.K. Defense DEF-5271 A.



Gaussmeters

Model 505

Model 505, a low cost unit ranging from 5 gauss to 50 kilogauss in 7 full-scale ranges. Measures permanent magnet, DC and AC fields to 20 kHz. Built in probe calibration and zero center mode for determining polarity. Accuracy: ±3% Price: **$225.00**

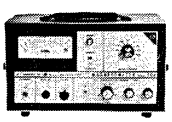
Model 750, a wide range device for flux density measurements from .02 gauss to 50 kilogauss in 24 full-scale ranges. Measures permanent magnetic fields, DC and AC from 20 Hz to 400 Hz. Easy to read 7" meter. Line or battery operation for field use. Accuracy: ± 1%① Price: **$760.00**

Model 3265, three-in-one gaussmeter capable of measuring absolute flux densities from .02 gauss to 50 kilogauss (DC and AC to 400 Hz). In the expanded scale mode, measurement to a resolution of 1 ppm and a differential mode for simultaneous measurement of two separate fields or field gradients. Accuracy: ± 1%① Price: **$1100.00**
①Plus accuracy of reference.
Gaussmeters are solid state, Hall effect instruments that yield laboratory accuracy traceable to NBS.

Probes — Are InAs elements for temperature stability. Choice of flat, axial or tangential in various sizes to fit most gaps. Flat ranges from .015" thick x .080" wide x .309" long. **$115.00 to $265.00**

Reference Magnets — Traceable to NBS with 50 gauss to 20K gauss fields and gaps from .040" to .343" are standards for probe calibration. **$50.00 to $500.00**

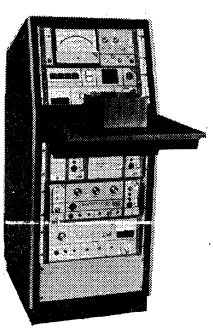
Magnetometer



Model 101

Solid state low level magnetic flux density measurements from 1 gamma to 100,000 gamma (1 oersted). Temperature compensation is provided to enable virtual drift-free operation.
Price: **$630.** — Standard Probe: **$145.**

Automagnetic® Systems



A combination of RFL standard magnetizing, measuring and demagnetizing equipment permits interconnection for semi-automatic and completely automatic systems, designed for individual requirements. Processing includes TWT, BAR and C shaped magnets, DC meters, Torque motors, accelerometers and other designs embodying permanent magnets.

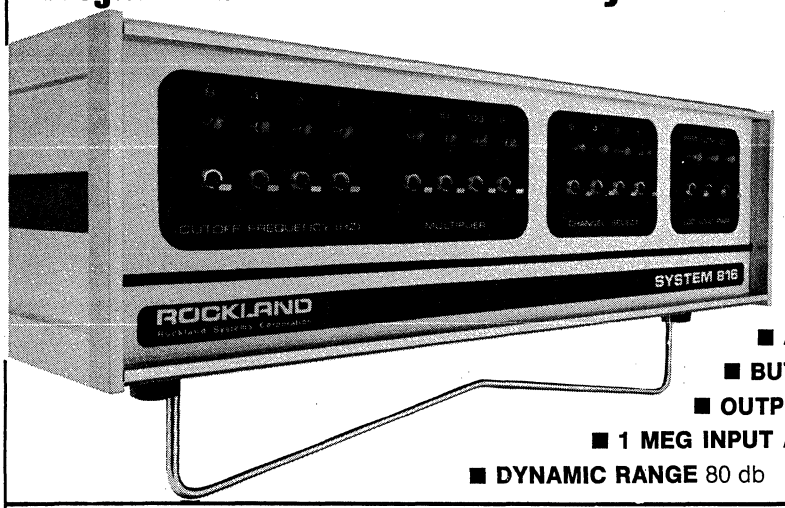
RFL Industries, Inc.
Instrumentation Division • Boonton, New Jersey 07005 • U.S.A.
Tel. (201) 334-3100 / TWX: 710-987-8352 / CABLE: RADAIRCO, N. J.

See Vol.2•1174 **Thermocontrol Division**
Temperature Measurement Control

ROCKLAND SIGNAL PROCESSORS

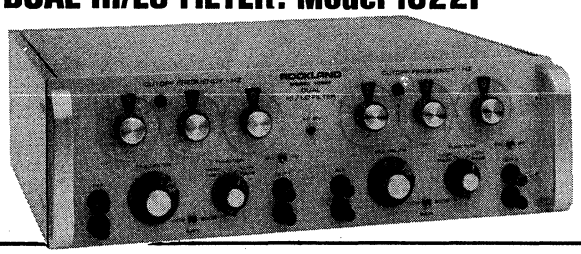
ANALOG FILTERS featuring Digital Frequency Selection, Local and Remote Programming

Programmable Multi-Channel Filter: System 816



- **UP TO 16 FILTER CHANNELS (THROUGH PLUG-IN CARDS) IN 5¼" PANEL HEIGHT**
- **LOCAL (FRONT PANEL),ON-CARD, AND REMOTE PROGRAMMING OF CUTOFF FREQUENCY**
- **DIRECT INTERFACE TO COMPUTER, PROGRAMMER OR SWITCH CLOSURES**
- **LOW PASS, HIGH PASS, BAND PASS, BAND REJECT**
- **FREQUENCY RANGE** 10 Hz to 150 KHz
- **PASSBAND GAIN** 0 db
- **ATTENUATION SLOPE** 48 db/oct per channel
- **BUTTERWORTH RESPONSE**
- **OUTPUT SIGNAL** 10 volts, p-p
- **1 MEG INPUT AND 50-OHM OUTPUT IMPEDANCE**
- **DYNAMIC RANGE** 80 db

DUAL HI/LO FILTER: Model 1022F

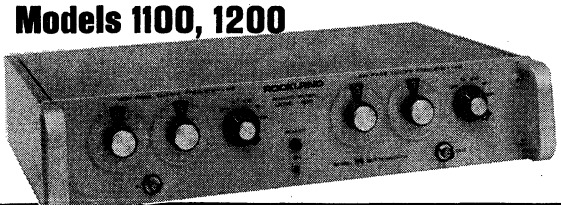


- High Pass, Low Pass, Band Pass, Band Reject
- Frequency Range: 0.001 Hz to 111 KHz at 2% accuracy (see options)
- Attenuation slope (each section): 24 db/oct
- Sections can be cascaded to produce 48 db/oct
- Passband Gain: 0, 20, 40 db
- Butterworth and RC response
- 10 Meg input and 50-ohm output impedance
- Output Signal: 20 volts, p-p

DUAL HI/LO FILTER: Model 1042F

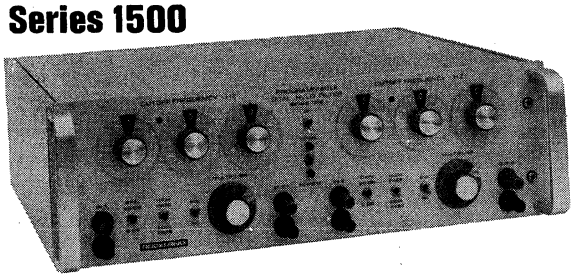
- High Pass, Low Pass, Band Pass, Band Reject
- Frequency Range: 0.001 Hz to 111 KHz at 2% accuracy (see options)
- Attenuation slope (each section): 48 db/oct
- Sections can be cascaded to produce 96 db/oct
- Passband Gain: 0, 20, 40 db
- Butterworth and RC response
- 10 Meg input and 50-ohm output impedance
- Output Signal: 20 volts, p-p

VARIABLE ANALOG FILTERS: Models 1100, 1200



- High Pass, Low Pass, Band Pass (Model 1100) and Band Reject (Model 1200)
- Frequency Range: 10 Hz to 1.1 MHz at 5% accuracy
- Attenuation Slope: 24 db/oct
- Passband Gain: 0 db
- Butterworth and Bessel response
- 100K input and 50-ohm output impedance
- Output signal: 10 volts, p-p

PROGRAMMABLE DUAL HI/LO FILTERS: Series 1500

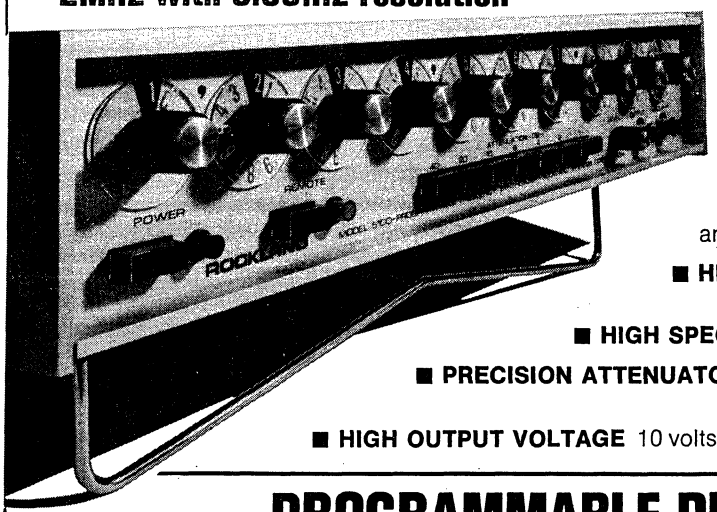


- Local and/or Remote programming of all functions
- Programming options: 02; 1-2-4-8 BCD positive logic, 03; 1-2-2-4 BCD positive logic
- High Pass, Low Pass, Band Pass, Band Reject
- Frequency Range: 0.001 Hz to 111 KHz at 2% accuracy (see options)
- Attenuation slope: 24 db/oct, each section, sections can be cascaded to produce 48 db/oct
- Passband Gain: 0, 20, 40 db
- Butterworth and RC response
- 10 Meg input and 50-ohm output impedance
- Output Signal: 20 volts, p-p

AND SYNTHESIZERS ROCKLAND

PROGRAMMABLE FREQUENCY SYNTHESIZER

Model 5100 Covering the range of 0.001Hz to 2MHz with 0.001Hz resolution



■ **DIRECT SYNTHESIS UTILIZING DIGITAL TECHNIQUES**
No mixing or Phase Locking.

■ **FULL PROGRAMMABILITY** Binary or BCD with integral buffer storage; direct interface to computer, programmer, or switch closures.

■ **1.5 MICROSEC PROGRAMMING SPEED**

■ **NO SWITCHING TRANSIENTS** Amplitude and phase continuity maintained between frequencies.

■ **HIGH STABILITY** $\pm 2 \times 10^{-8}$/°C standard
$\pm 2 \times 10^{-10}$/°C optional

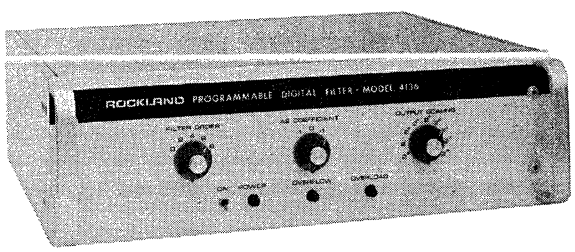
■ **HIGH SPECTRAL PURITY** —70db spurious —60db harmonic

■ **PRECISION ATTENUATOR** 0 to 85 db in 1 db steps plus continuous control (optionally programmable)

■ **HIGH OUTPUT VOLTAGE** 10 volts p-p, 50-ohm source impedance

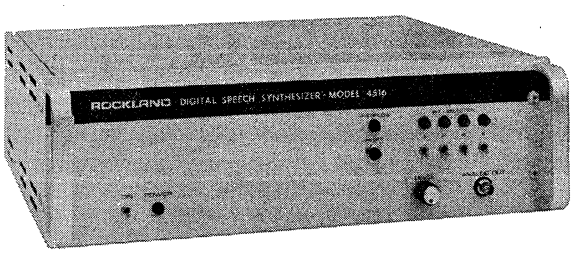
PROGRAMMABLE DIGITAL FILTERS

DIGITAL FILTER: Model 4136



- Recursive, eighth-order digital filter
- All classical designs: Butterworth, Bessel, Chebyshev, & Elliptic
- Programmable poles & zeros
- Modes: Low Pass, High Pass, Band Pass, & Band Reject
- Sampling Rate: 80 KHz
- Computational Accuracy: 24 bits
- Coefficient Accuracy: 16 bits
- Options: Internal A/D (12 bits) and D/A (12 bits)

DIGITAL SPEECH SYNTHESIZER: Model 4516



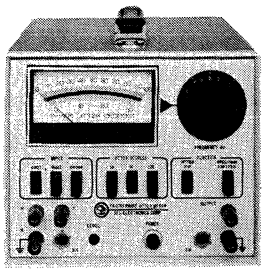
- Produces natural-sounding speech in real time
- Simulates the speech-producing mechanism, including the vocal tract and its excitation sources
- Sampling Rate: up to 12.8 KHz
- Clock signal: externally supplied, up to 6.25 MHz
- Computational Accuracy: 24 bits
- Coefficient Accuracy: 16 bits
- Operation: Pitch synchronous with up to 4096 samples per pitch period
- Gains: 0 to 2^{23} in steps of 2^{8} for both the pulse and noise generators
- Output: Digital output (16 bits) and Analog output through 12-bit D/A converter

Rockland Systems Corporation 230 W. Nyack Road, West Nyack, N.Y. 10994 • (914) 623-6666 • TWX 710-575-2631

ROCKLAND

SEG ELECTRONICS TELEPHONE CHANNEL TEST AND SIMULATION EQUIPMENT

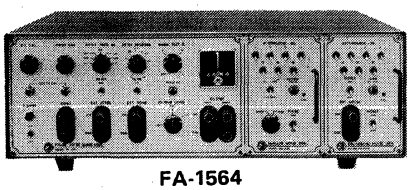
PHASE JITTER METER



FA-1743

- Measures peak-to-peak phase jitter from 0° to 100°
- Unique BUILT-IN SPECTRUM ANALYZER for instant determination of jitter frequencies and their contribution to total phase jitter, even in the presence of large amounts of broadband noise.
- Accepts carrier frequencies from 800 to 1800Hz
- Simplified operation — no level set or frequency adjustment required
- Rugged, portable — for field and laboratory use

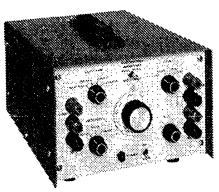
PHASE JITTER SIMULATOR



FA-1564

- Simulates normally encountered active telephone channel impairments such as phase jitter, phase hits, harmonic distortion, broadband and impulse noise and frequency translation
- Simulates phase jitter; 0 to 45° peak-to-peak; jitter frequencies, 20 to 300Hz
- Use for developing, testing and evaluating data-com equipment

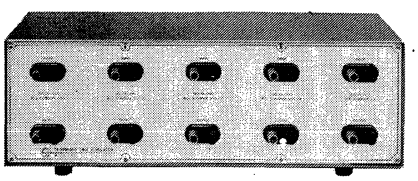
TUNABLE BAND PASS AND BAND REJECT FILTER



AF-850A

- Telephone channel filter tunable from 35Hz to 3500Hz
- Use for notched noise measurements and waveform analysis; 3.5Hz and 35Hz bandwidth
- Fully compatible with telephone channel transmission measuring techniques and equipment
- 0dB, 10dB, 20dB, 30dB gain and by-pass functions
- Generates reference signal at Fc of notch and bandpass

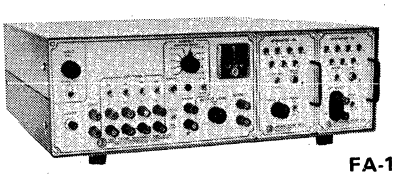
TELEPHONE DATA LINE SIMULATOR



Model LSCC-( )

- Contains up to 5 data line simulators
- Industry standard telephone line simulator
- Simulates nominal worst case attenuation and delay, per Bell, CCITT, and DCS schedules
- Simulates 3002, C1, C2, C4 and DCS-S3
- Controlled out-of-band characteristics
- Also available: C-Message Weighting, F1A Weighting, Telephoto 1 and 2, etc.

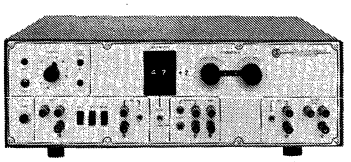
DROPOUT SIMULATOR



FA-1955

- Simulates data-channel dropout; adjustable duration from 1 ms to 10 seconds and depth from −3dB to greater than −50dB
- Simulates additive broadband and impulse noise, SFI tones and out-of-band signals
- Operates in band limited mode, with SEG Telephone Data Line Simulators, or in broadband metallic mode

DIGITAL DELAY (ECHO) GENERATOR



FA-1755

- Simulates data channel delay and/or echo
- Delay to 100 ms* in 1 ms steps
- Stores 99 ms* of transient input data and continuously regenerates it for analysis or utilization as additional channel impairment
- Bandwidth 200Hz to 3.4kHz delay-corrected to 50usec
- Echo adjustable to 49dB in 1dB steps

*Up to 2 seconds available

FOR APPLICATIONS ENGINEERING ASSISTANCE CALL 212-441-3200

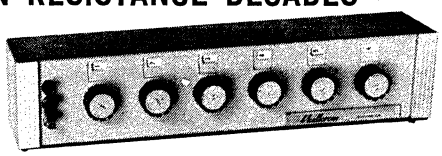
SEG ELECTRONICS Subsidiary of COMSTRON CORPORATION **120-30 Jamaica Avenue Richmond Hill, N.Y. 11418 Tel: 212-441-3200**

THE COMSTRON GROUP: SEG ELECTRONICS CUSTOM FILTERS ■ MULTIMETRICS ACTIVE FILTERS ■ SEG ELECTRONICS TELEPHONE CHANNEL TEST & SIMULATION EQUIPMENT

shallcross
A CUTLER-HAMMER COMPANY
SELMA, NORTH CAROLINA 27576 / TELEPHONE: (910) 965-2341 / TWX: 510-920-0740

PRECISION RESISTANCE DECADES

SERIES 6800



SPECIFICATIONS

DC Accuracy at Terminals

±.03% above 100 ohms
±.05% 10 to 100 ohms
±.1% 1 to 10 ohms
±.5% .1 to 1 ohm
±2% .01 to .1 ohm

Zero Resistance

2 milliohms ±2 milliohms per decade (approximate). Each instrument is supplied with exact reading.

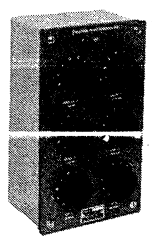
Wattage Rating per Step

½ watt above 1 ohm, ¼ watt for .1 ohm steps, .16 watt for .01 ohm steps.

Maximum Voltage

1500 volts DC where individual resistor ratings are not exceeded.

SERIES 800



SPECIFICATIONS

Resistor DC Accuracy

±.1% 10 ohms and above
±1% .1 ohm to 10 ohms
±5% .01 ohm to .1 ohm

Stability per Year

±.01% when operated within rated wattages over 10°C-40°C range.

Temperature Coefficient

Less than ±20 PPM 20°C-30°C.

Maximum Wattage

½ watt per resistor.

Maximum Voltage

2000 volts DC if wattage rating for resistors is not exceeded.

6800 SERIES BENCH AND RACK MOUNTED DECADE MODELS

Bench Model No.	Rack Model No.	No. Dials	Resistance Step Increments (Ohms)	Total Resistance (Ohms)	Bench Size (Inches)
6840	6840 RM	4	.01	111.1	17⅓ x 5 x 5
6841	6841 RM	4	.1	1,111	17⅓ x 5 x 5
6842	6842 RM	4	1	11,111	17⅓ x 5 x 5
6843	6843 RM	4	10	111,110	17⅓ x 5 x 5
6844	6844 RM	4	100	111,000	17⅓ x 5 x 5
6845	6845 RM	4	1,000	110,000	17⅓ x 5 x 5
6850	6850 RM	5	.01	1,111.1	19½ x 5 x 5
6851	6851 RM	5	.1	11,111	19½ x 5 x 5
6852	6852 RM	5	1	111,110	19½ x 5 x 5
6853	6853 RM	5	10	111,100	19½ x 5 x 5
6854	6854 RM	5	100	111,000	19½ x 5 x 5
6860	6860 RM	6	.01	11,111.1	19½ x 5 x 5
6861	6861 RM	6	.1	111,111	19½ x 5 x 5
6862	6862 RM	6	1	111,110	19½ x 5 x 5
6863	6863 RM	6	10	111,100	19½ x 5 x 5

800 SERIES BENCH AND RACK MOUNTED MODELS

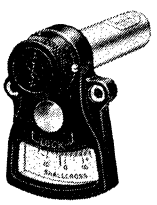
Bench Model No.	Rack Model No.	No. Dials	Resistance Step Increments (Ohms)	Total Resistance (Ohms)	Bench Size (Inches)
817-A	817 ARM	4	.01	111.1	9⅝ x 7¼ x 5¼
819	819 RM	4	.1	1,111	9⅝ x 7¼ x 5¼
825	825 RM	4	1	11,110	9⅝ x 7¼ x 5¼
826	826 RM	4	10	111,100	9⅝ x 7¼ x 5¼
827	827 RM	4	100	1,111,000	9⅝ x 7¼ x 5¼
828	828 RM	4	1,000	11,110,000	9⅝ x 7¼ x 5¼
817-B	817 BRM	5	.01	1,111.1	10⅞ x 6¼ x 5¼
8285	8285 RM	5	.1	11,111	10⅞ x 6¼ x 5¼
829	829 RM	5	1	111,110	10⅞ x 6¼ x 5¼
830	830 RM	5	10	1,111,100	10⅞ x 6¼ x 5¼
831	831 RM	5	100	11,111,000	10⅞ x 6¼ x 5¼
817-C	817 CRM	6	.01	11,111.1	10⅞ x 6¼ x 5¼
8315	8315 RM	6	.1	111,111	10⅞ x 6¼ x 5¼
832	832 RM	6	1	1,111,110	10⅞ x 6¼ x 5¼
833	833 RM	6	10	11,111,100	10⅞ x 6¼ x 5¼

6800 AND 400 SERIES UNMOUNTED DECADES — SPECS EQUAL TO 800 SERIES

Dials	Ohm Steps	Total (Ohms) Resistance	Weight (Lbs.)	Model No.	Dimensions (Inches)	Model No.	Dimensions (Inches)
1	.01	.1	½	6800	2⅞ x 3	435	3 x 3
1	.1	1	½	6801	2⅞ x 3	436	3 x 3
1	1	10	½	6802	2⅞ x 3	437	3 x 3
1	10	100	½	6803	2⅞ x 3	438	3 x 3
1	100	1,000	½	6804	2⅞ x 3	439	3 x 3
1	1,000	10,000	½	6805	2⅞ x 3	440	3 x 3
1	10,000	100,000	½	6806	2⅞ x 3	441	3 x 3
1	100,000	1,000,000	½	6807	2⅞ x 3	442	3 x 3
1	1,000,000	10,000,000	½	6808	2⅞ x 3		

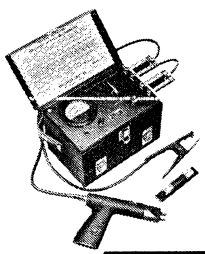
VALUE IN RESISTANCE MEASUREMENT

GALVANOMETER SYSTEMS WITH INTERNAL MAGNET CONSTRUCTION



Part No.	Price	Sensitivity/ Div. in Microamps	Period Seconds	Coil Resistance	External Critical Damping Resistance
1961-A	20.00	1.0	3	250	950
1961-B	20.00	0.5	3	1000	2400
1961-C	20.00	2.0	3	50	125
1961-D	20.00	4.0	3	20	50
1966-B	25.00	0.25	4	1000	2000
1966-C	25.00	1.0	4	50	100
1964-D	25.00	1.5	4	30	40

670 SERIES LOW RESISTANCE TEST SETS

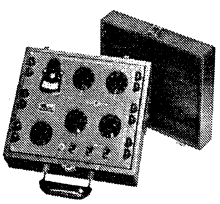


Six portable test sets offering the facility and operating speeds necessary for efficient production line testing of low resistances. Applications include the testing of welding bond resistances, welding cable resistances, switch contact resistances, etc. Six different measurement ranges (see chart below) with accuracies of ±5% of full scale values are available. A pistol grip probe and fixed clamp are standard accessories to facilitate production line tests.

657B pistol grip probe
676 fixed clamp
271 test standard 0.0025 ohm ±2%

Shallcross Type	No. of Ranges	Ranges in Ohms — Reading From 0 to Full Scale Value Indicated
670-A	6	0.001 0.005 0.01 0.05 0.10 0.50
673-D	5	0.005 0.01 0.50 1.0 5.0

638-R KELVIN WHEATSTONE BRIDGE



A portable Kelvin Wheatstone Bridge offering exceptional versatility and practicality. Wide measurement range is afforded by integrated Kelvin (.001 ohm to 10 ohms) and Wheatstone (1 ohm to 11 megohms) circuits. Internal galvanometer and compartment for 3 (1.5 volt) flashlight batteries supply portable operation in 0.1 ohm to 50,000 ohm range. Binding posts to connect external galvanometer (.005MA/MM sensitivity) and power supply (1 to 45 volts) supplied for higher resistance measurements. Limits of error are ±.75% (Kelvin circuit) and ±.2% (Wheatstone circuit). Rheostat arm is brought out to two binding posts to provide resistance decade operation (11,110 ohms on 1 ohm step increments) with ±.1% accuracy above 10 ohms and ±.25% for 1 ohm steps. Separate current and potential terminals are available for low resistance measurements.

6100 WHEATSTONE-FAULT LOCATION BRIDGE

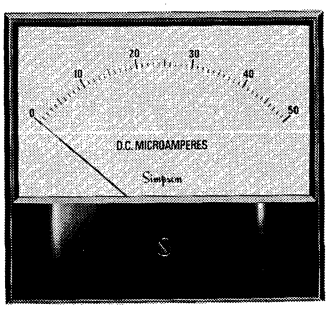
All purpose portable instrument for laboratory and field resistance measurements. Fault location capabilities of wires and cables performed with, Murray, Varley, Hilborn and Fisher loop tests. DC resistance from 1 ohm to 1.011 megohms with ±2% limit of error. Built-in galvanometer and compartment for 3 (1.5 volt) flashlight batteries permit portable measurements to 50,000 ohms — binding posts to connect external galvanometer and power supply available for testing of higher resistances. Rheostat arm of bridge connects to two binding posts for decade resistance operation. Available housed in weatherproof metal case and removable lid or with wooden case and removable lid.

Simpson®

INSTRUMENTS THAT STAY ACCURATE

PANEL METERS

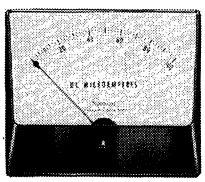
OVER 1500 STOCK RANGES, SIZES, AND TYPES
CONTROLLERS • METER RELAYS



■ NEW! CENTURY SERIES

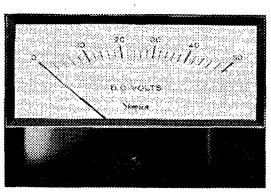
A MODERN BLEND OF PHENOLIC AND GLASS

Simpson's new panel instrument design concept. Rugged glass and phenolic construction **plus** a modern clean-cut design. Directly replaces older panel instrument designs. A complete line to meet all electrical needs — AC and DC Voltmeters, Ammeters, Wattmeters and Elapsed Time Meters. Available in four sizes, 1½", 2½", 3½" and 4½". Features Simpson's self-shielding movements with spring-loaded pivot and jewel or Taut Band suspensions. Available from stock in a wide selection of ranges. Write for bulletin 4100A.



■ WIDE-VUE

Simpson's most popular panel instrument designs. Clear acrylic viewing areas will not yellow or develop hairline cracks. Available from stock in 1½", 2½", 3½", 4½" and 8" sizes and the widest selection of ranges. Behind panel bezel mount also available for 3½" and 4½" sizes.

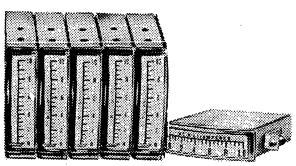


■ DESIGNER SERIES

3½" and 4½" sizes, made for today's compact equipment designs — without sacrificing readability. 4½" model uses less than 3" of panel height, yet has a clear, readable scale over 3¼" long. Clean, crisp glass windows.

■ 250° LONG-SCALE METERS

Provide more than double the scale length of the standard 90° or 100° meters. Available in 3½" or 4½" sizes and a variety of ranges covering DC microammeters, milliammeters, ammeters, millivoltmeters and AC voltmeters. Write for Bulletin P-609.

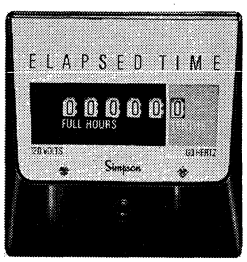


■ EDGEWISE METERS

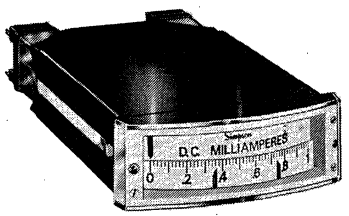
1½", 2½" and 3½" sizes. Single or stackable design. Self-shielding core magnet movements.

■ DIGITAL METER

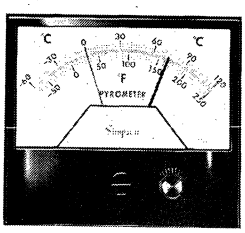
Compact Model 2830: 3½ digits, LED readout, 0.33" non-blinking bi-polar display. ±0.1% accuracy.



■ NEW! EDGEWISE CONTROLLER



Compact 3.3" wide by 1.2" high by 4.6" long, new Model 3623XA Edgewise Controller fits standard ASA panel cutout. Features: anti-parallax scale; 5-amp plug-in load relays; 2-piece offset illuminated dial; operating mode indication lamps; removable set-point adjust knobs; front panel mounting. Stocked in single and double set-point types for electrical and temperature control applications. Also supplied as indicating meter. Write for Bulletin 4100A.



■ CONTROLLERS

Maximum reliability through optical switch point sensing, long-life photoelectric light sources, solid state switching amplifier and exceptionally dependable electromechanical relays. DPDT relay output for each set point rated at 10 amps (115 VAC) resistance. Write for Catalog C-1208.

CALL SIMPSON FOR ALL YOUR PANEL METER NEEDS . . .

- Elapsed Time
- Radio Frequency
- Pyrometers
- % Load Meters
- Frequency Meters
- Behind Panel Mounts
- Decibel/VU
- Counters

Write today for Catalog 4100A.

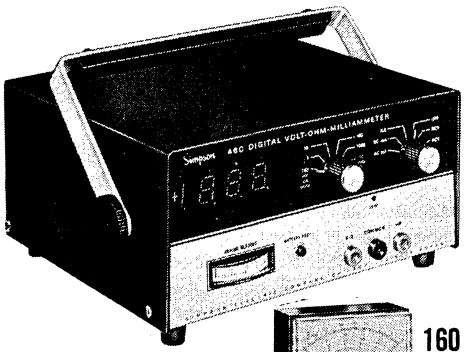
■ **TEMPERATURE CONTROLLERS . . .** Wide variety available. Write for details or call your local Simpson Representative.

SIMPSON ELECTRIC COMPANY • 5200 W. KINZIE STREET CHICAGO, ILLINOIS 60644 • (312) 379-1121

TEST EQUIPMENT
DIGITAL COUNTERS • RECORDERS

Simpson®
INSTRUMENTS THAT STAY ACCURATE

■ TEST EQUIPMENT



NEW!
460 Digital Volt-Ohm-Milliammeter

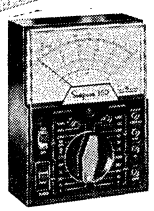
Provides seven segment, non-blinking digit display with automatic + and — indication. Front panel analog meter lets you see at a glance normal peaks or nulls. Measures AC and DC volts, AC and DC amps and resistance. Operation by line power, 120V 50-400 Hz, or re-chargeable D cell batteries (not supplied). $375.00.

NEW Sound Level Meter and Calibrator

MODEL 885 Sound Level Meter measures sound and noise anywhere, easily, quickly. Helps you meet OSHA and Bureau of Mines requirements. With batteries and operator's manual $250.00.

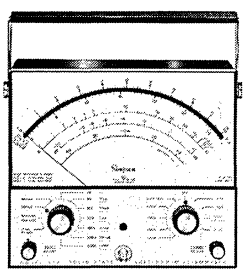
MODEL 889 Calibrator, calibrates your Model 885. With batteries and operator's manual $95.00.

NEW COMBO PACKAGE includes Models 885 and 889, 3 spare batteries, wrist strap and adjusting screwdriver, all for $345.00.



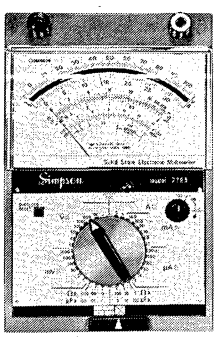
160 Handi-VOM

Full-size VOM features in a palm-size high-impact package! 20,000Ω/V DC, 5000Ω/V AC. Taut Band movement. Built for today's VOM needs, including solid-state circuit testing, the 160 has 25 ranges including 0.25 VDC and 0-50 DC μA ranges. $55.00.



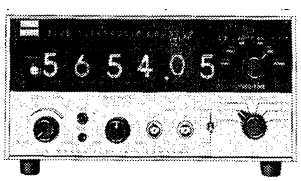
NEW! 314 FET-Input VOM

Designed for today's circuits. Measures both low power and conventional ohms. Voltage ranges have 10 Megohm and 100 Megohm input impedances with probe. AC and DC current ranges to 10 μA, FS. Total of 58 ranges. Portable, battery operated. X1, X10 (AC/DC Ohms) probe and batteries supplies. $195.00.



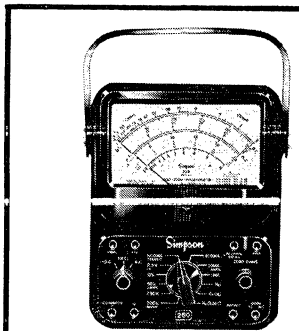
NEW! 2795 Electronic Multimeter

Portable, laboratory accuracy. Solid state, FET input. 68 switch selectable functions: 13 AC and DC voltage ranges start at 1 mV, FS . . . 14 AC and DC current ranges start at 1 μA, FS . . . 6 low power, IC compatible resistance ranges . . . 6 self-contained capacitance ranges . . . 2 temperature ranges . . . **plus** 12 output ranges. ±1% accuracy for AC and DC. $250.00. Write for Bulletin L-1010.



2726 Frequency Counter

32 MHz counter has six full-time digits plus overrange. Measures average frequency, frequency ratios, time periods, time intervals, and totalizes. Also provides multiple measurement of period and ratio. Accuracy 0.001, $575.00. Five-digit model also available, $525.00.



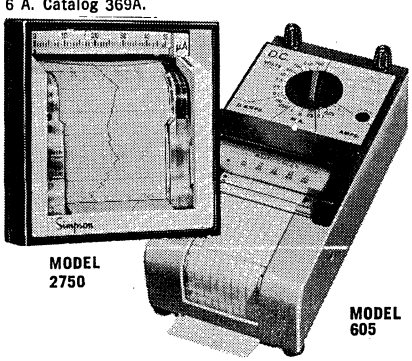
NEW!
260® Series 6 VOM

NEW range selection: built-in Amp-Clamp ranges to 250A; 0-1 VDC and 0-500 AC and DC ranges. Optional 5kV AC or DC probes. Rugged taut band movement. $70.00.

NEW 260-6P with handy resettable OVERLOAD PROTECTION also available. Write for Catalog 4100A.

■ CHART RECORDERS

Mount in just 3¾" x 3¾". Record over 30 days unattended. Model 2750 for AC or DC V or A recording. Model 2755 is a 10-channel event recorder. Models 2761 and 2762 record varying temperatures. Optional DC motors available. Request Catalog 368D. Model 605 is a recording volt ammeter. 24 switch selectable ranges covering AC/DC voltage from 12 MV to 600 V and AC/DC current from 600 μA to 6 A. Catalog 369A.

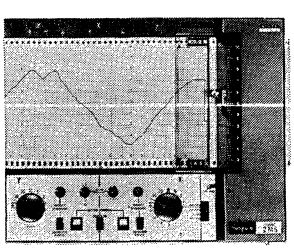


MODEL 2750

MODEL 605

■ NEW! 2745 X-Y and Y-T Portable Recorders

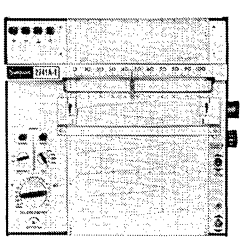
Choice of X-Y or Y-T recording at the flick of a switch, at 1 Megohm input impedance. Ink or inkless recording in a lightweight, compact, battery-powered unit. Only $750.00 ready to operate. Write for Bulletin L-1012.



MODEL 2745

■ NEW! Potentiometric Desk-top Recorders

Single and dual channel models, 17 switch-selectable ranges. New blot-free ink system — also ball point, felt tip or pressure sensitive writing. Fast response, high accuracy and sensitivity. Linear or Linear/Log, with or without Integrator. 8 switchable chart speeds. Zero center and segmental scales. Many options. Prices start at $875. Write for Bulletin L-1013.



MODEL 2741A

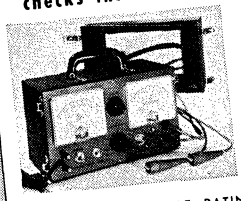
Insulation Testers

WRITE FOR DATA SHEETS ON THE INSTRUMENTS SHOWN . . . ALL ARE STANDARD PRODUCTION MODELS, AVAILABLE FOR IMMEDIATE DELIVERY FROM STOCK . . . LET US QUOTE ON YOUR REQUIREMENTS FOR MODIFIED UNITS OR SPECIAL TEST EQUIPMENT.

SLAUGHTER CO.
MOORE & HAILEY STREETS
ARDMORE, OKLAHOMA
TELEPHONE: 405-223-4773 TWX: 405-223-6832

High-voltage Leakage Tester

checks insulation for . . . leakage . . . grounds . . . . . arcing



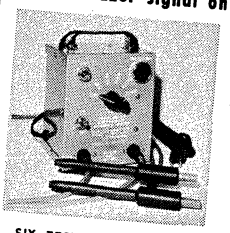
MODEL **122**

16 lb. Portable for lab and field work

VARIABLE VOLTAGE RATINGS TO 5 KV AC & D.C. DUAL RANGE LEAKAGE METER 0/100/1000 μa. . . . CAPACITY COMPENSATION. . . MEASURES INSULATION RESISTANCE, CAPACITY, POWER FACTOR.

High-voltage Insulation Tester

with buzzer signal on breakdowns . . . grounds . . . . shorts



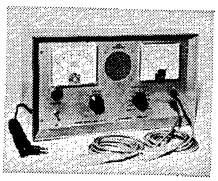
MODEL **101**

Watch what you are doing . . . not the tester

SIX TEST VOLTAGES . . 500 to 2500 V.A.C. PRICED SO YOU CAN AFFORD TO SPOT A FEW ALONG YOUR ASSEMBLY LINES.

High-voltage Leakage Tester

audibly signals excess leakage . . . grounds . . . . . arcing



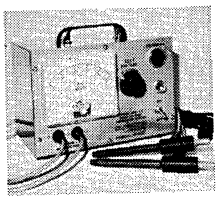
MODEL **103**

Measures Leakage . . . not capacity current

TEST VOLTAGE CONTINUOUSLY VARIABLE ADJUSTABLE LEAKAGE LIMIT. . CAPACITY COMPENSATION ON AC TESTS. . . RATINGS TO 10,000 VOLTS AC & DC. . . . LIMITED ENERGY. . NON-DESTRUCTIVE. . . FOR LAB AND PRODUCTION LINE SERVICE. . . . . .

Adjustable High-voltage Tester

with buzzer signal on breakdowns . . . grounds . . . . shorts



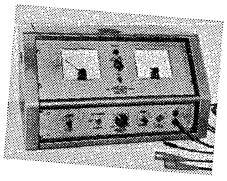
MODEL **106**

Voltmeter shows actual Test Voltage

CONTINUOUSLY VARIABLE TEST VOLTAGE RATINGS TO 10,000 VOLTS AC & DC . . RECOMMENDED FOR BREAKDOWN TESTING AT FINAL ASSEMBLY AND INSPECTION

Automatic H-V Insulation Tester

for precision checking . . . breakdowns . . . leakage . . . grounds



MODEL **103-MP**

Automatic Test Cycle

FULLY AUTOMATIC TEST CYCLE. . . CONTROLLED RATE-OF-RISE. . . ADJUSTABLE TEST VOLTAGE, DWELL TIME, & LEAKAGE LIMIT. . . CAPACITY COMPENSATION ON AC TEST. . . FOR PRECISION TEST OF CRITICAL PARTS & ASSEMBLIES. . .

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Stroboscopes

WRITE FOR DATA SHEETS ON THE INSTRUMENTS SHOWN . . . ALL ARE STANDARD PRODUCTION MODELS, AVAILABLE FOR IMMEDIATE DELIVERY FROM STOCK . . . LET US QUOTE ON YOUR REQUIREMENTS FOR MODIFIED UNITS OR SPECIAL TEST EQUIPMENT.

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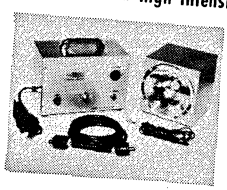
MOORE & HAILEY STREETS
ARDMORE, OKLAHOMA
TELEPHONE: 405-223-4773 TWX: 405-223-6832

Inspection Stroboscope

. . . with extra high intensity daylight lamp



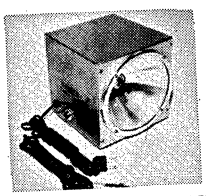
MODEL **167**

0/600 Flashes per Minute

SUPER INTENSITY TRIGGERED FLASH UNIT . . . PUSH—TO—SEE SWITCH. . . . FOR INSPECTION ON-THE-GO UNDER HIGH AMBIENT LIGHT CONDITIONS.

Inspection Stroboscope

. . . . . with high intensity daylight lamp



MODEL **161**

0/2,000 Flashes per Minute

LIGHT WEIGHT INEXPENSIVE TRIGGERED FLASH UNIT. . . . .PUSH-TO-SEE SWITCH. . . . INTENSE WHITE LIGHT FOR INSPECTION ON —THE —GO

MIDGET STROBOSCOPE FLASH HEAD

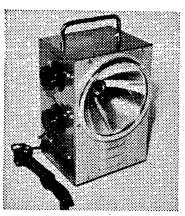
MODEL **166**

0/10,000 Flashes per Minute

FOR WORK ON MINIATURIZED EQUIPMENT . . . . FOR PRINTING TRADES. . . . FOR BIO—MEDICAL WORK. . ADAPTS TO ANY SLAUGHTER STROBOSCOPE. . .

Universal Stroboscope

. . . with high intensity daylight lamp



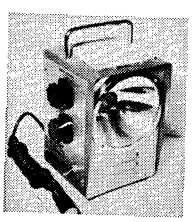
MODEL **163**

50/16,000 Flashes per Minute

UNIVERSAL UNIT FOR MOTION STUDY & INSPECTION ON-THE-GO. . . INSTANT STARTING . . . HIGH INTENSITY WHITE LIGHT . . . . TRIGGER EXTERNALLY OR OPERATE FROM INTERNAL OSCILLATOR

Metered Precision Stroboscope

. . . . . with high intensity daylight lamp



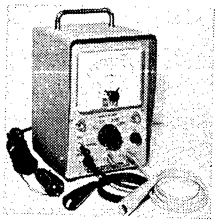
MODEL **165**

50/16,000 Flashes per Minute

PRECISION STROBOSCOPE TACHOMETER INSTANT STARTING. . . HIGH INTENSITY WHITE LIGHT. . . OPERATES FROM EXTERNAL CONTACTS OR INTERNAL OSCILLATOR. . EASILY SYNCHRONIZED. . OUTPUT JACKS TO COUPLE SCOPE, ETC. . . .

Precision Linear Ohmmeter

. . . . for accurate resistance testing



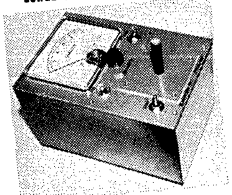
SERIES **203**

0.1 to 5000 Ohms Range

LINEAR RESISTANCE SCALES . . . CONTINUOUSLY SELF-CHECKING . . . GO/NO-GO LIMIT STYLE WITH BUZZER REJECTION SIGNAL.

High Energy Coil Tester

SURGE TESTS COILS FOR . . SHORTS . . GROUNDS . . OPENS



SERIES **640**

High Level Tester

DETECTS WEAKNESSES AS WELL AS DEFECTS . . . USE WITH CORE OR SOLENOID TYPE COILS . . . REQUIRES NO OPERATOR SKILL.

Coil & Winding Testers

WRITE FOR DATA SHEETS ON THE UNITS SHOWN ALL ARE STANDARD PRODUCTION ITEMS, AVAILABLE FOR EARLY DELIVERY . . . LET US QUOTE ON YOUR REQUIREMENTS FOR MODIFIED UNITS OR SPECIAL TEST EQUIPMENT.

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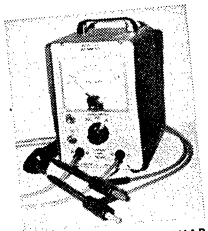
Adjustable Limit Megohmmeter

. . . . . with buzzer signal on rejections



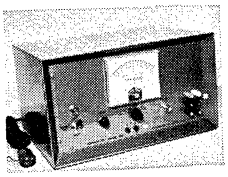
SERIES **205**

1 to 2000 Megohms

DRIFT FREE . . . NO WARM-UP . . . RUGGED TAUT BAND MOVEMENT . . . ADJUSTABLE REJECTION LIMIT WITH BUZZER SIGNAL.

Universal Comparator

tests coils and windings for impedance
. . . . . shorts
. . . . . opens
. . . . . turns



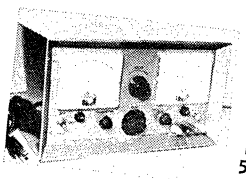
SERIES **635**

0.1 Percent Sensitivity

COMPARES COILS AND WINDINGS WITH STANDARD ON HIGH PRODUCTION GO/NO-GO BASIS . . . EXCELLENT AS A TURNS COUNT CHECKER . . .

Adjustable HI Voltage Surge Tester

tests coils and windings for shorts
. . . grounds
. . . . . opens



SERIES **648**

Ratings to 5000 Volts

DIRECT READING PULSE-SURGE TESTER . . . REQUIRES NO ACTIVE MASTER . . . PRECISE ENERGY CONTROL . . . GO/NO-GO OPERATION FOR UNSKILLED PERSONNEL . . .

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

Automatic Test Equipment

WRITE FOR DETAILS ON THE EQUIPMENT SHOWN THESE ARE FULLY ENGINEERED, PROVEN, STANDARD DESIGNS AVAILABLE ON A REASONABLE DELIVERY SCHEDULE . . . LET US QUOTE ON YOUR REQUIREMENTS . . .

SLAUGHTER CO.
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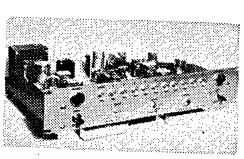
TELEPHONE: 405-223-4773 TWX: 405-223-6832

Automatic Test Sequence Controller

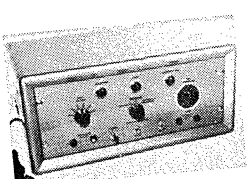


SERIES **910**

Brain Package

FULLY AUTOMATIC CONTROLLER WITH START — ACCEPT — REJECT — DELAY — SKIP — STOP — RESET FUNCTIONS . . . SELF-TIMING . . . PROGRAMMABLE.

Universal Cable & Harness Tester for continuity . . . breakdowns

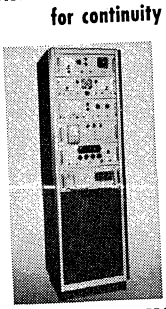


SERIES **701**

17 Circuit Capacity

SEMI-AUTOMATIC ECONOMY UNIT FOR GENERAL PURPOSE TESTING . . . REQUIRES NO OPERATOR SKILL . . . ELIMINATES COSTLY RE-WIRING.

Automatic Cable & Harness Tester for continuity . . . breakdowns . . . megohms

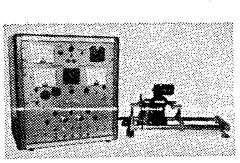


SERIES **707**

Expandable to 10,000 Circuits

INTERCHANGEABLE PROGRAM BOARDS FOR RAPID SET-UP CHANGES . . . MODULAR CONSTRUCTION . . . TESTING RATES TO 200 CIRCUITS/MINUTE . . . ALL LIMITS ADJUSTABLE.

Automatic Wound Armature Tester for insulation weakness . . . opens . . . grounds . . . shorted turns

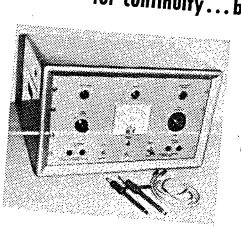


SERIES **920**

360 Parts Per Hour

CHECKS WOUND ARMATURES ON GO/NO-GO BASIS AT HIGH PRODUCTION RATES . . . HIGHLY EFFECTIVE PULSE-SURGE TEST SPOTS WEAKNESSES AS WELL AS DEFECTS.

Automatic Cable & Harness Tester for continuity . . . breakdowns



SERIES **706**

Expandable to 50 Circuits

FULLY AUTOMATIC PROGRAMMABLE UNIT FOR HIGH PRODUCTION ON SIMPLE ASSEMBLIES . . . GO/NO-GO OPERATION . . . ADJUSTABLE LIMITS.

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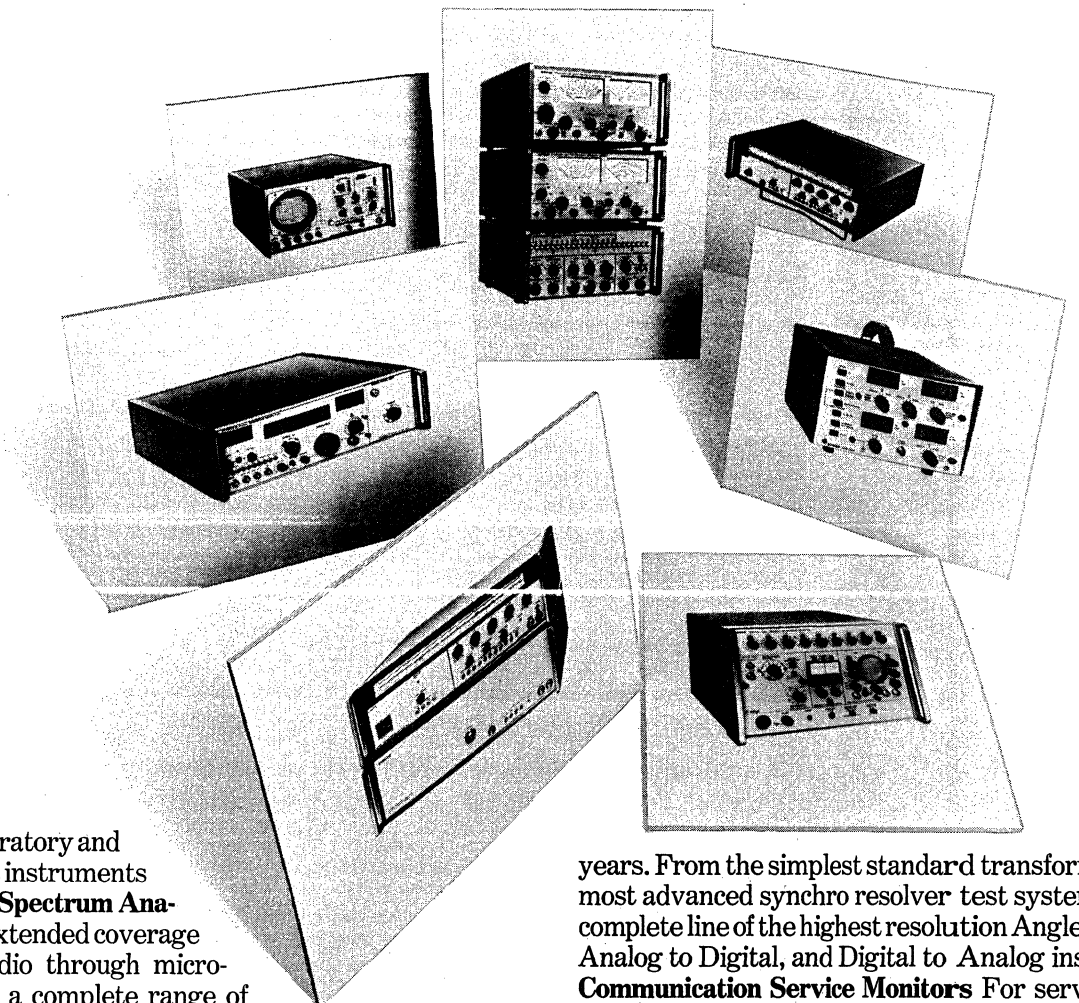

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INSTRUMENTATION

FREQUENCY COUNTERS

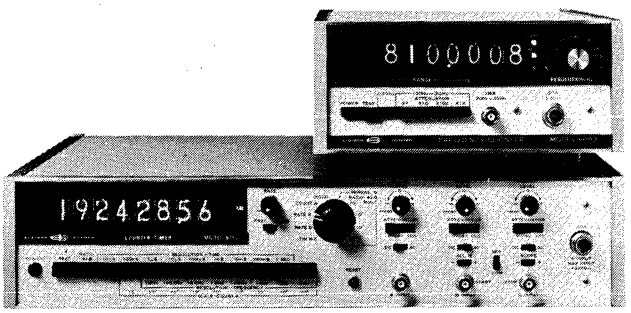
6050 series counter features: Automatic operation right up to 3 GHz. Small 3½" height in ½ rack width. 10 mV sensitivity to 200 MHz; 50 mV to 3 GHz. Resolution to 0.1 Hz. Programmable options. Low cost.

6150 series universal counter features: Choice of 100 nsec or 10 nsec TIM resolution. Choice of 5 oscillators; four types of BCD output. Up to 9 digit readout. Versatile remote programming. Resolution to 0.1 Hz.

Microwave counters: such as the Model 6057 measure CW, FM, and pulsed RF to 18 GHz. The models 6016, 6092, and 6057 offer a choice of manual or fully automatic operating features with prices that are the most competitive in the industry.

Low cost counters: New 6202, 6220, 6250 counters feature AGC and autoranging circuits for total hands-off operation. Model 6250 measures frequency, period, TIM and ratio. Model 6220 includes a phase lock/multiplier for high speed direct reading measurements; resolves 0.001 Hz in 1 sec.

6050 SERIES COUNTER



6150 SERIES COUNTER-TIMER

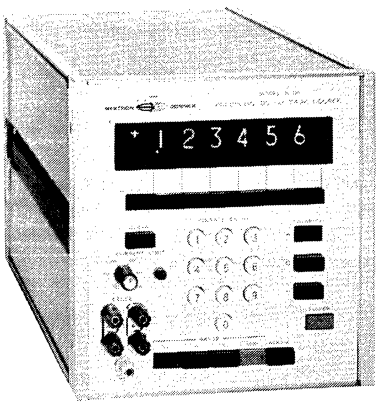
Quick Reference Guide to Systron-Donner Electronic Counters

	Expandable Universal Counter-Timers				Expandable Portable Frequency Counters				Microwave Frequency Counters					Low Cost Counters		
Model	**6150**	**6151**	**6152**	**6153**	**6050**	**6051**	**6052**	**6053**	**6016**	**6092**	**6057**	**6316A**	**6316B**	**6202**	**6220**	**6250**
Frequency Range	DC to 50 MHz	DC to 200 MHz	DC to 512 MHz	DC to 3 GHz	20 Hz to 50 MHz	20 Hz to 200 MHz	20 Hz to 512 MHz	20 Hz to 3 GHz	20 Hz to 18 GHz			DC to 12.4 GHz	DC to 18 GHz	20 Hz to 200 kHz	20 Hz to 2 MHz	20 Hz to 50 MHz
Resolution	.1 Hz to 1 MHz				.1 Hz to 1 MHz				1 Hz to 1 MHz			.1 Hz to 1 MHz		.1 Hz	.001 Hz	.1 Hz
Display Std. Digits Max.	7 9				7 9				9 9	7 9	9 9	9 9	9 9	5 7	6 9	8 —
Sensitivity (rms)	50 mV	100 mV	Note 1	Note 2	10 mV	10 mV	Note 3	Note 3	Note 4			100 mV	Note 5	25 mV rms		
Input Impedance	1 MΩ	1 MΩ	1 MΩ to 200 MHz 50Ω above	1 MΩ to 200 MHz 50Ω above	1 MΩ	1 MΩ	1 MΩ to 200 MHz 50Ω above	1 MΩ to 200 MHz 50Ω above	1 MΩ to 200 MHz 50Ω above			1 MΩ to 100 MHz 50Ω above		1 MΩ		
Coupling	AC/DC				AC				AC			AC/DC		AC		
Standard Time Base Stability	±3 parts in 10^7 per month				±2 parts in 10^6 per month				±2 parts in 10^8 per 24 hr.					3 parts in 10^7		
Optional Oscillators to	±5 parts in 10^{10} per 24 hr.				±5 parts in 10^{10} per 24 hr.				±5 parts in 10^{10} per 24 hr.					Yes		
Ratio/Mult. Ratio	Yes				Yes				No					No	No	Yes
Period/Mult. Period	Yes				No				No					No	Yes	Yes
Time Interval	Yes				No				No					No	No	Yes
Scaling	Yes				No				No					No	No	Yes
Totalizing	Yes				No				No					Yes	Yes	Yes
Digital Outputs (Opt.)	Yes				Yes				Yes					Yes	Yes	Yes
Remote Programming (Opt.)	Yes				Yes				Yes					No	No	No
Base Price	$1195	$1495	$1795	$2995	$770	$1050	$1395	$2295	$4575	$3695	$5450	$4950	$5245	$275	$395	$625
Other Features	Full system interface capability. Expandable range and functions. Rack or bench mount.				Compact portable package. Expandable range and functions. Optional battery operation.				Choice of manual or fully automatic readings. Half-rack portable packages.			1¾" thin line package. Fully automatic, direct readout.		Highly reliable, low cost units. Small compact packages. Bench or panel mount.		

NOTES: 1. 100 mV rms from DC to 200 MHz; 10 mV rms above 200 MHz (D input)
2. 100 mV rms from DC to 200 MHz; 50 mV rms above 200 MHz (D input)
3. 10 mV to 200 MHz; 50 mV above 200 MHz.
4. 10 mV rms to 200 MHz; 50 mV to 9 GHz, 160 mV at 18 GHz
5. 100 mV rms to 12.4 GHz; 160 mV rms above 12.4 GHz

SYSTRON DONNER CORPORATION
Concord Instruments Division, 10 Systron Drive, Concord, California 94518 • Telephone: (415) 682-6161 • TWX: 910-481-9479
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

PROGRAMMABLE PRECISION DIGITAL VOLTAGE SOURCE



Features — Model M106A:

- Manual selection of output voltage, range, and polarity with the front panel keyboard
- Automatic (remote) BCD programming of output voltage, range and polarity from computer control systems
- Reprogramming of single decades when rapid voltage changes are needed, without clearing all six digits.

Specifications:

- Output programmable, 0-1000 Vdc in four ranges
- Output current 50 mA to 100 Vdc, 5 mA to 1000 Vdc
- Accuracy 0.002% of range
- Stability 0.015%
- Regulation 0.0001%
- Price $1995.00

Applications:

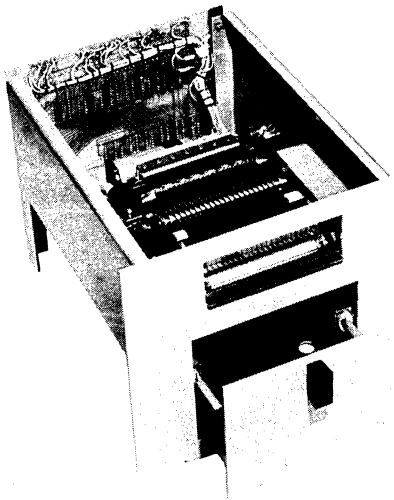
Model M106A is a precision, programmable source of stable, isolated, dc voltage — ideal for laboratory or field use as a:

- DC Voltage Calibrator
- Secondary DC Voltage Standard
- Digital-to-analog converter with high resolution and output voltage; excellent isolation and extreme stability

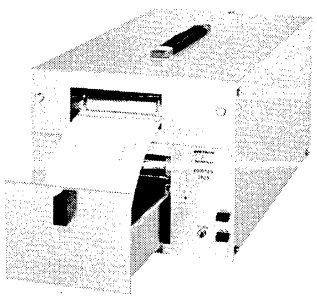
This versatile instrument is an isolated, floating source of voltage to 999.999 Vdc, in four decade ranges: 1V, 10V, 100V and 1000V, with six-digit resolution. The calibration accuracy is 0.002%, overall stability 0.0015%, and regulation better than 0.0001%.

DC output voltage range, and polarity appears on the digital display and at BCD output terminals for coupling back to a computer or to data acquisition systems. This precision portable instrument will meet all critical requirements for a stable DC voltage reference source. Its conservative solid-state design and rugged construction assure consistent, dependable operation under a wide range of severe uses.

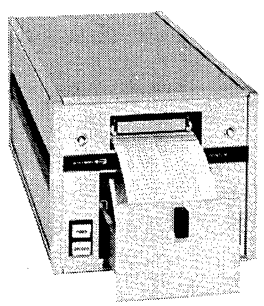
DIGITAL PRINTERS



Model 5103A, $595. A very reliable, low cost OEM printer. Small size is well suited for panel mounting. Choice of 6, 12, or 18 columns. Prices begin at $595 (even less in quantity).



Model 5103B, $650. Designed for system and OEM users who need reliable, day-in day-out performance. Choice of 7, 14, 21 columns. IC compatible inputs; normal or inverted logic. Grounded or floating inputs. 2-color printing. Power supply optional. Prices start at $650 (even less in quantity).



Model 5103, $945. A low cost medium speed printer with many features found only on higher priced instruments. Will accept almost any input with a minimum of options. Up to 21 columns. Plug-in boards, field expandability. Dual-source operation. Internal clock. Programmable zero suppression. Base price $945.

TIME CODE GENERATOR/ READERS, TAPE SEARCH SYSTEMS, DIGITAL CLOCKS

Systron-Donner offers a large variety of timing instruments in both standard and highly specialized versions to cover vitually every possible application from the very simple to the most sophisticated.

TIME CODE GENERATORS:

Economy Series: 8200 and 8300 series.
General: 8000 and 8100 series.
Airborne: 8400 and 8500 series.

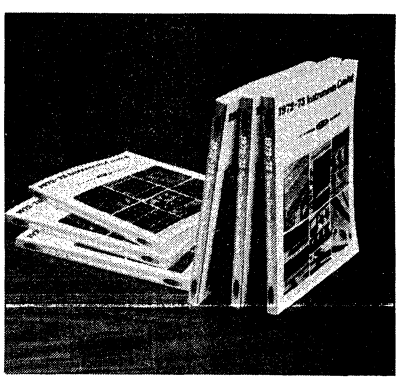
TAPE SEARCH:

Economy Series: Models 8154 and 8350.
General: 8150/8140 System.

DIGITAL CLOCKS:

Economy Series: Model 8210.
General: Model 8110.

For complete product data and prices on Systron-Donner's extensive range of timing instruments, please send for "1972/73 Instruments Catalog," or contact your nearest SCIENTIFIC DEVICES sales office (see under Systron-Donner in yellow page section).



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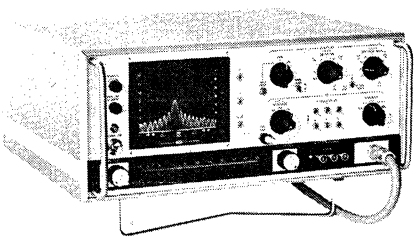
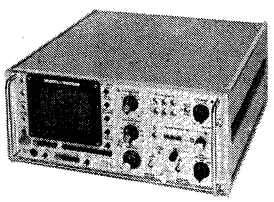
SPECTRUM ANALYZERS



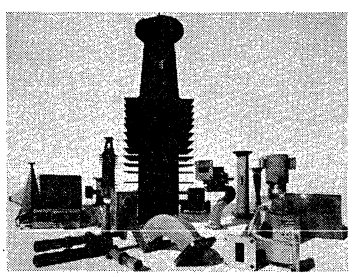
No matter what your need, from audio to microwave, Systron-Donner offers a spectrum analyzer that will save you time and money. Two broad families are available. The Plug-in family and the Portable family:

Plug-in Family: Versatility is insured through the use of main frame Display Units and plug-in Tuning Units. Standard and Variable Persistence Display Units are available, in addition to a battery operated version. Tuning units covering the range from audio to microwave are offered.



The Portable Family: These are self-contained, fully calibrated instruments covering frequencies from 1 MHz to 40 GHz. Four models make up the family, each optimized for a particular frequency range; VHF, UHF, Microwave and Ku Band.

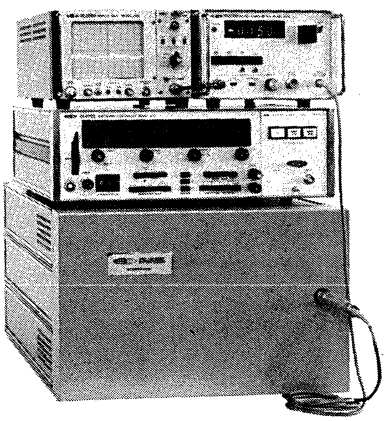
MICROWAVE COMPONENTS



Over 3,000 components are available in waveguide, coax, AIR-STRIP® and solid state — spanning frequency ranges from 1 GHz to 140 GHz.

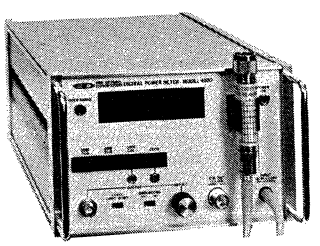
Microwave Division, Systron-Donner Corp., 14844 Oxnard St., Van Nuys, California 91409. Phone: (213) 786-1760.

SWEEPERS AND BROADBAND SWEEP SYSTEMS TO 18 GHz



Kruse Model 50520 (shown) operates from 10 MHz to 18 GHz with wide range plug-ins. Extremely compact and versatile. Ideal for testing power gain, insertion loss, and frequency response characteristics of communications systems. Basic sweeper expands easily. Available are multiband power units, multiplexers, and controllers. You get direct readout of data on a compact X-Y CRT Display Unit, Model 7000.

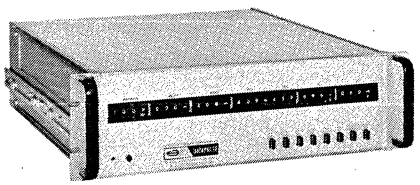
DIGITAL POWER METER, 1-18,000 MHz



- Fast Response for Real Time Scope Displays
- Digital Readout to .01 dB
- Drift-Free: < 10 nanowatts/°C
- Wide Dynamic Range: −40 to +10 dBm
- BCD Output Option for Programmed Testing
- Rugged and Portable; Only 9 lbs.
- Frequency Range: 1 to 12,400 MHz (Option M-1, 10-18,000 MHz)
- Power Range: −40 dBm to +10 dBm; +20 dBm max.
- Price of Model 4020: $1,575

Kruse Electronics Division, Systron-Donner Corp., 735 Palomar Ave., Sunnyvale, California 94086. Phone: (408) 735-9660.

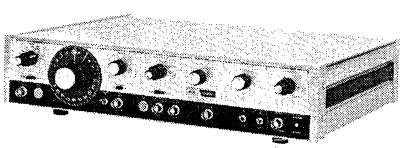
PULSE AND DATA GENERATORS



Datapulse offers a complete line of manually operated and automatic fast rise time pulse generators with a wide range of repetition rates and output powers. Baseline offset, complementary outputs, linear variable rise and fall, and sync/async gating are typical of the many advanced features provided. Full control over width, delay, and output polarity is standard. Line includes compact, low cost ($285.00) models, versatile high frequency (250 MHz) models, and new 150 programmable series which comes in 16 different models for every type of automatic test application.

DATAPULSE DIVISION, Systron-Donner Corp., 10150 W. Jefferson Blvd., Culver City, California 90230. Phone: (213) 836-6100.

FUNCTION GENERATORS



Datapulse function generators provide basic sine, square and triangle waveforms of exceptional clarity. Model 421 offers superior frequency response to 20 MHz, internal sweep generators and simple sweep limit dial indicators. Model 410 features a multiplicity of operating modes, dual 40 volt output amplifiers, and built-in sweep generator (the industry's most versatile waveform source).

DATAPULSE DIVISION, Systron-Donner Corp., 10150 W. Jefferson Blvd., Culver City, California 90230. Phone: (213) 836-6100.

SYSTRON DONNER CORPORATION

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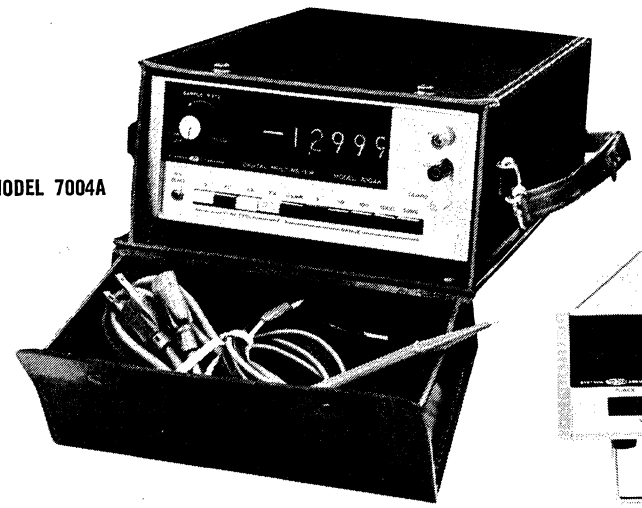
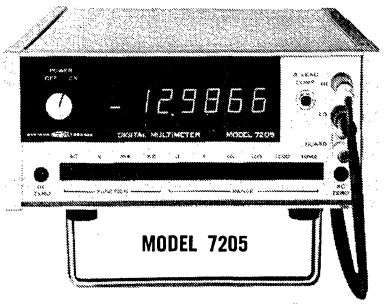
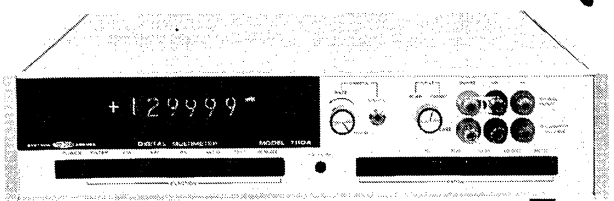
DIGITAL VOLT/MULTIMETERS



MODEL 7004A



MODEL 7205



MODEL 7110A

Quick Reference Selection Guide

Model	Mini-Portable 7050	Bench Portables 7000A	7004A	7005A	7205	Sytems Meter 7110A
Display Digits	3½	4½	4½	5½	5½	5½
Resolution	1 mV	10 μV[1]	10 μV	1 μV[1]	±1 μV	1 μV
DC Ranges	4	5[1]	5	5[1]	5	5
Overrange	50%	20%	30%	20%	30%	30%
Input Circuit	Floating	Floating	Floating	Floating	Floating/ Guarded	Floating/ Guarded
Accuracy Range	±0.1%	±0.01%	±0.01%	±0.005%	±0.005%	±0.005%
Sample Rate	6/sec.	5/sec.	to 5/sec.	5/sec.	2.5/sec.	to 30/sec.
N.M.N.R. @ 60 Hz	40 dB	80 dB	60 dB	80 dB	80 dB	80 dB
C.M.N.R. @ 60 Hz	60 dB	80 dB	100 dB	100 dB	120 dB	120 dB
Autoranging	No	Yes[2]	No	Yes[2]	No	Yes
DC Ratio	No	No	No	No	No	Yes
Resistance	Yes	Yes[2]	Yes	Yes[2]	Yes	Yes[2]
AC Volts	No	Yes[2]	Yes	Yes[2]	Yes	Yes[2]
DC Current	Yes[3]	Yes[2]	Yes[6]	Yes[2]	Yes	Yes[3]
Digital Outputs	No	Yes[2]	Yes[2]	Yes[2]	Option	Yes[2]
Full Remote Programming	No	No	No	No	No	Yes[2]
Price From / To	$299-[4] $365	$1095- $2000	$595- $740[5]	1245- $2285	$995	$1995- $3065

NOTES: [1] With DC mV option. [2] Optional. [3] Requires accessory current shunts. [4] Quantity discounts available. [5] Includes self-contained battery pack. [6] Also measures AC current.

3½ digit, 17,000 units sold. High performance at lowest cost. Unequaled customer acceptance. Good noise rejection and long-term stability resulting from Dual-Slope integration design. Ideal for production, test and design areas. (Model 7050, $279 and up)

4½ digit, AC, DC, volts, amps, ohms. 25 ranges of dc and ac volts, dc and ac current, and resistance. Full 4-digit display with 10 microvolt resolution. Dual-Slope design and a fully guarded input assure highest noise rejection. Lightweight, with optional battery pack and leather carry-case, for operate-anywhere convenience. (Model 7004A, $595)

5½ digit bench. Best price/performance. Full 5-digit accuracy and resolution at lowest cost. Use in any area where critical measurements must be made. Fast response readings. High input impedance; lowest 'kickback' noise. New lead-compensated ohms circuit, 26 ranges, 5 full functions, optional digital outputs. (Model 7205, $995)

5½ digit systems. Fast and Accurate. 30 readings/second and high noise rejection. Fully isolated programming and digital outputs in a variety of optional formats. DC volts and ratio standard. Plug-in card options for ac volts, 4-wire ohms, system interface. (Model 7110A, $1995)

For full details, contact your Scientific Devices office or Concord Instruments Division, 10 Systron Drive, Concord Calif. 94518. **Phone** (415) 682-6161.

In Europe: 8 Munchen 60, Bodensee Str. 113 Germany. Telex: 841-529-615.

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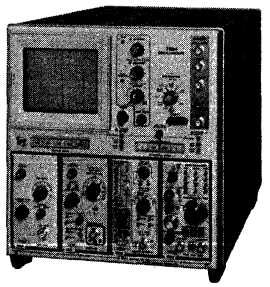
You know us as the Oscilloscope Company...

7000-SERIES OSCILLOSCOPE



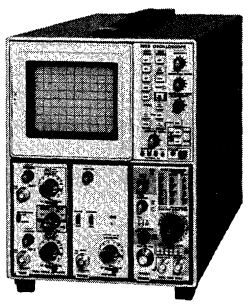
7904 Oscilloscope
500 MHz at 10 mV

Throughout its history of product development, Tektronix, Inc. has sought to safeguard the customer's investment. The TEKTRONIX 7000-Series Oscilloscope System illustrates the major effort which has been devoted to achieving this goal. Currently the 7000-Series consists of fifteen mainframes and 27 plug-ins, encompassing a broad measurement spectrum, unmatched in performance and versatility. Bandwidths range from 1 GHz at <4 V/div, 500 MHz at 10 mV/div, 100 MHz at 5 mV/div to 50 MHz at 5 mV/div, all real-time measurements.

In addition to the high performance bandwidths above, many other significant features and measurement capabilities are available. They include: • CRT READOUT • 525-MHz Direct Counter • Time-Interval Counter • Digital Time Delay • Digital Multimeter • 45 ps Risetime TDR • 1.8-GHz Spectrum Analyzer • 1 mA/Div Current Amplifier • 10 μV/Div Differential • Sampling to 14 GHz • Curve Tracer • 500-ps Dual Time Base • And More Coming.

7000-Series Oscilloscope prices begin at **$950**
7000-Series Plug-In prices begin at **$95**

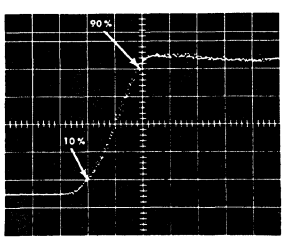
7000-SERIES STORAGE OSCILLOSCOPES



There are six members in the TEKTRONIX 7000-Series Storage Family with each one offering an excellent price/performance ratio. Choose the 7623/R7623 for Multimode Storage (200 cm/μs writing speed), 7613/R7613 for Variable Persistence Storage or the 7313/R7313 for Bistable Phosphor Storage. Stored writing speed for the last four is 5 cm/μs. Multimode Storage includes Fast Bistable, Variable Persistence, Bistable and Non-storage.

7000-Series Storage Oscilloscope prices begin at **$1600**

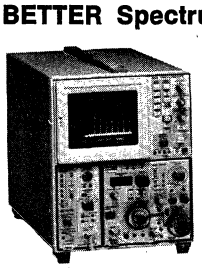
OSCILLOSCOPE SAMPLING SYSTEM



Tektronix, Inc. has a complete range of plug-in sampling systems covering DC to 14 GHz with 50 Ω to 1 MΩ input characteristics. They also feature a wide choice of mainframes, including digital readout.

Sampling plug-in prices begin at **$1550**

BETTER Spectrum Analyzer Measurements

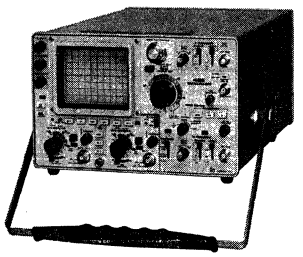


over wider ranges (0-1800 MHz) with the TEKTRONIX 7L12 Spectrum Analyzer

- <70 dB I.M. Distortion
- 115 dBm Sensitivity
- 70 dB Dynamic Range
- 4 to 1 Shape Factor
- With Variable Persistence

Spectrum Analyzer prices begin at **$1300**

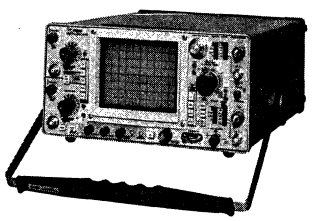
PORTABLE OSCILLOSCOPES



485 Oscilloscope—The 485 is a 350-MHz, 1-ns/div, 20.5-lb portable dual-trace oscilloscope. In addition to significantly advancing portable measurement capabilities, the 485 has many other new features. These features include selectable input impedance, trigger holdoff, external trigger display, alternate and delayed sweep with trace separation control, vertical scale-factor indication, auto-focus, and B sweep intensity control.

The 485 can be operated from a free-standing battery pack. Accurate measurements can now be made in difficult environments or remote locations.

485 Oscilloscope **$4200**

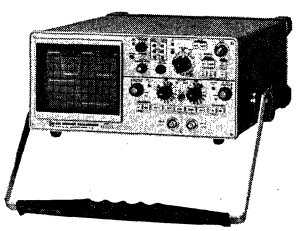


475 and 465 Oscilloscopes—The low cost of the 465 with 100 MHz at 5 mV/div and the 475 with 200 MHz at 2 mV/div represents a price/performance that insures top value for the future.

A fully calibrated 8 x 10-cm CRT display, new versatile trigger selection, trigger view, and automatic volts/div readout are just a few of the many features designed into the lightweight 465 and 475 portable oscilloscopes.

The 475 and 465 can be operated from either a free-standing battery pack or one which attaches directly to the oscilloscope.

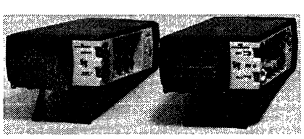
465 Oscilloscope **$1725**
475 Oscilloscope **$2500**



434 Storage Oscilloscope—All of the advantages of Bistable Split-Screen Storage, plus those of a conventional oscilloscope in a portable instrument with a large 8 x 10-cm CRT.

Bandwidth is DC to 25 MHz and deflection factors are 1 mV/div to 10 V/div. A wide range, direct-reading magnifier expands the horizontal display up to 50 times in six steps. 20 ns/div is the fastest magnified sweep. Storage writing rate is 100 cm/ms (400 cm/ms in enhanced mode) for the 434. Storage writing rate is 500 cm/ms (5000 cm/ms in enhanced mode) for the 434 Option 1.

434 Storage Oscilloscope **$2150**
434 Storage Oscilloscope Option 1 ..... **$2175**



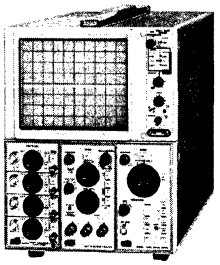
212 and 211 Miniscopes—The dual-trace 212 and the single-trace 211 are valuable assets to the man who travels. They weigh just 3½ pounds and measure approximately 3 x 5¼ x 9 inches, easily fitting in a tool kit, briefcase or even a glove compartment. Although small and light weight, they have a bandwidth of 500 kHz and 1 mV/div vertical sensitivity. Horizontal sweep speeds are from 5 μs/div to 500 ms/div in the 212, and 5 μs/div to 200 ms/div in the 211. In both cases, the maximum sweep speed is expandable to 1 μs/div with the magnifier.

Rechargeable nickel cadmium batteries provide the measurement flexibility required for remote applications.

211 Oscilloscope **$545**
212 Oscilloscope **$725**

. . . here are some other ways to think of us.

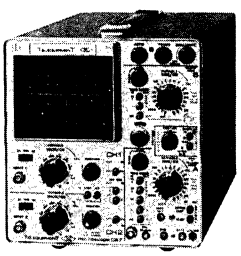
LOW-FREQUENCY OSCILLOSCOPE SYSTEM



5103N Oscilloscope System—Exclusive cost-saving features and flexibility are offered in this new modular system consisting of 11 vertical amplifiers (including a semiconductor curve tracer), 3 time bases and a 3-plug-in mainframe compatible with 5 interchangeable display modules. Bandwidth is DC-to-2 MHz, depending on the amplifier selected. Four X-Y or eight Y-T displays are available by combining plug-ins. Scale factors are read out on lighted knob skirts. Information is displayed on a large 6½-inch CRT.

5103N System prices begin at **$675**

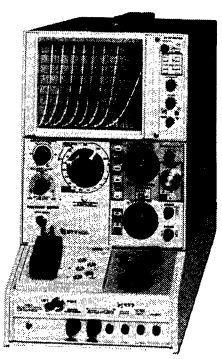
TELEQUIPMENT ..... low cost oscilloscopes a subsidiary of Tektronix, Inc.



When price is of prime importance, TELEQUIPMENT warrants serious consideration. TELEQUIPMENT oscilloscopes combine low price with a number of features not usually found in other oscilloscopes in this price range. Bandwidths range from 50 MHz at 5 mV/div to 3 MHz at 100 mV/div. A dual-trace bistable storage oscilloscope is also available.

TELEQUIPMENT Oscilloscope prices begin at **$245**

CURVE TRACER

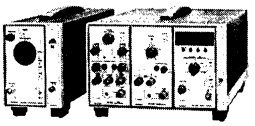


The 577 Curve Tracer is a solid-state system for measuring the parameters of semiconductor devices such as linear ICs, tunnel diodes, Zener diodes, signal diodes, rectifier diodes, NPN or PNP transistors, field effect transistors, and silicon controlled rectifiers. The 577 can be used with either the D1 storage or the D2 nonstorage display module.

Two test fixtures are presently available for the 577. The 178 Linear IC Test Fixture introduces the capability of displaying the characteristics of linear ICs. Among their characteristics are gain, common-mode rejection ratio, power supply rejection ratio, input current, supply current, and L/F noise. The 177 standard test fixture enables fast, reliable measurements of the characteristics of two-, three- and four-layer semiconductor devices.

577/D1 Storage Curve Tracer **$2000**
577/D2 Nonstorage Curve Tracer **$1550**
177 Standard Test Fixture **$300**
178 Linear IC Test Fixture **$900**

TM 500 TEST and MEASUREMENT SYSTEM



A compatible series of power supplies (single- or dual-tracking), digital counters, digital multimeter, ramp, signal, pulse and function generators comprise the initial offering in this low-cost line. Each module is designed for stand-alone capability in its cabinet/power unit. Extra benefits accrue when the modules are inserted in the larger 3-wide cabinet/power unit. For example, a counter, function generator and power supply can be used simultaneously, with less bench space and cost than three monolithic instruments.

Up to 6 modules can be mounted in a standard 10-inch rack, and occupy only 5¼ inches of rack height. Now you can combine many of your common bench-gear functions in one compact, simple, yet expandable system, and at a very favorable cost-performance ratio.

Digital Multimeter **$495**
Digital Counter, 110 MHz . **$550**
Digital Counter, 550 MHz . **$895**
Universal Counter **$695**
Power Supplies, 0-20 V $95-$150
Dual Tracking Pwr Supply $130
Dual Power Supply, 0-20 V $180
Function Generator, 1 MHz $325
Pulse Generator, 50 MHz . **$295**
Ramp Generator, 10 μs . **$175**
RC Oscillator, 500 kHz .. **$295**

TDR

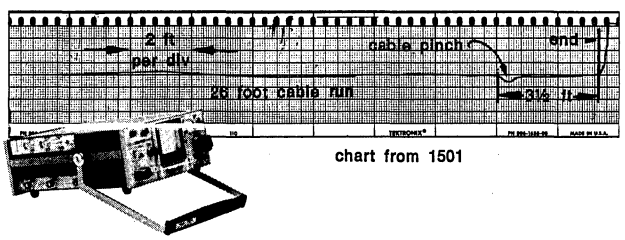


chart from 1501

Tektronix, Inc. has a complete range of plug-in and non-plug-in high performance Time Domain Reflectometer Units. TDR is for simple, convenient pulse echo testing of electrical transmission lines. TEKTRONIX TDRs can test from connector to almost two miles.

The 1501 Time Domain Reflectometer operates from self-contained rechargeable batteries or AC—weight, 8 lbs! A push button operated plug-in chart recorder produces a 2 by 12-inch strip chart for inexpensive permanent records. The 3S7/3T7 and the 7S12 are some more of TEKTRONIX high-performance TDR units.

1501 With Chart Recorder **$1900**
3S7/3T7 ..... **$1195**
7S12/S5/S54 ..... **$1895**
(Typical combination for 7000-Series Oscilloscopes)

OTHER PRODUCTS

Engine Analyzer—Displays gas and diesel engine parameters including cylinder combustion pressure, vibration, ignition, timing and indicated horsepower.

Accessories—Oscilloscope cameras, carts, signal acquisition probes.

Tektronix products are marketed and supported in the U.S. through a network of 56 Field Offices and 34 Service Centers. The instruments are warranted against defective parts and workmanship for one year. A catalog with full specifications and prices is available on request. For a demonstration or more information, call your nearby Tektronix Field Engineer or write: Tektronix, Inc., P.O. Box 500, Beaverton, Oregon 97005.

TEKTRONIX®
committed to technical excellence

Texscan

A Complete Line
A Single Source

Texscan was incorporated on May 10, 1965 to engage in the design and manufacture of instruments and components for the electronics industry. The original line was limited to only a few of the products presently produced and consisted principally of sweep signal generators, display oscilloscopes and various coaxial and microwave components. Today, Texscan offers a complete line from a single source.

Spectrum Analyzers – 1 MHz to 13 GHz, solid state, -100 to +30 dBm. Texscan's new line of spectrum analyzers consists of three models, the AL–40, 1 to 300 MHz, the AL–60, 1 MHz to 3 GHz, and the AL–70, 5 MHz to 13 GHz, all designed for maximum reliability and maintainability. Accurate frequency and amplitude identification.

Solid State Oscillators – Texscan's six lines of solid state RF sources span between them 10 MHz to 35 GHz and supply RF power up to one watt. Both electronically and mechanically tuned devices are offered. Custom engineered models in the Gunn diode series can be supplied with integral pulse modulators or injection locking modules for crystal stability.

Attenuators – RA Series – Rotary – DC–4000 MHz, direct reading in dB, 8 attenuation ranges up to 120 dB, 50 to 75 ohm. Texscan offers a complete range of attenuators with steps of 0.1, 1.0 and 10.0 dB, covering attenuation ranges of 1.0, 10.0 and 120.0 dB. Wide selection of connector choices available.

FP Series – Fixed Coaxial – DC–13.3 GHz, 1 watt average power, values up to 30 dB.

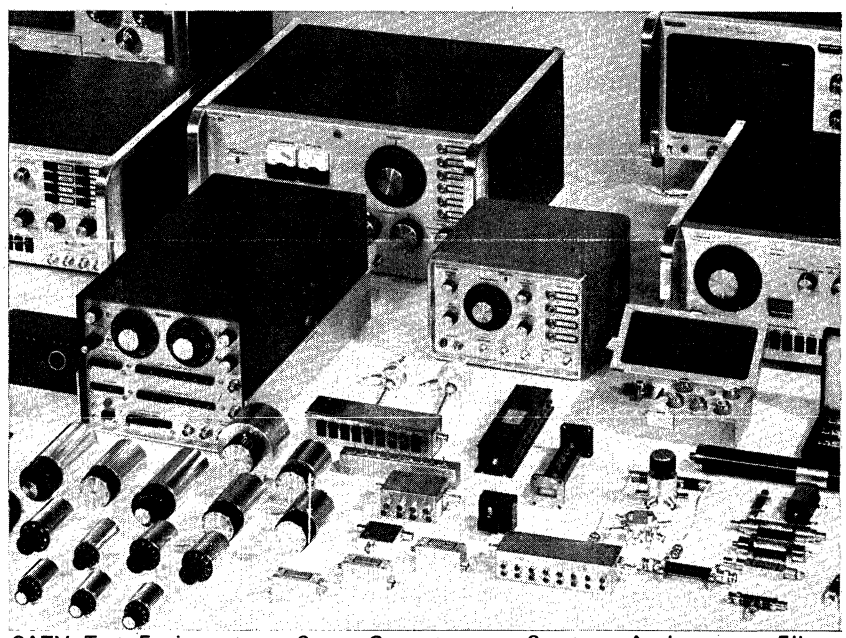
PA Series – Digitally Programmable – DC–1250 MHz, 4 millisecond switching speed. Three different units cover 0–127 dB in 1.0 dB steps. Each pad represents a single binary digit for easy mating to a digital system.

Filters – Tunable Bandpass – 48 MHz to 4 GHz, 3 dB BW, 1% to 10%, 3 and 5 sections. Any single model covers more than an octave.

Bandpass/Lowpass – 10 MHz to 13 GHz. Five different types available, each with its own unique characteristics. Choice of connector styles as well as special mechanical designs to fit your packaging requirements, 48 hour delivery.

Lumped Component – 5 MHz to 1000 MHz, 3 to 8 sections. Miniature size provides freedom in circuit layout, reducing overall package volume. Available in bandpass and lowpass designs.

Cavity Bandpass – 30 MHz to 3000 MHz, 2 to 6 sections, 0.2 to 3%, 3 dB BW. Designed to provide low insertion loss at narrow bandwidths.



CATV Test Equipment | Sweep Generators | Spectrum Analyzers | Filters
Tuner Test Equipment | Oscilloscopes | Components | Oscillators

Sweep Signal Generators

	Frequency Range	Min/Max Sweep Width*	RF Output into 50 ohms
VS–20	500 Hz – 25 MHz	500 Hz – 25 MHz	20 mw (1 Vrms)
VS–30	300 kHz – 100 MHz	100 kHz – 100 MHz	20 mw (1 Vrms)
VS–40	1 MHz – 300 MHz	200 kHz – 300 MHz	5 mw (0.5 Vrms)
VS–50	5 MHz – 500 MHz	500 kHz – 500 MHz	20 mw (1 Vrms)
VS–60	5 MHz – 1000 MHz	100 kHz – 1000 MHz	5 mw (0.5 Vrms)
VS–80	1 MHz – 1200 MHz	50 kHz – 300 MHz low band, up to 40% high band	5 mw (0.5 Vrms)
VS–80DH	0.5 MHz – 1200 MHz	50 kHz – 300 MHz low band, up to 40% high band	5 mw (0.5 Vrms)
VS–90	5 MHz – 2350 MHz	100 kHz – 800 MHz, 550 MHz or 1100 MHz, depending on band	10 mw (0.7 Vrms)
VS–340	3.6 GHz – 4.3 GHz low band 5.8 GHz – 6.5 GHz high band	0.5 MHz – 700 MHz wide 0.5 MHz – 500 MHz narrow	+10 dBm min.
SS–25	1 MHz – 125 MHz	200 kHz – 125 MHz	5 watts
SS–35	125 MHz – 225 MHz	200 kHz – 100 MHz	5 watts
SS–45	225 MHz – 400 MHz	200 kHz – 175 MHz	5 watts
SS–55	400 MHz – 700 MHz	200 kHz – 300 MHz	5 watts
SS–65	700 MHz – 1000 MHz	200 kHz – 300 MHz	5 watts
HS–85	400 MHz – 1000 MHz	0.1% to 15% of CF	4 watts
HS–86	500 MHz – 1000 MHz	0.1% to 15% of CF	8 watts

*All units also have CW capability

Solid State Oscillators

Series	Freq. Range	Tuning	Tuning Range	Power Range
VTS	4 MHz – 2 GHz	Elect.	Up to an octave	200 – 600 mW
VTO	1 GHz – 8 GHz	Elect.	Up to an octave	20 – 150 mW
MTO	10 MHz – 4 GHz	Mech.	Up to an octave	10 – 1000 mW
GTO	4 GHz – 40 GHz	Mech.	Up to 65%	5 – 1000 mW
ETO	4 GHz – 18 GHz	Elect.	Up to 500 MHz	10 – 100 mW
LTO	32 MHz – 1 GHz	Elect.	Up to 3 octaves with 1% linearity.	– 20 mW

Large Screen X–Y Oscilloscopes

	DU-88/89	DU-120	WMS-853T
Screen Size	9 in.	12 in.	19 in.
Bandwidth	DC-10 KHz	DC-10 KHz	DC-10 KHz
Phosphor	P-4, P-7, P-31	P-4, P-7, P-31	P-7, P-4, P-26

RF Components

Detectors	100 KHz	4000 MHz
Minimum Loss Pads	DC	1000 MHz
Reflection Coefficient Bridges	500 KHz	2.5 GHz
Terminations	DC	1000 MHz
RF Coax Switches	DC	2000 MHz
Voltage Monitors	500 KHz	4 GHz
Mismatches	DC	2.5 GHz

Texscan Corporation
2446 N. Shadeland Avenue
Indianapolis, Indiana 46219
Ph: 317-357-8781
TWX: 810-341-3184

Texscan

MAGNETIC INSTRUMENTS

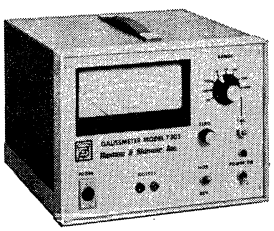
DESIGNED BY THOMAS & SKINNER, INC.

. . . a rugged, sensitive and growing line of magnetic equipment perfect for magnetizing, demagnetizing, measuring and stabilizing permanent magnets in both production and laboratory situations . . .

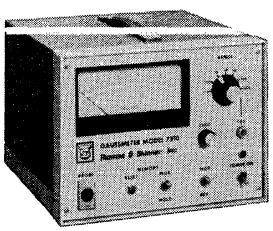
GAUSSMETERS

The wide line of Thomas & Skinner Gaussmeters shares the following features:

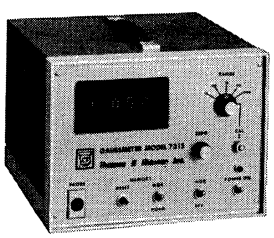
- Magnetic field measurements from 1 Gauss to 100,000 Gauss.
- Output voltage accurate to 10X over range.
- Simple setup and operation with front panel controls.
- Accurate internal calibration.
- Wide range of high linearity Hall probes.



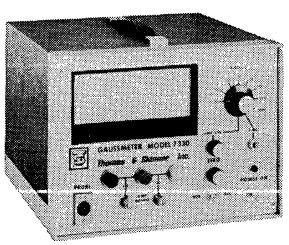
MODEL 7303 - HALL EFFECT



MODEL 7310 - PEAK READING MEMORY



MODEL 7315 - DIGITAL READ-OUT



MODEL 7330 - 3-LEVEL COMPARATOR
(MODEL 7320
2-LEVEL COMPARATOR also available)

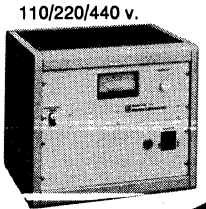
Since 1901
specialists in the manufacture of ALNICO PERMANENT MAGNETS and EI TRANSFORMER LAMINATIONS

MAGNETIZERS

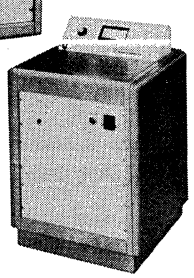
The Thomas & Skinner IMPULSE Magnetizer line features the following:

- High speed production operation.
- Energy levels from 300 to 5400 Joules.
- Low voltage — 425 volts maximum.
- Saturation of all ALNICO-BARIUM FERRITE-RARE EARTH COBALT magnetic materials.
- Continuous meter readout of capacitor voltage.
- Wide variety of fixtures — multi-pole fixtures.
- Control prevents firing below preset level.

Also ½ CYCLE Magnetizers for 110/220/440 v.



MODEL 7515

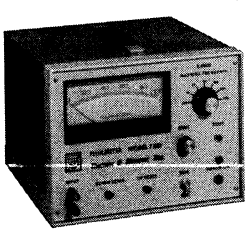


MODEL 7500

INTEGRATING FLUXMETERS

Fluxmeters by Thomas & Skinner provide:

- Very low drift rate.
- Push button or remote electronic zeroing.
- Up scale and down scale push button drive.
- Simple setup and operation with front panel controls.
- Solid state circuit design.

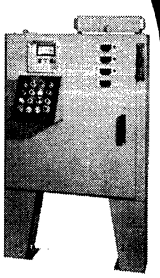


MODEL 7381

MODEL 7385
(not pictured) provides a digital readout in place of the 5½" taut-band mirror scale meter.
2- and 3-LEVEL COMPARATORS also available.

INDUSTRIAL MAGNETIC PROCESSING EQUIPMENT

This innovative Thomas & Skinner line provides magnetizing, measuring, stabilizing and demagnetizing systems built to NEMA 12/JIC specifications. These systems, including automatic parts feeding, are designed to customer specs.

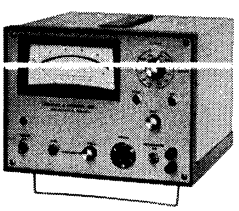


7100 SERIES

MAGLAB

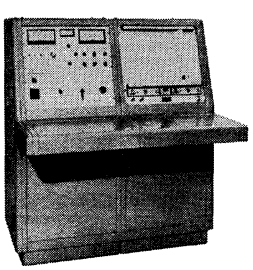
Thomas & Skinner's perfect answer for a dual-purpose test instrument for use where an Integrating Fluxmeter and a Hall Effect Gaussmeter are needed . . . but not simultaneously.

MODEL ML-40



MAGNETIC BRIDGE RECORDING PERMEAMETER

Designed by Thomas & Skinner to serve as one of the most versatile and accurate magnetic measuring instruments in the field, using a balanced magnetic bridge yoke system.



MODEL PR1000

When it comes to MAGNETIC INSTRUMENTATION, Thomas & Skinner can meet your every need from a flexible range of existing designs, modified designs, custom designs . . . just for you.

Thomas & Skinner, Inc.
1120 EAST 23RD ST., INDIANAPOLIS, IN. 46205 • PHONE: 317-923-2501

TRIPLETT CORPORATION, BLUFFTON, OHIO 45817
TEL: (419) 358-5015 TWX 810-490-2400
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

GENERAL MULTI-PURPOSE V-O-Ms

ACTUAL SIZE

Hand Size MODEL 310 V-O-M TYPE 2

1. **Hand-size V-O-M with diode overload-protection.**
2. **20,000 Ohms per volt DC and 5,000 Ohms per volt AC.**
3. **Single range switch; provision for clamp-on AC ammeter.**

RANGES

DC Volts: 0-3-12-60-300,1,200 (20,000 Ohms per Volt).
AC Volts: 0-3-12-60-300-1,200 (5,000 Ohms per Volt).
Ohms: 0-20k-200k-2MΩ-20MΩ.
DC Microamperes: 0-600 at 250 mV.
DC Milliamperes: 0-6-60-600 at 250 mV.
Accuracy: ±3% DC; ±4% AC.
Scale Length: 2⅛".
Meter: Self-shielded; diode overload protected; spring backed jewels.
Case: Molded, black, 2¾" w X 1 5/16" d X 4¼" h.
Batteries: NEDA 15V 220 (1), 1½V 910F (1): Complete with 42" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 2 lbs.
Model 310 Cat. No. 3018 ..... **$46.00**

ACCESSORIES FOR 310's

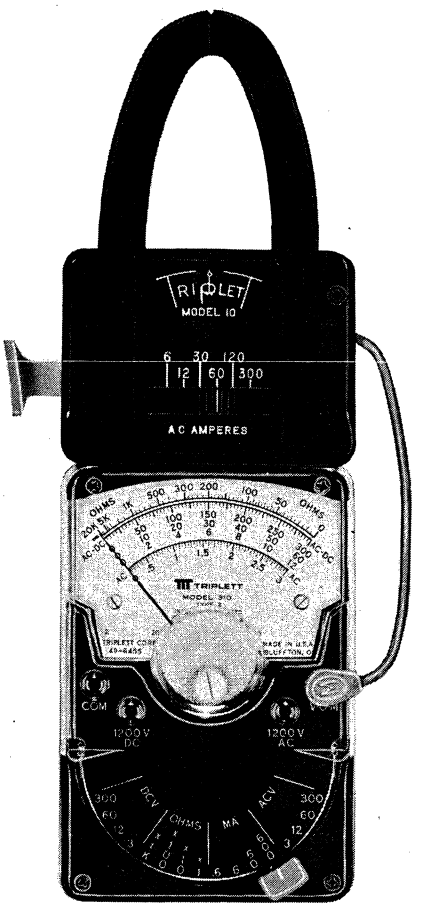
Model 10 Clamp-on AC Ammeter—For 310 and 310-FET. Ranges, 0-6-12-30-120-300. Cat. No. 60-211 **$21.00**
Model 10-C Clamp-on AC Ammeter—For 310-C. Ranges, 0-6-12-30-120-300 Cat. No. 60-210 ..... **$21.00**
Model 101 Line Separator—Divides two conductor cords direct or increases Model 10 sensitivity 10x and 20x. Cat. No. 60-218 ..... **$8.40**
Model 311 Lead—42" long lead to separate Model 10 from 310 unit for easy reading in awkward spots. Cat. No. 79-161 ..... **$4.00**
Model 369 Carrying Case—For Model 310's. Cat. No. 10-1258 ..... **$5.10**
Model 369-S Carrying Case—For Model 310's; front opens permitting use of tester in case. Cat. No. 10-1791 ..... **$12.10**
Model 379 Carrying Case—For Model 310 and Model 10 in combination, plus Model 101. Cat. No. 10-1456 ..... **$9.70**
Model 79-153 Needle Tip Replacement Lead—For Model 310 series. Cat. No. 79-153 ..... **$4.00**
Model 79-296 Blunt Tip Replacement Lead—For Model 310 series. Cat. No. 79-296 ..... **$6.10**

HAND SIZE V-O-M CLAMP-ON AMMETERS

MODEL 100

1. **Complete maintenance kit with V-O-M and clamp-on AC ammeter.**
2. **Diode overload-protected; 20,000 Ohms per volt on DC.**
3. **AC clamp-on will read up to 300 Amps AC.**

Model 100—Complete set includes Model 310, Model 10, Model 101, No. 311 lead and Model 379 case. Shpg. Wt. 7 lbs. Cat. No. 3014 ..... **$82.00**
Model 100-C—Complete set includes Model 310-C, Model 10-C, Model 101, No. 311 lead and Model 379 case. Shpg. Wt. 7 lbs. Cat. No. 3010 ..... **$92.00**
Model 100-FET—Complete set includes Model 310-FET, Model 10, Model 101, No. 311 lead and Model 379 case. Shpg. Wt. 7 lbs. Cat. No. 3013 ..... **$115.00**



MODEL 100

TRIPLETT CORPORATION, BLUFFTON, OHIO 45817
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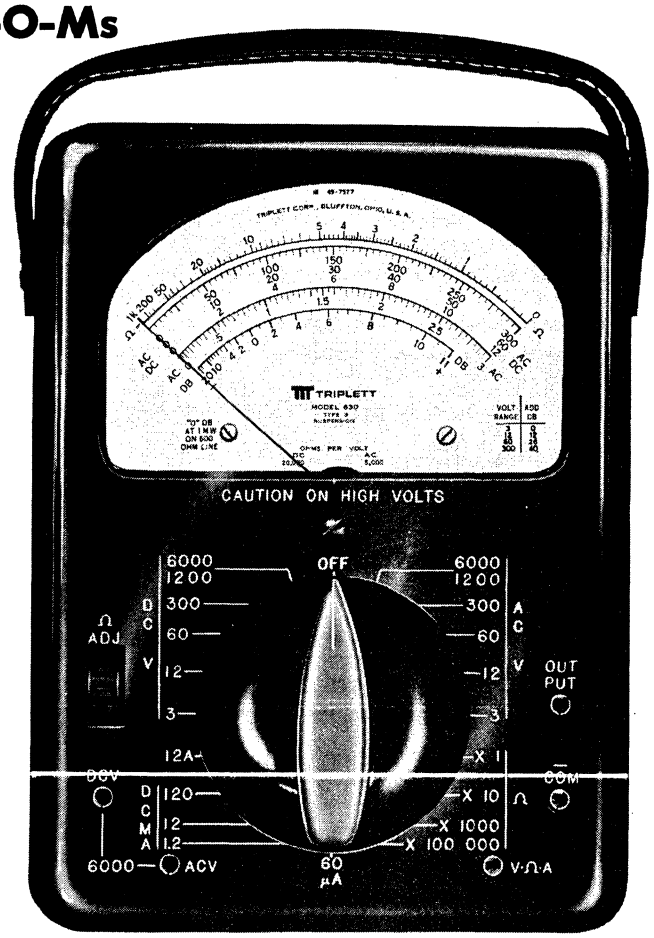
GENERAL MULTI-PURPOSE V-O-Ms



MODEL 630 V-O-M TYPE 3

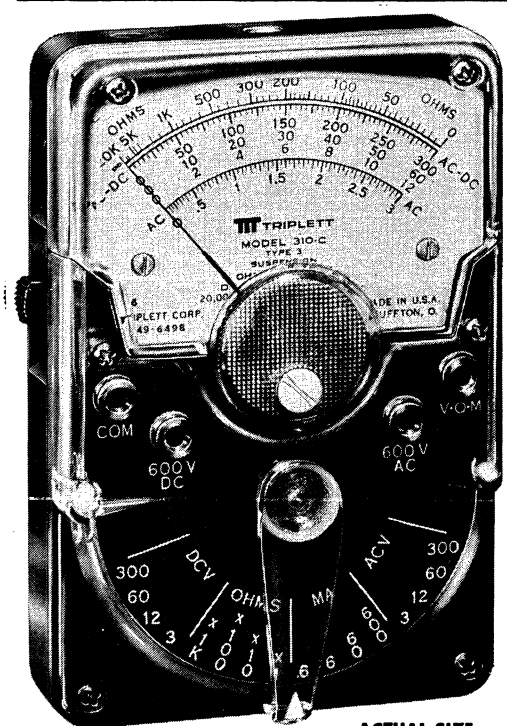
1. **Diode overload-protected suspension movement V-O-M; single range switch minimizes error.**
2. **4 ohmmeter ranges with 4.4 Ohms center scale.**
3. **Simplified scale—only 4 arcs for all 27 ranges.**

RANGES

DC Volts: 0-3-12-60-300-1,200-6,000 (20,000 Ohms per Volt).
AC Volts: 0-3-12-60-300-1,200-6,000 (5,000 Ohms per Volt).
Ohms: 0-1k-10k-1MΩ-100MΩ (4.4 Ohm center scale on low range).
DC Microamperes: 0-60 at 250 mV.
DC Milliamperes: 0-1.2-12-120 at 250 mV.
DC Amperes: 0-12.
Decibels: −20 to +51 ("0" dB at 1 mW on 600 Ohm line).
Output Volts (AC): 0-3-12-60-300 (5,000 Ohms per Volt).
Accuracy: ±2% DC, ±3% AC.
Scale Length: 4⅜".
Meter: Diode overload protected suspension movement.
Case: Molded, black, 5½" w X 3-11/32" d X 7½" h.
Batteries: NEDA 30V 210 (1), 1½V 13F (1).
Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.

Model 630 Cat. No. 3030 ..... **$69.00**

Model 630-A Laboratory version of Model 630 V-O-M above. Has same ranges and sensitivity but comes equipped with mirror scale, knife-edge pointer, and accuracy of ±1½% DC and ±3% AC. Model 630-A Cat. No. 3034 ..... **$79.00**



ACTUAL SIZE

MODEL 310-C V-O-M TYPE 3

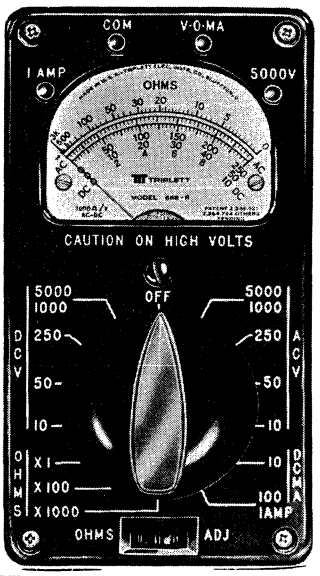
1. **Hand-size V-O-M with diode overload-protected suspension movement.**
2. **20,000 Ohms per volt DC and 15,000 Ohms per volt AC.**
3. **Single, enclosed range switch minimizes error; DC polarity-reversing switch.**

RANGES

DC Volts: 0-3-12-60-300-600 (20,000 Ohms per Volt).
AC Volts: 0-3-12-60-300-600 (15,000 Ohms per Volt).
Ohms: 0-20k-200k-2MΩ-20MΩ.
DC Microamperes: 0-600 at 250 mV.
DC Milliamperes: 0-6-60-600 at 250 mV.
Accuracy: ±3% DC; ±4% AC.
Scale Length: 2⅛".
Meter: Self-shielded, diode overload protected suspension movement; DC polarity-reversing switch; single, enclosed range switch.
Case: Molded black, 2¾" w X 1 5/16" d X 4¼" h.
Batteries: NEDA 15V 220 (1), 1½V 910F (1).
Complete with 42" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 2 lbs.

Model 310-C Cat. No. 3022 ..... **$59.00**

TRIPLETT CORPORATION, BLUFFTON, OHIO 45817
TEL: (419) 358-5015 TWX 810-490-2400
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)



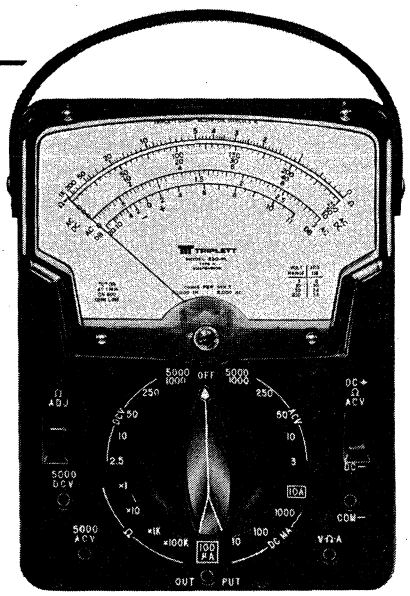
GENERAL MULTI-PURPOSE V-O-Ms

MODEL 666-R V-O-M TYPE 1

1. **Rugged 16-range V-O-M; single range switch minimizes error.**
2. **3 ohmmeter ranges reading to 3 megohms.**
3. **AC and DC voltage ranges from 10 to 5000 volts.**

RANGES

DC Volts: 0-10-50-250-1,000-5,000 (1,000 Ohms per Volt).
AC Volts: 0-10-50-250-1,000-5,000 (1,000 Ohms per Volt).
Ohms: 0-3k-300k-3MΩ (20 Ohm center scale on low range).
DC Milliamperes: 0-10-100 at 250 mV.
DC Amperes: 0-1 at 250 mV.
Accuracy: ±3% DC, ±4% AC.
Scale Length: 3".
Meter: Rugged spring-backed instrument jewels.
Case: Molded, black, 3 1/16" w X 2 9/16" d X 5 7/8" h.
Batteries: NEDA 1½V 15A (2), 1½V 14F (1). Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 3 lbs.
Model 666-R Cat. No. 3066 ..... **$52.00**

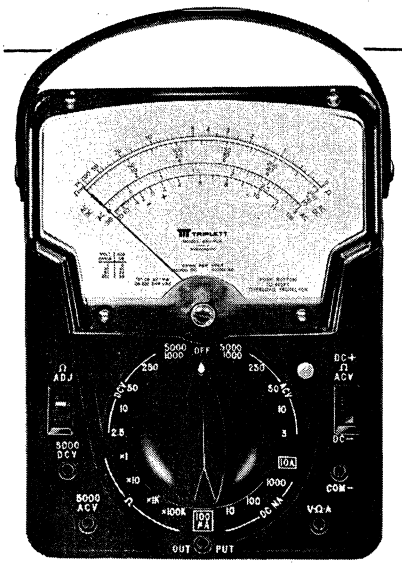


MODEL 630-PL V-O-M TYPE 4

1. **27-range V-O-M with single range switch minimizes error; DC polarity reversing switch.**
2. **5" suspension meter with diode overload protection.**
3. **4 ohmmeter ranges with 4.4 Ohms center scale.**

RANGES

DC Volts: 0-2.5-10-50-250-1,000-5,000 (20,000 Ohms per Volt); 0-0.25 at 100 ua.
AC Volts: 0-3-10-50-250-1,000-5,000 (5,000 Ohms per Volt). Frequency range 10 Hz to 500 kHz.
Ohms: 0-1k-10k-1MΩ-100MΩ (4.4 Ohm center scale on low range).
DC Microamperes: 0-100 at 250 mV.
DC Milliamperes: 0-10-100-1,000 at 250 mV.
DC Amperes: 0-10 at 250 mV.
Decibels: −20 to +49 ("0" dB at 1 mW on 600 Ohm Line).
Output Volts (AC): 0-3-10-50-250 (5,000 Ohms per Volt).
Accuracy: ±2% DC, ±3% AC.
Scale Length: 4½".
Meter: Diode overload protected suspension movement, DC polarity reversing switch.
Case: Molded, black, 5½" w X 3-11/32" d X 7½" h.
Batteries: NEDA 30V 210 (1), 1½V 13F (1). Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.
Model 630-PL Cat. No. 3050 ..... **$73.00**



MODEL 630-PLK V-O-M TYPE 5

1. **Burnout-proof solid-state overload protection; suspension movement.**
2. **Single range switch minimizes error; DC polarity-reversing switch.**
3. **4 ohmmeter ranges with 4.4 Ohms center scale.**

RANGES

DC Volts: 0-2.5-10-50-250-1,000-5,000 (20,000 Ohms per Volt); 0-0.25 at 100 uA.
AC Volts: 0-3-10-50-250-1,000-5,000 (5,000 Ohms per Volt).
Ohms: 0-1k-10k-1MΩ-100MΩ (4.4 Ohm center scale on low range).
DC Microamperes: 0-100 at 250 mV.
DC Milliamperes: 0-10-100-1,000 at 250 mV.
DC Amperes: 0-10 at 250 mV.
Decibels: −20 to +49 ("0" dB at 1 mW on 600 Ohm line).
Output Volts (AC): 0-3-10-50-250 (5,000 Ohms per Volt).
Accuracy: ±2% DC, ±3% AC.
Scale Length: 4½".
Meter: Diode overload protected suspension movement, DC polarity reversing switch.
Overload Protection: Complete tester protected with solid-state switching circuit.
Case: Molded, black, 5½" w X 3-11/32" d X 7½" h.
Batteries: NEDA 30V 210 (1), 1½V 13F (1). Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.
Model 630-PLK Cat. No. 3055 ..... **$113.00**

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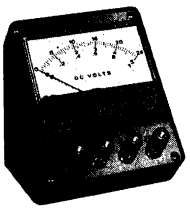
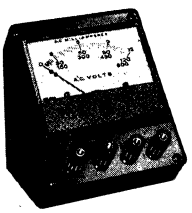
G/P PORTABLES

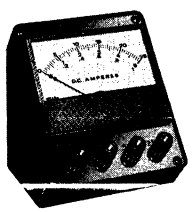
MODEL 320 G/P SERIES



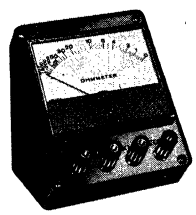
DC Volts



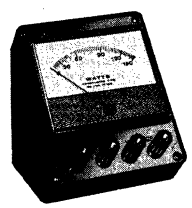
AC Volts



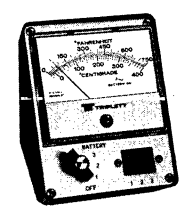
DC Amperes



Ohmmeter



Watts



Temperature

1. **Wide clear view plastic meter, with Bar-Ring DC movements.**
2. **Overload protection on all models. (Diodes on DC, Fused AC)**
3. **Unbreakable molded black plastic cases with aluminum panels.**

- 59 Standard ranges available on 29 units.
- ±2% accuracy on DC and AC Iron Vane Type.
- ±3% accuracy on AC Rectifier Type and Ohms.
- ±3% or better accuracy on temperature.
- Wide clear view plastic 3½" Model 320-G panel instrument.
- Bar-Ring construction in DC movements assures self-shielding.
- Five-way binding posts; three switch selected inputs on temperature unit.
- Knife-edge pointers; approx. 3" scale length.
- Diodes protect against instantaneous overloads on DC movements.
- AC movements are fuse protected.
- Temperature unit electrically compensated; thermocouple, type J, sensor.
- Unbreakable molded black plastic case 3⅞" w X 4¼" d X 4¼" h.

RANGES AND PRICES

Range	Ohms Res.	Cat. No.	Price
DC TYPE 320-G/P			
0-1-5-25 Volts (1000 Ω/V)		3500	$34.80
0-25-100-500 Volts (1000 Ω/V)		3501	35.50
0-6-60-600 Volts (1000 Ω/V)		3502	35.50
0-50 μA	2300	3503	32.40
500-25-0-25-500 μA	6250	3504	36.60
0-0.25-1-5 mA		3505	33.80
0-25-100-500 mA		3506	34.30
0-1-10-100 mA		3507	34.30
0-1-5-25 Amp.		3508	34.80
0-50-100-250 mV		3509	34.30
0-3-15 Amp.		3510	31.30
0-10-50-250 μA (Suspension)		3511	66.40
40-0-40 μA (Suspension) Null Meter	1700	3512	45.60
AC RECTIFIER TYPE 350-G/P			
0-6-60-600 Volts (1000 Ω/V)		3530	$50.40
AC IRON VANE TYPE 330-G/P			
0-120-600 Volts (83 Ω/V) & 0-12 mA		3540	$47.00
0-5-25 Volts (4 Ω/V) & 0-250 mA		3541	35.00
0-30-120 Volts (17 Ω/V) & 0-60 mA		3542	36.40
0-150 Volts (125 Ω/V)		3543	27.90
0-1 Amp.	3	3544	26.40
0-5 Amp.	.015	3545	26.40
0-25 Amp.	.002	3546	26.40
OHMS TYPE 320-G/P			
0-1K-100K (10-1000 at center scale) Includes 1.5 V battery & test leads		3560	$38.50
0-1 Meg-100 Meg (5K-500K at center scale) Includes 30 V battery & test leads		3561	44.40

Range	Ohms Res.	Cat. No.	Price
RF VOLTS TYPE 340-G/P			
0-2.5 Volts (240 Ω/V)		3570	$53.40
WATTS TYPE 360-G/P			
0-150 Watts (150 V, 2A. Max.)		3580	56.50

Note: The 0-50-100-250 DC mV model may be used with any of several standard switchboard shunts to extend range into higher current areas.

TEMPERATURE TYPE 320-G/P			
−150°F to +250°F −100°C to +120°C	(suspension)	3590	$62.00
0°F to +500°F −20°C to +260°C	(suspension)	3591	62.00
0°F to +750°F −20°C to +400°C	(suspension)	3592	62.00
0°F to +1000°F −20°C to +540°C	(suspension)	3593	62.00

Includes 5' thermocouple probe, 1.5V C battery and instruction manual.

SPECIAL RANGES

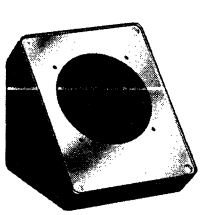
Special ranges to customer requirements on request. Special charges will apply.

OPTIONAL ACCESSORIES

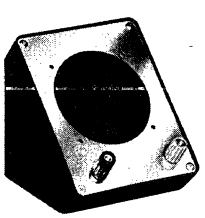
Test leads for G/P Series (except temperature G/P)	79-127	$ 4.00
5' thermocouple probe (temperature G/P)	79-310	9.40

PORTABLE INSTRUMENT KIT

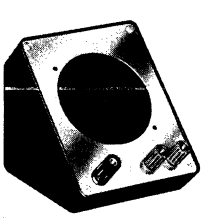
- Design your own portable instrument. Case styles with five-way binding posts available for single, double or triple range meters.
- Case assembly for mounting a 3½" square meter to meet specific needs.
- Permits greater flexibility in meter range selection. See Triplett Panel Instrument Catalog for nearly 250 3½" meters from which to choose.
- Accepts the 320-G and 327-T series meters.
- Easily assembled, ready to connect to panel instrument.



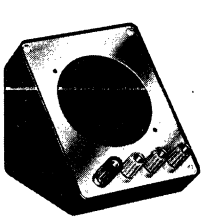
Case with panel.
Cat. No. 10-2192 $4.90



Case with panel, 1 black and 1 red post.
Cat. No. 10-2191 $6.50



Case with panel, 1 black and 2 red posts.
Cat. No. 10-2190 $7.30



Case with panel, 1 black and 3 red posts.
Cat. No. 10-2189 $8.10

Test leads for use with G/P Kit Cat. No. 79-127 $ 4.00

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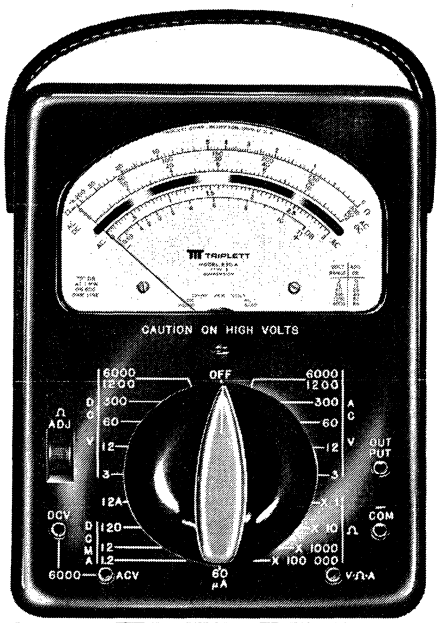
LABORATORY ACCURACY V-O-Ms

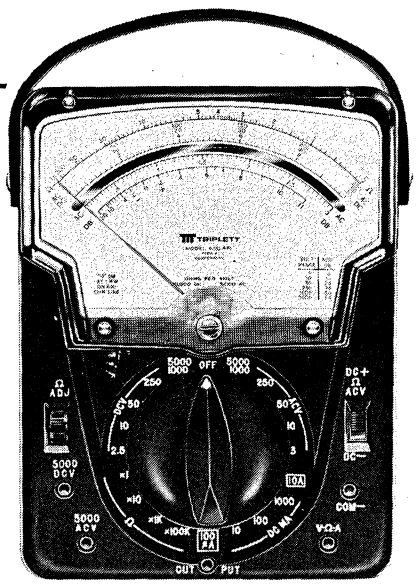


MODEL 630-A V-O-M TYPE 3

1. **Diode overload protected V-O-M with suspension movement; accuracy 1½% DC and 3% AC.**
2. **4 ohmmeter ranges with 4.4 Ohms center scale.**
3. **Simplified mirrored scale; only 4 arcs for all 27 ranges.**

RANGES

DC Volts: 0-3-12-60-300-1,200-6,000 (20,000 Ohms per Volt).
AC Volts: 0-3-12-60-300-1,200-6,000 (5,000 Ohms per Volt).
Ohms: 0-1k-10k-1MΩ-100MΩ (4.4 Ohm center scale on low range).
DC Microamperes: 0-60 at 250 mV.
DC Milliamperes: 0-1.2-12-120 at 250 mV.
DC Amperes: 0-12 at 250 mV.
Decibels: −20 to +51 ("0" dB at 1 mW on 600 Ohm line).
Output Volts (AC): 0-3-12-60-300 (5,000 Ohms per Volt).
Accuracy: ±1½% DC, ±3% AC.
Scale Length: 4⅜".
Meter: Diode overload protected suspension movement, mirror scale, ½% resistors.
Case: Molded, black, 5½" w X 3-11/32" d X 7½" h.
Batteries: NEDA 30V 210 (1), 1½V 13F (1).
Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.
Model 630-A Cat. No. 3034 ..... **$79.00**

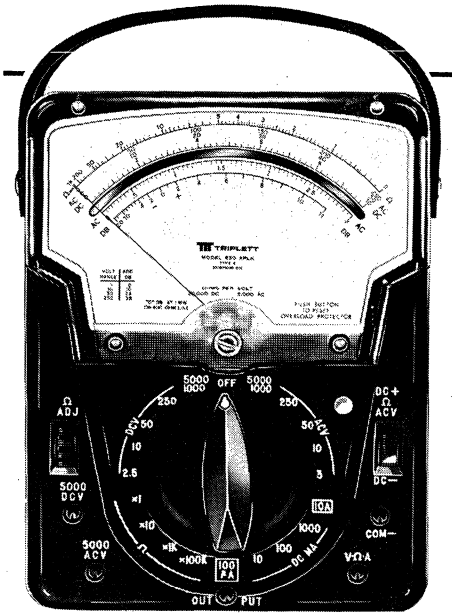


MODEL 630-APL V-O-M TYPE 4

1. **Accuracy 1½% DC and 3% AC; mirrored scale; diode overload-protected suspension movement.**
2. **27 range V-O-M with single range switch minimizes error; DC polarity reversing switch.**
3. **4 ohmmeter ranges with 4.4 Ohms center scale.**

RANGES

DC Volts: 0-2.5-10-50-250-1,000-5,000 (20,000 Ohms per Volt); 0-0.25 at 100 μA.
AC Volts: 0-3-10-50-250-1,000-5,000 (5,000 Ohms per Volt). Frequency range 10 Hz to 500 kHz.
Ohms: 0-1k-10k-1MΩ-100MΩ (4.4 Ohm center scale on low range).
DC Microamperes: 0-100 at 250 mV.
DC Milliamperes: 0-10-100-1,000 at 250 mV.
DC Amperes: 0-10 at 250 mV.
Decibels: −20 to +49 ("0" dB at 1 mW on 600 Ohm line).
Output Volts (AC): 0-3-10-50-250 (5,000 Ohms per Volt).
Accuracy: ±1½% DC, ±3% AC.
Scale Length: 4½".
Meter: Diode overload protected suspension movement, DC polarity reversing switch, mirror scale, ½% resistors.
Case: Molded, black, 5½" w X 3-11/32" d X 7½" h.
Batteries: NEDA 30V 210 (1), 1½V 13F (1).
Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. wt. 5 lbs.
Model 630-APL Cat. No. 3038 ..... **$83.00**



MODEL 630-APLK V-O-M TYPE 3

1. **Burnout-proof solid-state overload protection; accuracy 1½% DC and 3% AC; mirrored scale.**
2. **Single range switch minimizes error; DC polarity-reversing switch.**
3. **4 ohmmeter ranges with 4.4 Ohms center scale.**

RANGES

DC Volts: 0-2.5-10-50-250-1,000-5,000 (20,000 Ohms per Volt); 0-0.25 at 100 μA.
AC Volts: 0-3-10-50-250-1,000-5,000 (5,000 Ohms per Volt).
Ohms: 0-1k-10k-1MΩ-100MΩ (4.4 Ohm center scale on low range).
DC Microamperes: 0-100 at 250 mV.
DC Milliamperes: 0-10-100-1,000 at 250 mV.
DC Amperes: 0-10 at 250 mV.
Decibels: −20 to +49 ("0" dB at 1 mW on 600 Ohm line).
Output Volts (AC): 0-3-10-50-250 (5,000 Ohms per Volt).
Accuracy: ±1½% DC, ±3% AC.
Scale Length: 4½".
Meter: Diode overload protected suspension movement, DC polarity reversing switch, mirror scale, ½% resistors.
Overload Protection: Complete tester protected with solid-state switching circuit.
Case: Molded, black, 5½" w X 3-11/32" d X 7½" h.
Batteries: NEDA 30V 210 (1), 1½V 13F (1).
Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.
Model 630-APLK Cat. No. 3120 ... **$123.00**

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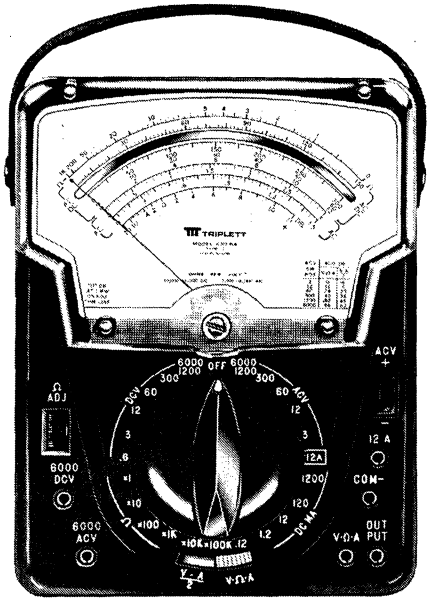
LABORATORY ACCURACY V-O-Ms



MODEL 630-NA V-O-M TYPE 3

1. **70-range V-O-M with single range switch and DC polarity-reversing switch.**
2. **Accuracy 1½% DC and 3% AC; mirrored scale.**
3. **Diode overload-protected suspension movement; temperature compensation.**

RANGES

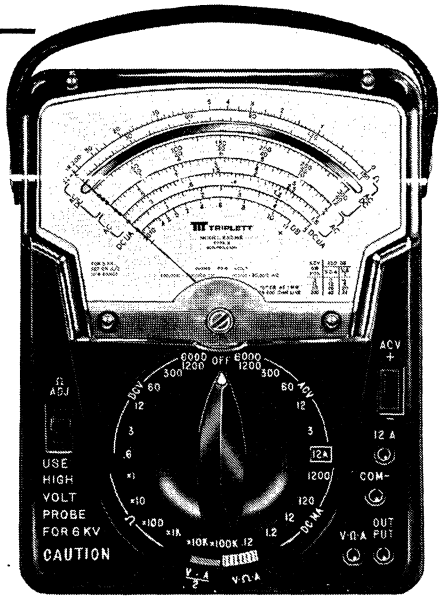
DC Volts: 0-0.6-3-12-60-300-1,200-6,000 (10,000 Ohms per Volt). 0-0.3-1.5-6-30-150-600-3,000 (20,000 Ohms per Volt). 0-0.120 at 60 microamperes; 0-0.240 at 120 microamperes.
AC Volts: 0-3-12-60-300-1,200-6,000 (5,000 Ohms per Volt). 0-1.5-6-30-150-600-3,000 (10,000 Ohms per Volt). Frequency range 35 Hz to 20 kHz.
Ohms: 0-1k-10k-100k-1MΩ-10MΩ-100MΩ (4.4 Ohm center scale on low range).
DC Microamperes: 0-60-600 at 120 mV; 0-120 at 240 mV.
DC Milliamperes: 0-6-60-600 at 120 mV; 0-1.2-12-120-1,200 at 240 mV.
DC Amperes: 0-6 at 120 mV; 0-12 at 240 mV.
Decibels: −26 +51 ("0" dB at 1 mW on 600 Ohm line).
Output Volts (AC): 0-3-12-60-300 (5,000 Ohms per Volt).
Accuracy: ±1½% DC, ±3% AC.
Scale Length: 4½".
Meter: Diode overload protected suspension movement, DC polarity reversing switch, mirror scale, ½% resistors, slide switch for doubling range selection.
Case: Molded, black, 5½" w X 3-11/32" d X 7½" h.
Batteries: NEDA 30V 210 (1), 1½V 13F (1). Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.
Model 630-NA Cat. No. 3042 ..... **$103.00**

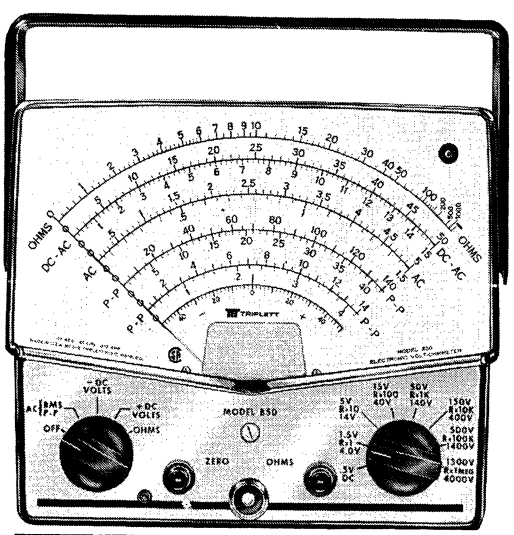
MODEL 630-NS V-O-M TYPE 2

1. **V-O-M with 200,000 Ohms per volt DC and 20,000 Ohms per volt AC; accuracy 1½% DC and 3% AC.**
2. **5μA suspension movement with diode overload protection; mirrored scale.**
3. **62 ranges with single range switch and DC polarity reversing switch.**

RANGES

DC Volts: 0-0.6-3-12-60-300-1,200 (100,000 Ohms per Volt). 0-0.3-1.5-6-30-150-600 (200,000 Ohms per Volt). 0-0.150 at 60 microamperes.
AC Volts: 0-3-12-60-300-1,200 (10,000 Ohms per Volt). 0-1.5-6-30-150-600 (20,000 Ohms per Volt). Frequency range 30 Hz to 20 kHz.
Ohms: 0-1k-10k-100k-1MΩ-10ΩM-100MΩ (4.4 Ohm center scale on low range).
DC Microamperes: 0-60-600 at 150 mV; 0-5-120 at 300 mV.
DC Milliamperes: 0-6-60-600 at 150 mV; 0-1.2-12-120-1,200 at 300 mV.
DC Amperes: 0-6 at 150 mV; 0-12 at 300 mV.
Decibels: −26 to +51 ("0" dB at 1mW on 600 Ohm line).
Output Volts (AC): 0-3-12-60-300 (10,000 Ohms per Volt). 0-1.5-6-30-150 (20,000 Ohms per Volt.)
Accuracy: ±1½% DC, ±3% AC.
Scale Length: 4½".
Meter: Diode overload protected suspension movement, DC polarity reversing switch, mirror scale, ½% resistors, slide switch for doubling range selection.
Case: Molded, black, 5½" w X 3-11/32" d X 7½" h.
Batteries: NEDA 1½V 15A (1), 1½V 13F (1). Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.
Model 630-NS Cat. No. 3102 ..... **$122.00**





ELECTRONIC VOLT-OHMMETER
MODEL 850

1. **8" meter with six scales for easy readability.**
2. **29-range VTVM with 11 megohm DC input resistance.**
3. **Color-coded scales for peak-to-peak measurements.**

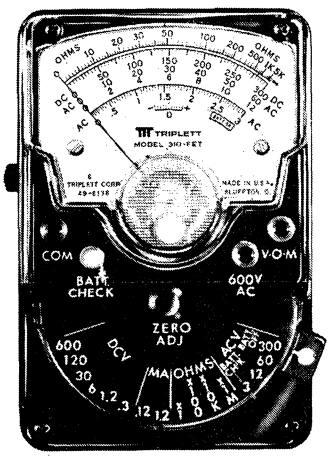
RANGES

DC Volts: 0-0.5-1.5-5-15-50-150-500-1,500 (Input resistance 11 megohms).
AC RMS Volts: 0-1.5-5-15-50-150-500-1,500 (Input impedance minimum 0.83 megohms).
Peak-to-Peak Volts: 0-4-14-40-140-400-1,400-4,000.
Ohms: 0-1k-10k-100k-1MΩ-10MΩ-100MΩ-1,000MΩ (10 Ohm center scale on low range).
Accuracy: ±3% DC, ±3% AC.
Scale Length: 7".
Meter: Rugged spring-backed instrument jewels, DC polarity reversing switch.
Frequency Range: 15 Hz to 3 MHz (Optional accessory diode probe for 0-250 MHz measurements).
Tube Complement: 1—12AU7, 1—6AL5.
Case: Molded, black, 7⅝" w X 3¾" d X 6 7/16" h.
Power: 115 Volts AC 50-60 Hz.
Battery: NEDA 1½V 14F.
Complete with 48" leads, alligator clips, battery and instruction manual. Shpg. Wt. 7 lbs.
Model 850 Cat. No. 3074 ..... **$113.00**
Model 850 (Export—220V, 50 to 60 Hz) Cat. No. 3075 ..... **$121.00**

TRIPLETT CORPORATION, BLUFFTON, OHIO 45817
TEL: (419) 358-5015 TWX 810-490-2400
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N.Y. STATE CALL COLLECT (516) 294-0990)

HANDSIZE FET V-O-M

MODEL 310-FET—TYPE 1



1. **Hand-size FET V-O-M with 10 megohm DC input resistance and diode overload-protected suspension movement.**
2. **Low voltage range of 300 mV DC; X1 megohm range.**
3. **Single range switch; DC polarity-reversing switch.**

RANGES

DC Volts: 0-0.3-1.2-6-30-120-600. Input resistance 10 megohms.

AC Volts: 0-3-12-60-300-600 (5,000 Ohms per Volt).

Ohms: 0-5k-500k-50MΩ-5,000MΩ (50 Ohm center scale on low range).

DC Milliamperes: 0-0.12-1.2 at 300 mV.

Accuracy: ±3% DC; ±4% AC.

Scale Length: 2⅛".

Meter: Self-shielded, diode overload protected suspension movement; DC polarity-reversing switch.

Case: Molded, black, 2¾" w X $1\frac{5}{16}$" d X 4¼" h.

Batteries: NEDA 7V 1501M (1), 1½V 910A (1).

Complete with 42" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 2 lbs.

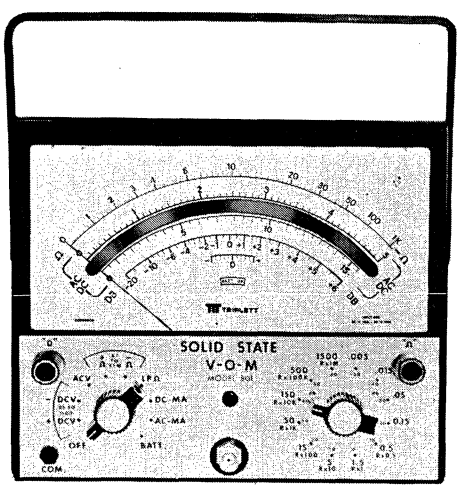
Model 310-FET Cat. No. 3027 .....**$78.00**

Model 100-FET Cat. No. 3013 .....**$115.00**

FET V-O-M WITH LOW POWER OHMS

MODEL 801—TYPE 2

1. **LOW-POWER OHMS—LPΩ™—8 ranges with 35 mV power source and 1 Ohm center scale.**
2. **High sensitivity—5 mV AC full scale at 10 megohm input impedance; 50 mV DC at 11 megohm input resistance.**
3. **Simplified scale—8" meter with only 4 arcs for all 73 ranges.**



RANGES

DC Volts: 0-0.05-0.15-0.5-1.5-5-15-50-150-500-1,500. Input resistance 11 megohms with 1 megohm series resistor in probe tip. Includes 40 dB 60 Hz rejection.

AC Volts: 0-0.005-0.05-0.15-0.5-1.5-5-15-50-150-500-1,500. Input impedance 10 megohms. Frequency range 50 Hz to 50 kHz. Capacitance at input jack 60 mm fd max.

Ohms—Low-power: 0-100-1k-10k-100k-1MΩ-10MΩ-100MΩ-1,000MΩ (35 mV open circuit voltage, 35 μW maximum power applied to device under test, and 1 Ohm center scale on low range).

Ohms—Conventional: 0-1k-10k-100k-1MΩ-10MΩ-100MΩ-1,000MΩ (1.5 open circuit voltage, 56mW maximum power applied to device under test, and 10 Ohm center scale on low range).

AC and DC Microamperes: 0-5-15-50-150-500 at 45 mV.

AC and DC Milliamperes: 0-1.5-5-15-50-150-500 at 45 mV.

AC and DC Amperes: 0-1.5 at 45 mV (Optional external shunt for 0-15A measurements).

Decibels: −70 to +66 ("0" dB is equal to .775 V).

Accuracy: DC ±2% Voltage, ±3% Current; AC ±3% Voltage, ±4% Current.

Scale Length: 6¾".

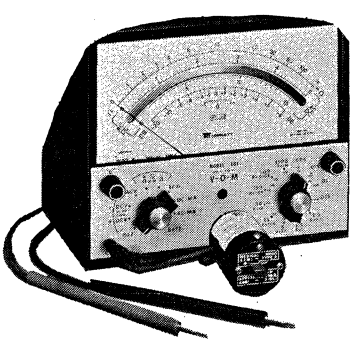
Meter: Diode overload protected suspension movement.

Case: Shielded, molded, black, 8" w X 5" d X 7" h.

Batteries: NEDA 9V 1604 (3), 1½V 13F (1).

Complete with 48" shielded probe, 36" grd. lead, alligator clips, batteries and instruction manual. Shpg. Wt. 10½ lbs.

Model 801 Cat. No. 3071 ..... **$231.00**



AC CURRENT LEAKAGE ADAPTER

Adapter used with new or existing Model 801 FET V-O-M's permits AC current leakage measurement checks for either medical or commercial appliance applications. Meets NFPA and AAMI Standards for Type A Medical AC Current Leakage tests and proposed ANSI Standard C101.1 for commercial Appliance AC Current Leakage tests.

Leakage Readings: 8 ranges, 10 μA f.s. to 30 mA f.s.

Resolution: .2μA on lowest V-O-M range.

Accuracy: ±4% of full scale.

Frequency Response: Approximates the C. F. Dalziel's "50 Percentile threshold of Perception Curve, within ± 1.0 dB".

Input Impedance: Switch selection for Medical or Commercial Appliance leakage measurements.
Medical—500 Ω test load,
Commercial Appliance—1500 Ω test load.

Leakage Adapter for Model 801
Cat. No. 60-413 .....**$33.00**

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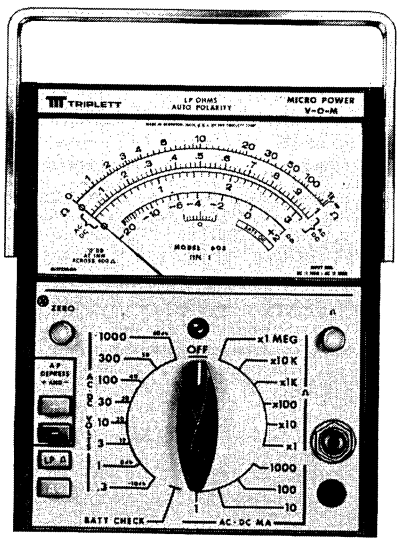
FET V-O-M WITH MICRO POWER, LOW POWER OHMS, AND AUTO-POLARITY

MODEL 603—TYPE 1



1. **Exclusive TRIPLETT MICRO POWER—TMP™ provides battery life in excess of a year for carbon batteries.**
2. **LOW-POWER OHMS—LPΩ™—6 ranges with 70 mV power source for in-circuit measurements without component damage.**
3. **FET V-O-M WITH AUTO-POLARITY—convenient and time saving, always reads up scale.**

RANGES

DC Volts: 0-0.3-1-3-10-100-300-1,000. Input resistance 11.12 megohms with 1.12 Meg in Probe.

AC Volts: 0-0.3-1-3-10-100-300-1,000. Input impedance 10 megohms. Frequency range 20 Hz to 10 kHz.

Ohms—Low Power: 0-1k-10k-100k-1MΩ-10MΩ-1000MΩ. (70 mV open circuit voltage, 123 μW maximum power applied to device under test, 10 Ohm center scale on low range).

Ohms—Conventional: 0-1k-10k-100k-1MΩ-10MΩ-1000MΩ. (1.5V open circuit voltage, 56 mW maximum power applied to device under test, 10 Ohm center scale on low range).

AC and DC Milliamperes: 0-1-10-100-1000 at 316 mV.

Decibels: −30 to +62 ("0" dB is equal to .776V).

Accuracy: ±3% all Voltage and Ohms ranges, ±4% all Current ranges.

Scale Length: 4⅛".

Meter: Diode overload protected suspension movement.

Case: Shielded, molded, black, 5⅛" w X $3\frac{3}{16}$" d X 6½" h.

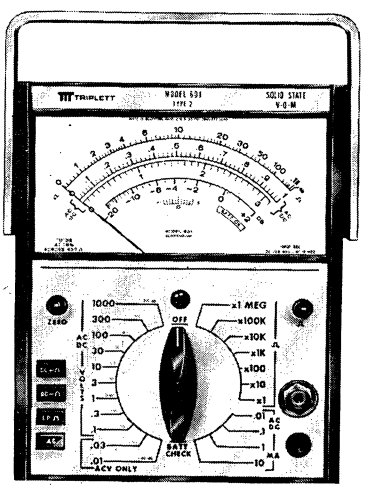
Batteries: NEDA 9V 1604 (2), 1½V 13F (1).

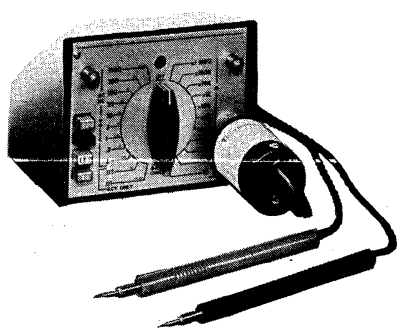
Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.

Model 603 Cat. No. 3037 ..... **$165.00**

FET V-O-M WITH LOW POWER OHMS

MODEL 601—TYPE 2





1. **LOW-POWER OHMS—LPΩ™—7 ranges with 75 mV power source.**
2. **High sensitivity—10 mV AC full scale at 10 megohm input impedance; 100 mV DC at 11 megohm input resistance.**
3. **Simplified scale—only 4 arcs for all 53 ranges.**

RANGES

DC Volts: 0-0.1-0.3-1-3-10-30-100-300-1,000. Input resistance 11 megohms with 690k series resistor in probe tip. Includes 40 dB 60 Hz rejection.

AC Volts: 0-0.01-0.03-0.1-0.3-1-3-10-30-100-300-1,000. Input impedance 10 megohms. Frequency range 50 Hz to 50 kHz. Capacitance at input jack 60 mm fd max.

Ohms—Low-power: 0-1k-10k-100k-1MΩ-10MΩ-100MΩ-1,000MΩ (75 Mv open circuit voltage, 100 μW maximum power applied to device under test, 10 Ohm center scale on low range).

Ohms—Conventional: 0-1k-10k-100k-1MΩ-10MΩ-100MΩ-1,000MΩ (1.5V open circuit voltage, 56 mW maximum power applied to device under test, 10 Ohm center scale on low range).

AC and DC Milliamperes: 0-0.01-0.1-1-10 at 100 mV.

Decibels: −60 to +62 ("0" dB is equal to .775V).

Accuracy: DC ±2% Voltage, ±3% Current; AC ±3% Voltage, ±4% Current.

Scale Length: 4⅛".

Meter: Diode overload protected suspension movement.

Case: Shielded, molded, black, 5⅛" w X $3\frac{3}{16}$" d X 6½" h.

Batteries: NEDA 1½V 15A (10).

Complete with 48" leads, alligator clips, batteries and instruction manual. Shpg. Wt. 5 lbs.

Model 601 Cat. No. 3033 ..... **$182.00**

AC CURRENT LEAKAGE ADAPTER

Adapter used with new or existing Model 601 V-O-M's for testing appliances, motors, hand tools, industrial equipment and machines, etc. for AC current leakage. Meets proposed ANSI Standard C101.1 for commercial appliance AC Current Leakage tests.

Leakage Readings: 7 ranges, 10μA f.s. to 30 mA f.s.

Resolution: .2μA on lowest V-O-M range.

Accuracy: ±4% of full scale.

Frequency Response: Approximates the C.F. Dalziel's "50 Percentile threshold of Perception Curve, within ±1.0dB"

Input Impedance: 1500Ω test load.

Leakage Adapter for Model 601
Cat. No. 60-407 ..... **$27.50**

TRIPLETT CORPORATION, BLUFFTON, OHIO 45817
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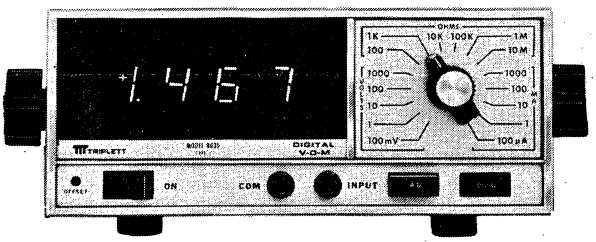
DIGITAL V-O-M

MODEL 8035 DVOM



1. **EASY OPERATION—Single polarized plug for test leads eliminates switching leads when changing functions.**
2. **LOW POWER CONSUMPTION—Less internal heating for greater stability and reliability.**
3. **LOW CIRCUIT LOADING—Greater measurement accuracy with 10 megohm input resistance for all AC and DC voltage ranges.**

RANGES

DC Volts Range	Maximum Indication	Rated Accuracy ±1 Digit	Overload Protection
0-100mV	199.9	±0.1% RDG	125V
0-1V	1.999	±0.1% RDG	1100V
0-10V	19.99	±0.1% RDG	1100V
0-100V	199.9	±0.1% RDG	1100V
0-1000V	1100	±0.1% RDG	1100V

Input Resistance all ranges: 10 megohm. Full scale step response: 2 seconds (3 seconds on 1V).

AC Volts Range	Maximum Indication	Rated Accuracy ±1 Digit (40Hz-20kHz)	Overload Protection
0-100mV	199.9	±0.5% RDG	250V
0-1V	1.999	±0.5% RDG	1000V
0-10V	19.99	±0.5% RDG	1000V
0-100V	199.9	±0.5% RDG*	1000V
0-1000V	1000	±0.5% RDG**	1000V

Input tmpedance all ranges: 10 megohm, shunted by less than 50 pf. *40 Hz-10 kHz. Full scale step response: 4 seconds. **40 Hz-1 kHz.

Ohms Range	Maximum Indication	Rated Accuracy ±1 Digit	Test Current
0-100	199.9	±0.25% RDG	1mA
0-1K	1.999	±0.25% RDG	100μA
0-10K	19.99	±0.25% RDG	10μA
0-100K	199.9	±0.25% RDG	1μA
0-1M	1.999	±0.5 % RDG	100nA
0-10M	10.00	±2 % RDG	10nA

Full scale step response: 2 seconds all ranges except 10M—15 seconds. Overload protection: At least 220 VAC all ranges. Maximum voltage across resistor under test: 199.9 mV all ranges.

DC Current

Range	Maximum Indication	Rated Accuracy ±1 Digit	Overload Protection
0-100μA	199.9	±0.2% RDG	30 mA
0-1mA	1.999	±0.2% RDG	100 mA
0-10mA	19.99	±0.2% RDG	2A (fused)
0-100mA	199.9	±0.2% RDG	2A (fused)
0-1000mA	1999	±0.4% RDG	2A (fused)

Voltage drop across input: 199.9 mV at max. indication. Full scale step response: 2 seconds.

AC Current

Range	Maximum Indication	Rated Accuracy ±1 Digit (40Hz-20kHz)	Overload Protection
0-100μA	199.9	±0.7% RDG	30 mA
0-1mA	1.999	±0.7% RDG	100 mA
0-10mA	19.99	±0.7% RDG	2A (fused)
0-100mA	199.9	±0.7% RDG	2A (fused)
0-1000mA	1999	±1.0% RDG	2A (fused)

Voltage drop across input: 199.9 mV at max. indication. Full scale step response: 3 seconds.

Construction

Out of range indication: Three least significant digits blank. Polarity indication: Auto-polarity for DC functions. Single plane 7 bar fluorescent display: 3½ digits. CMR: Greater than 80 dB with 1kΩ unbalanced at 60 Hz. NMR: Greater than 30 dB at 60 Hz. Power requirements: 105-125V AC, 50-60 Hz, 3 Watts. Temperature operating range: 0°C to 45°C. Case dimensions: 8⅛" w X 10" d X 3½" h. Complete with 48" leads, alligator clips and instruction manual. Shpg. Wt. 4½ lbs.

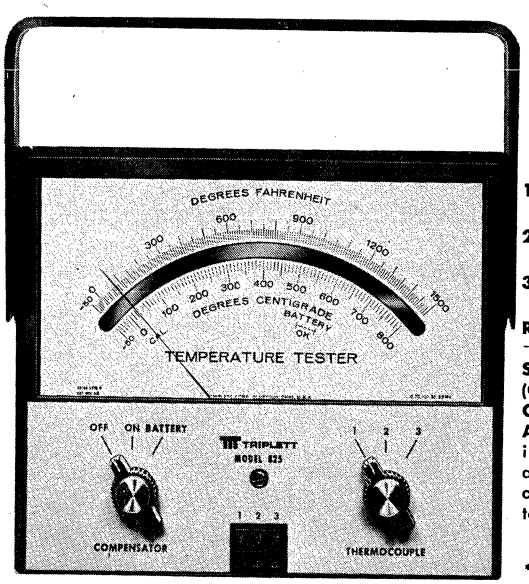
Model 8035 Cat. No. G200 ..... **$385.00**

Model 8035 (Export—220V., 50-60 Hz) Cat. No. G201 ..... **$393.00**

ACCESSORIES

Panel Mounting Hardware Cat. No. 163-87 ..... **$2.80**

TEMPERATURE TESTER



MODEL 825 TYPE 1

1. **Measures −50°F to +1500°F and −50°C to +800°C.**
2. **Large easy to read 8" dial with mirror scale.**
3. **Electrical Compensation for Ambient temperature.**

Range: −50°F to +1500°F; −50°C to +800°C.

Sensor Type: Thermocouple, type K (Chromel-Alumel*), 5Ω (±1%) resistance.

Compensation Type: Electrical.

Accuracy: Accuracy of Model 825 (including probe) operated in horizontal position at ambient temperature of 77°F is ±1¼% of full scale reading. Operated at ambient temperatures other than 77°F results in greater error; i.e., at extremes of 50°F to 120°F, an additional error of ±½% would result. Specific accuracy for other situations provided upon request.

*Trademark of Hoskins Mfg. Co.

TESTER CONSTRUCTION

Meter: Suspension movement.
Scale Length: 6¾".
Inputs: 3—switch selected inputs.
Case: Molded, black, 7⅝" w X 4¼" d X 6¾" h.
Battery: NEDA 1½V 13F (1).
Complete with 10' thermocouple probe, alligator clips, battery and instruction manual. Shpg. Wt. 4½ lbs.

Model 825 Cat. No. 3119 ..... **$104.00**

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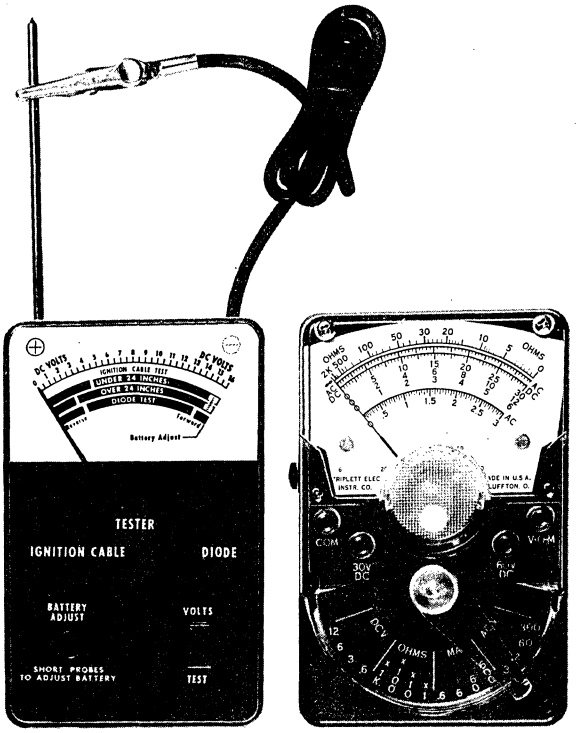
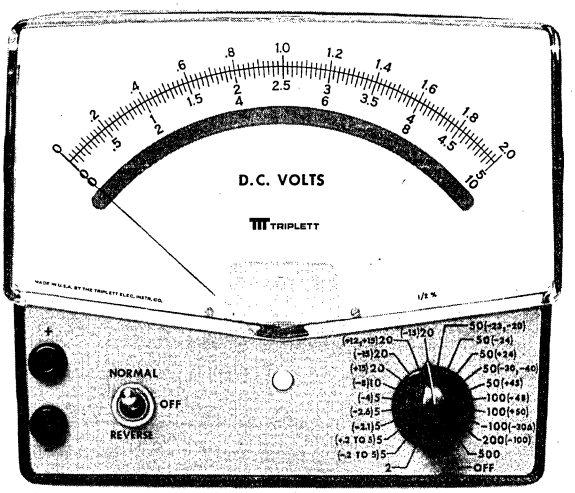
If you need a tester with special scales, ranges, accessories or any combination...

Buy a Triplett tester custom-designed for you



A B



C

Triplett, manufacturer of the World's most complete line of V-O-M's, is ready, willing and able to design and manufacture special testers of virtually any size, style or type to meet your specifications.

Tester A (above) was designed to give auto mechanics a simple, rugged tester for "go/no go" tests that would otherwise be measured in electrical units unfamiliar to them.

Tester B is a modification of a standard Triplett tester incorporating only the specific ranges needed by the field service engineers for whom it was designed.

Tester C has special ranges and special input connectors and cables to permit a single-point connection for trouble-shooting and servicing all the circuits of a complex business machine.

Several other buyers of standard Triplett test equipment request their company name on the dial to personalize their testers.

If you think a custom tester may solve some problems for you, contact your Triplett representative. He'll put you in touch with the Tester Designers and Engineers at Triplett who'll help you analyze the problem and suggest the optimum cost/result solution. Triplett Corporation, Bluffton, Ohio 45817

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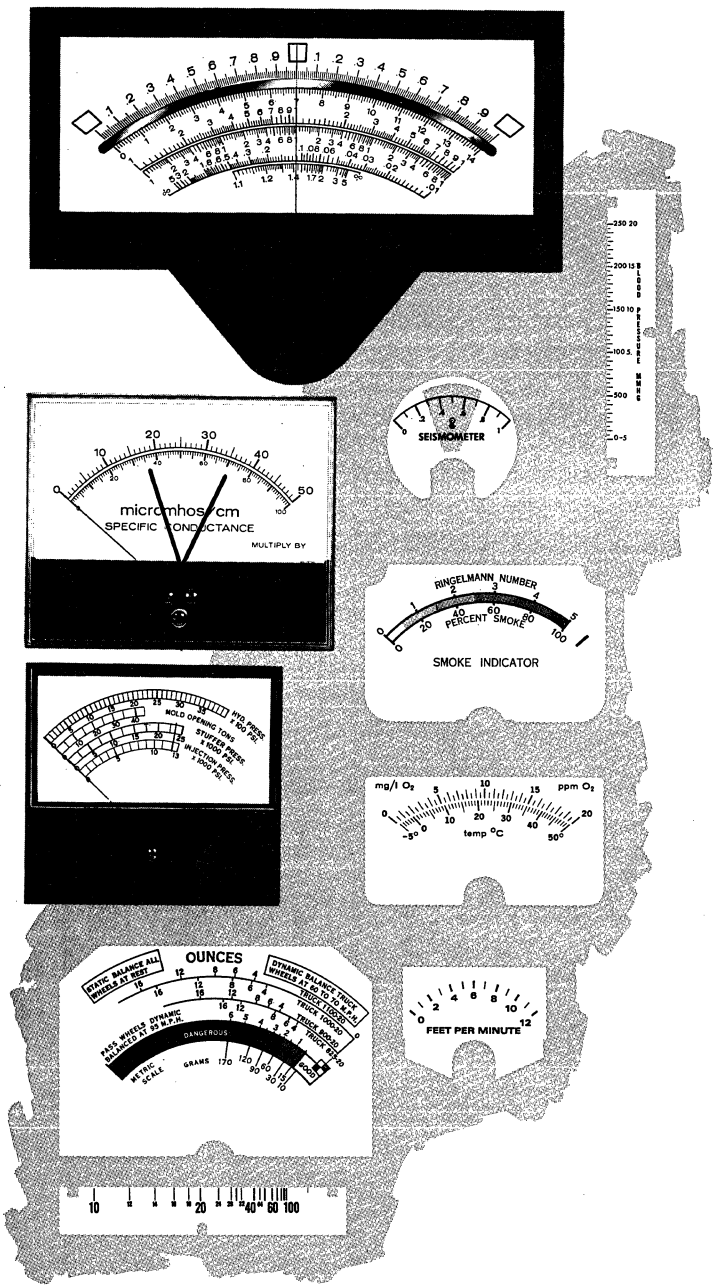
If you need panel instruments with custom dials, cases, accuracy, tracking, resistance, response time, or practically any combination of unusual specs...

Buy Triplett's designed-for-you Panel Instruments



Although we stock some 1369 different styles, sizes and types of standard panel instruments, a very large proportion of our customers buy custom instruments.

Because they need:

Custom Dials. Reading in such units as pH, roentgens, mm Hg, rpm, %, inches. **Custom Cases.** Square, round, rectangular, edgewise (horizontal and vertical), wide, narrow, shallow. **Custom Ranges.** 0-28.4, 25-0-75, 80-220, 75-0 or virtually any electrical range not listed in catalog. **Custom Accuracy.** To within ½% with mirror scales and knife-edge pointers. **Custom Tracking.** To match the specific needs of existing or new instrument designs. **Custom Resistance.** For low circuit loading with tolerances as low as ±1%. **Custom Damping.** To meet stringent electrical and vibration requirements. What custom panel instrument specifications do you need to make your product more reliable, more accurate, more rugged and — in the long run — less expensive? For quick, dependable delivery of small quantities of Triplett's "designed-for-you" panel instruments, contact your Triplett Sales/Service/Modification Center. For prototypes or production quantities, contact your Triplett representative. He'll put you in touch with our Instrument Designers/Engineers who'll help you analyze the problem and suggest the optimum cost/result solution.

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- **AC, DC, and RF types**
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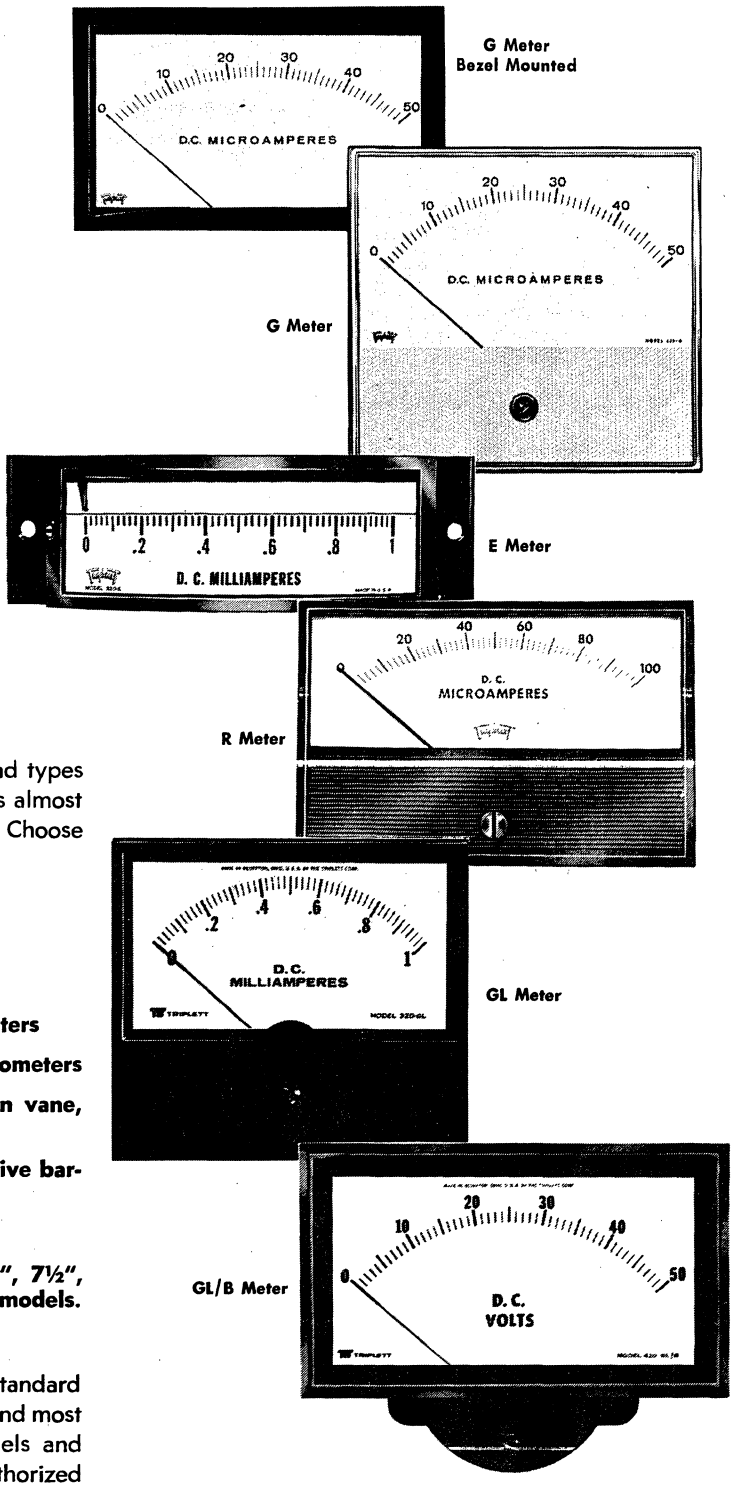
- **Amp, milliamp and microamp meters**
- **Null meters, ohmmeters and pyrometers**
- **Pivot and jewel, suspension, iron vane, d'Arsonval**
- **All DC movements contain exclusive barring self shielded magnet**
- **1½", 3½", 4½" edgewise types**
- **1½", 2½", 3½", 4½", 5½", 6½", 7½", 8½" round, square & rectangular models.**

In addition to a large stock of standard models at the Bluffton, Ohio, plant and most Triplett distributors, standard models and specials are available from 40 authorized Sales / Service / Modification Centers throughout the United States and in Canada.



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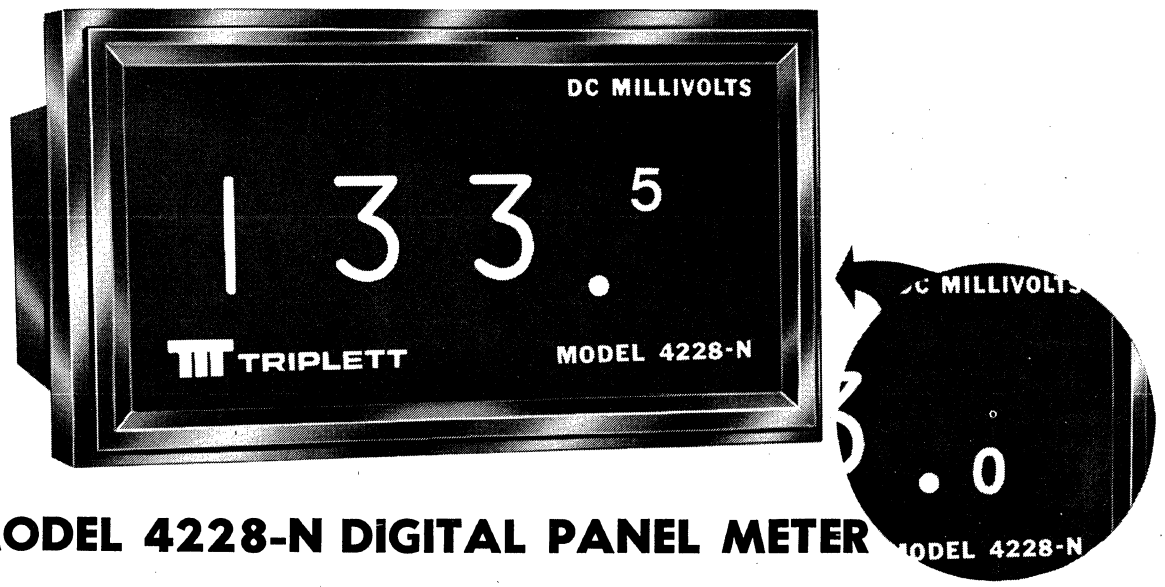


MODEL 4228-N DIGITAL PANEL METER

1 **2¾ Digits — Provides double the accuracy, (.25% of reading ±½ digit) and double the resolution at lower cost.**

2 **INSTANTANEOUS RESPONSE — 16 millisecond display rate with 60 times per second sampling rate.**

3 **FOOL PROOF NUMERAL DISPLAY — Blurs when out-of-range and with negative polarity.**

The Triplett Model 4228-N is a new, lower cost 2¾ digit instrument designed for the OEM market as well as for use in production and general testing, servicing and educational applications. It has indicating capabilities to 1995.

The Model 4228-N employs an analog to digital converter of the single ramp type, with the ramp being generated through the summing of BCD output signals. This is one of the most accurate methods used for analog to digital conversion. The unique "2¾ digit" concept (patent pending) provides you with double the accuracy and resolution by reading to the nearest half digit.

Other important features are:

- Neon lamps indicating "1" and the half digits 0 and 5.
- Neon-glow display.
- Low power drain (2 watts).
- Small compact size, molded case.
- Sampling rate 60 times per second.
- Display response time 16 millisecond (0.016 second).
- Out-of-range input indicated by simultaneous display of all numbers.
- Negative polarity indicated by soft blurred display.
- Normal mode rejection variable with external capacitor.
- May be mounted from front or rear of panel.
- Available Options:

BCD output; code 1 2 4 8	$30.00
Peak (maximum) reading hold	5.00
High resistance input (10 megohm)	20.00
0-19.95 mVDC (10 megohm input resistance)	35.00

MODEL 4228-N SPECIFICATIONS

DC VOLTS

Range	Catalog No.	Input Resistance	Max. Voltage
0-199.5 mV	F89-14-01	1 K Ohm	10 V
0-1.995 V	F89-14-02	10 K Ohm	50 V
0-19.95 V	F89-14-03	100 K Ohm	150 V
0-199.5 V	F89-14-04	1 megOhm	500 V
0-1000 V	F89-14-05	10 megOhm	1000 V

DC CURRENT

Range	Catalog No.	Shunt Resistance	Max. Current
0-199.5 uA	F89-14-06	1 K Ohm	10 mA
0-1.995 mA	F89-14-07	100 Ohm	50 mA
0-19.95 mA	F89-14-08	10 Ohm	150 mA
0-199.5 mA	F89-14-09	1 Ohm	500 mA
0-1.995 A	F89-14-10	0.1 Ohm	2.5 A

Accuracy : Model 4228-N; ±0.25% of reading ±½ digit, Model 4225-N; ±0.50% of reading ±½ digit, Model 4220-N; ±1.0% of reading ±1 digit

Common Mode Rejection: 80 dB (60 Hz)

Normal Mode Rejection: controllable with external filter.

Operating Range : 0-45°C

Temperature Coefficient : ±(0.2% of reading plus 0.02% of scale) °C.

Power Requirement: 105 to 125 V AC, 50-60 Hz less than 2 Watts

Physical Characteristics: Height — 2.359" Max., Width — 4.140" Max., Depth — 4.846" Max., Weight — 1.0 lb. approx.

Model 4228-N With 2¾ digit feature, indicating capabilities to 199.5 and accuracy of 0.25% of reading ±½ digit.

Price **$140.00**

Model 4225-N Available with indicating capabilities to 99.5 and accuracy of ±0.5% of reading ±½ digit, retaining all other features of the Model 4228-N.

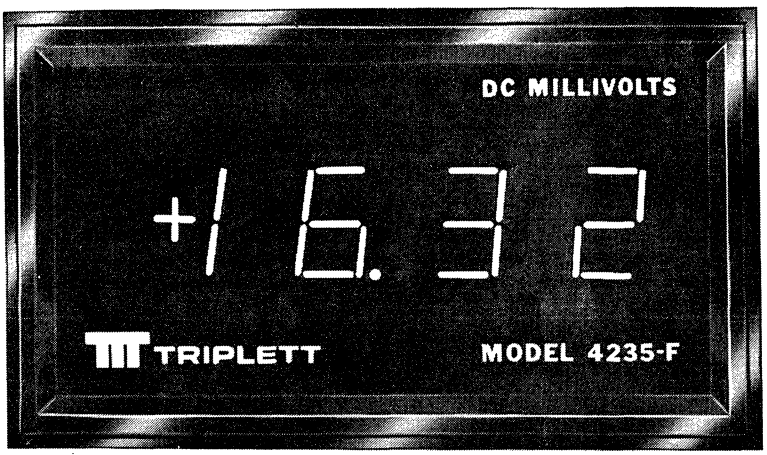
Price **$125.00**

Model 4220-N Available with indicating capabilities to 99 and accuracy of ±1% of reading ±1 digit, retaining all other features of Model 4228-N except negative polarity indication.

Price **$110.00**

TRIPLETT CORPORATION, BLUFFTON, OHIO 45817
TEL: (419) 358-5015 TWX 810-490-2400
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

MODEL 4235-F DIGITAL PANEL METER



1 **3½ Digits with AUTO-POLARITY.**

2 **LOW POWER DRAIN — Provides low operating temperature and long-lived reliability.**

3 **SINGLE-PLANE, SEVEN-BAR READOUT — For accurate wide-angle readability.**

The Triplett Model 4235-F Panel meter is a 3½ digit instrument with auto-polarity, designed for the OEM market as well as for use in production and general testing, servicing and educational applications. It has indicating capabilities to 1999.

The Model 4235-F employs a dual slope analog to digital conversion technique, providing high noise rejection, stability and accuracy for precise voltage or current measurements. The seven bar fluorescent readout provides a single plane display for wide angle ease of viewing. A green circularly polarized window filter enhances the appearance and readability.

Other important features are:

- Low power drain (2 watts).
- Single plane 7 bar fluorescent display.
- Circularly-Polarized, green viewing window.
- Small compact size.
- Display blanks when out-of-range (prevents error).
- Sampling rate 3 times a second.
- High input resistance (1000 megOhms to 10 megOhms).
- No extra charge for 19.99mV or 1.999 μA ranges.
- Display response time less than 1 second.
- BCD output as optional extra ($25.00); code: 1 2 4 8
- Movable decimal point.
- Display hold capability (terminals included).
- Front calibration.
- May be mounted from front or rear of panel.
- Molded case.

MODEL 4235-F SPECIFICATIONS

DC VOLTS

Range	Catalog No.	Input Resistance	Max. Voltage
0-19.99 mV	F89-13-01	100 megOhms	100 V
0-199.9 mV	F89-13-02	1000 megOhms	250 V
0-1.999 V	F89-13-03	10 megOhms	1000 V
0-19.99 V	F89-13-04	10 megOhms	1000 V
0-199.9 V	F89-13-05	10 megOhms	1000 V
0-1000 V	F89-13-06	10 megOhms	1000 V

DC CURRENT

Range	Catalog No.	Shunt Resistance	Max. Current
0-1.999 uA	F89-13-07	10 K Ohms	2 mA
0-19.99 uA	F89-13-08	10 K Ohms	2 mA
0-199.9 uA	F89-13-09	1 K Ohms	10 mA
0-1.999 mA	F89-13-10	100 Ohms	20 mA
0-19.99 mA	F89-13-11	10 Ohms	100 mA
0-199.9 mA	F89-13-12	1 Ohm	500 mA
0-1.999 A	F89-13-13	0.1 Ohm	2.5 Amps

Accuracy (Voltage): ±0.1% of reading ±1 Digit.

Accuracy (Current): ±0.15% of reading ±1 Digit.

Common Mode Rejection: 80 dB (60 Hz)

Normal Mode Rejection: 30 dB (60 Hz)

Operating Range 0 to 45°C

Temperature Coefficient (100.0 mv and above): ±(0.01% of reading + 0.005% of scale)/C°

Temperature Coefficient (10.00 mv): ±(0.01% of reading +0.01% of scale)/C°

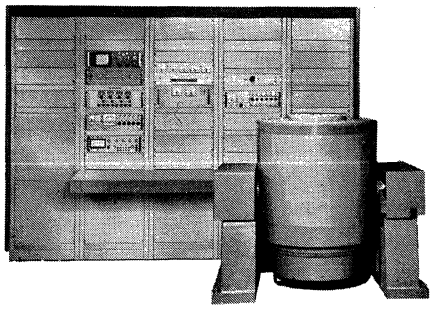
Power Requirement: 105 to 125 VAC 50-60 Hz 2.0 watts.

Physical Characteristics: Height — 2.359" Max., Width — 4.140" Max., Depth — 4.846" Max., Weight — 1.0 lb. approx.

Model 4235-F Price **$240.00**
($265 with BCD Output)

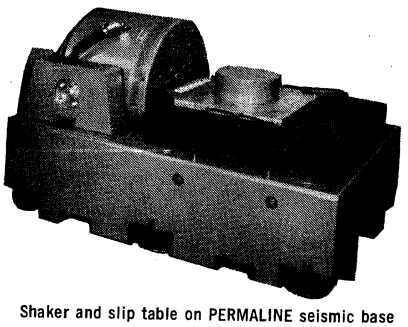
Model 4335-F AC version of Model 4235F. ACV ranges 0-199.9 mV, 1.999 V, 19.99 V, 199.9 V, 1000 V. AC current ranges 0-199.9 μA, 1.999 mA, 19.99 mA, 199.9 mA, 1.999 A. Response time 3 seconds, average sensing, RMS calibrated.
Price **$320.00**

ELECTRODYNAMIC VIBRATION TEST SYSTEMS



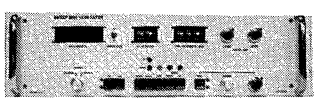
20,000 lb. system with solid state amplifier

- 50 to 20,000 lb. force systems for sine and random vibration
- Systems powered by solid state amplifiers to 150 kVA and higher
- Automatic controls for MIL-STD-810B testing
- Multiple shaker systems
- 6 inch stroke electrodynamic force generators
- PERMALINE slip table on seismic base
- Simulation of earthquake type motion



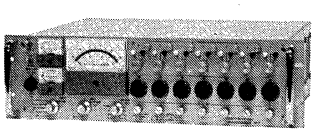
Shaker and slip table on PERMALINE seismic base

ACCESSORY INSTRUMENTS



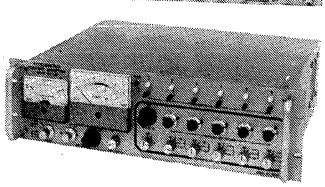
Model OSC-1

Sweep sine generator uses digital circuitry to generate output signal. Features presettable time of sweep, number of sweeps, and digital frequency counter with 0.1 Hz resolution displayed each second.



Model SP-7

Servo-programmer features acceleration, velocity or displacement control in any sequence in up to 7 independent automatic program segments as a function of frequency — log d-c output for record of test.

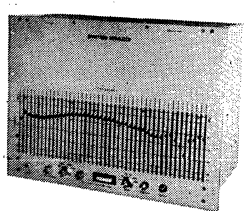


Model ACS-6

Acceleration control automatically selects for system control the one input accelerometer from six as it starts to exceed a preset value of acceleration.

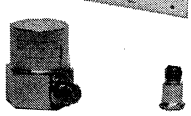
Model MAC-8

Averaging control accepts 8 inputs. Time division multiplexing of input signals avoids additional time delays in control signal used for sine or random testing. Expandable to 32 channels.



Model E109B

Spectrum Equalizer 45 channels features 4-pole integrated circuit, active filters, stable operation, and compact size.



Piezoelectric Accelerometers

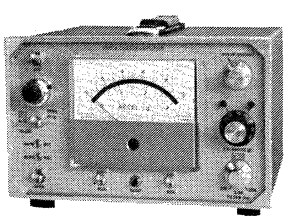
1.3 grams micro-miniature to general purpose high sensitivity and standardized 10 pC/g.

SIGNAL CONDITIONING INSTRUMENTS

Model TF-11	Model D22ERM	Model D22MHP	Model 1612
Tracking Filter	Charge/Strain Gage Amp	Charge Amp/Filter	Charge Amp/Integrator
$900.00	$730.00	$650.00	$425.00

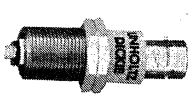
These are only a few examples of a complete family of signal conditioners that permit a wide variety of dynamic measurements.

TYPICAL OPTIONAL FEATURES		
S	Normalized 10 mV/g servo output with no clipping to 300 g	$50.00
O	Fixed amplitude, 1 kHz, sine wave internal calibration oscillator	$50.00
C	High current line driver to increase variable output to 100 mA	$50.00
L	Log dc output with 60 dB dynamic range (requires meter feature)	$175.00
F	Linear dc output to 1 Vpk full scale (requires meter feature)	$25.00
I	Normalized 100 mV/in/sec velocity output within ±2%, 5 Hz to 5 kHz	$50.00
E	Full scale decade ranging with front panel or external computer control	$40.00
-2	Extended low frequency response flat within ±5% down to 0.5 Hz	$25.00



Model SA11 Series

Shock amplifier with peak holding meter measures pulses from 0.1 to 500 milliseconds in duration. Multichannel versions with optional features are available.



Model 11CA-2

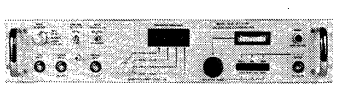
Low noise, two - wire Remote Charge Preamp. Operates with any Model 11 series instruments.

Model 22CA-2

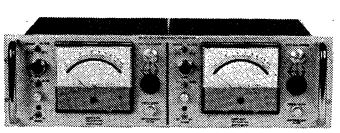
Low noise, two - wire Remote Charge Preamp. Operates with any Model 22 series instruments.

Model 11PA-2

Two-wire Remote Voltage Preamp. Operates with Model 11 or Model 22 series instruments.



Model 1611 Precision Charge/Voltage Calibration Standardizer. Typical ¼% overall instrument accuracy and stability. Frequency response from 2 Hz to 20 kHz. Four digit direct reading sensitivity thumbswitch. Acceleration, velocity and displacement outputs.



Model 1610 Series

Vibration monitor has precision log scale meter for indicating acceleration, velocity, or displacement. Portable, single-channel rack-mount, and dual-channel rack mount versions with optional features.

Write for complete data on all products

manufacturers of shaker systems, advanced instrumentation, and accelerometers

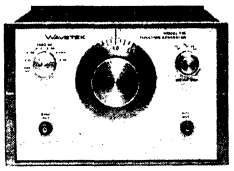
UNHOLTZ-DICKIE CORPORATION

3000 WHITNEY AVE. / HAMDEN, CONN. 06518 / (203) 288-3358

Oscillator/Function Generators

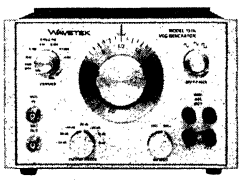
WAVETEK®

Model 130
Oscillator/
Function Generator
0.2 Hz to 2 MHz
∿, ⊓, ⋀.
$295



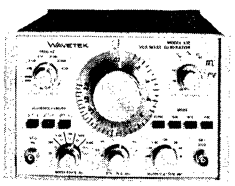
The Model 130 is the first general purpose laboratory test instrument that offers true function generator versatility at a low oscillator price. Its outputs are selectable and variable from a 50 ohm source with an auxiliary sync output for scope or system timing. The Model 130 is ideal for ultrasonic, audio and video applications — from trouble-shooting to exotic IC design.

Model 131A
Oscillator/VCG
0.2 Hz to 2 MHz
50Ω and 600Ω Output
∿, ⊓, ⋀.
$395



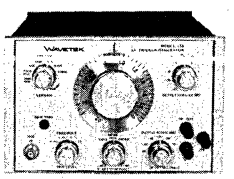
The Model 131A is a precision source of voltage controlled signals. The frequency may be dc-programmed or modulated with a wide-band ac signal and swept over a 1000:1 ratio covering the audio range of 20 Hz to 20 kHz in a single sweep. The output impedance is selectable with 50Ω floating or 600Ω balanced output. A 60 dB step attenuator gives precision control over output signal level for increased versatility.

Model 132
VCG/Noise Generator
∿, ⊓, ⋀.
0.2 Hz to 2 MHz
⊓⊓ 160 Hz to 1.6 MHz
⋀⋀ 10 Hz to 100 kHz
$795



The Model 132 adds digital and analog noise capability to further increase the versatility of the sine, square and triangle function generator. Waveforms, or noise outputs, can be used individually as signal sources. In addition, the waveforms can be combined with the noise to provide signals with calibrated signal-to-noise ratios over a 50 dB range, or to present a signal with an adjustable amount of random jitter.

Model 133
LF/Trigger/VCG
0.000002 Hz to 200 kHz
∿, ⊓, ⋀.
$495

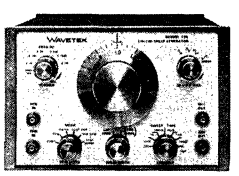


The Model 133 offers precision VCG sine, triangle and square wave output signals with up to 138-hour periods. The following additional features allow generation of special purpose waveforms such as the haversine: (1) waveform start/stop point control, (2) external triggering and gating and (3) adjustable waveform dc offset. This is an ideal instrument for use in the fields of mechanical and material testing and simulation of low frequency phenomena.

Model 134
Sweep/Trigger VCG
0.2 Hz to 2 MHz
∿, ⊓, ⋀, ◺, ⋀⋀, ⋀⋀.
$495

The Model 134 combines (1) a precision VCG having sine, square and triangle waveform outputs, and (2) an independent triggered ramp or sawtooth generator supplying the voltage to sweep the frequency of the first. This unit is virtually a portable oscillator, square wave generator, frequency shift keyer, and a sweep and tone burst generator in one compact package.

Model 135
Lin/Log
Sweep Generator
0.2 Hz to 2 MHz
∿, ⊓, ⋀, ◺, ⋀⋀, ⋀⋀.
$695



The Model 135 Sweep Generator is a Model 134 plus — The frequency of this instrument can be swept over a 1000:1 ratio by a selectable linear or logarithmic sweep function. Generator control voltage (GCV) output is featured. This voltage is proportional to the instantaneous frequency of the generator and can be used as a calibrated horizontal drive for an oscilloscope or X-Y recorder. Model 135 is ideally suited for audio testing where uninterrupted sweeping of the entire audio range is desired.

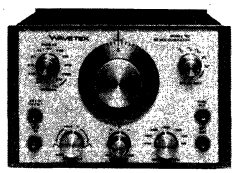
Model 136
VCG/VCA Generator
0.2 Hz to 2 MHz
∿, ⊓, ⋀, ◆◆◆
$595

The Model 136 VCG/VCA Generator provides a new dimension in oscillator/function generator performance. In addition to the VCG capability of the Wavetek Model 131A, this instrument provides true amplitude modulation (VCA). Either amplitude modulation, frequency modulation or a combination of the two can be externally controlled by remote programming voltages.

Function Generators

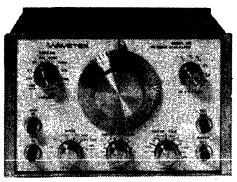
WAVETEK®

Model 142
HF VCG Generator
0.0005 Hz to 10 MHz
$595



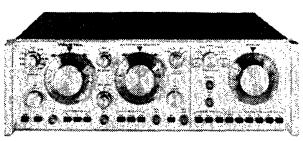
The Model 142 is a precision laboratory source of sine, triangle, square, positive pulse, and negative pulse waveforms whose output waveshape may be made either symmetrical or non-symmetrical (20:1 non-symmetry max) at the user's option. Its wide frequency range (0.0005 Hz to 10 MHz) and its precision output attenuator (six 10 dB steps) are characteristic of the laboratory quality built into this instrument.

Model 144
HF Sweep Generator
0.0005 Hz to 10 MHz
$845



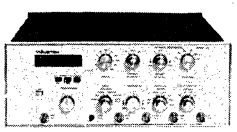
The Model 144 combines all the features of a Model 142 with an independent triggered ramp or sawtooth generator supplying a sweep voltage for the output waveforms. In addition to the internal sweep, terminals are provided for external voltage control of frequency (VCG) – either dc programmed or wide-band ac modulation. This unit also employs a precision output attenuator, variable in six 10 dB steps.

Model 146
Multifunction Generator
0.0005 Hz to 10 MHz
$1495



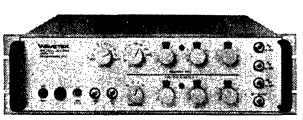
The Model 146 incorporates all of the features of Wavetek generators in one convenient unit. This unique instrument offers frequency and amplitude modulation, and triggered and gated operation. Actually, the Model 146 contains two complete function generators. The main generator operates from 0.0005 Hz to 10 MHz and the auxiliary generator from 0.004 Hz to 100 kHz. Caliper-type sweep/modulation indicators allow calibrated setting of amplitude and frequency modulation limits.

Model 147
HF Sweep Generator
With Digital Readout
0.0005 Hz to 10 MHz
$1295



The Model 147 combines all the features of the 144 with an LED display of frequency and amplitude. The front panel display shows the frequency or maximum or minimum peak amplitude of the output signal. Frequency is available immediately, even for the very slow cycles. Another feature is variable dc voltage output, which is also displayed. This is a remarkably self-contained instrument.

Models 150/155
Programmable Generators
0.01 Hz to 1 MHz
$1195 / $1395

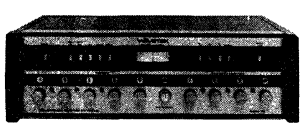


The 150 Series Programmable Voltage Controlled Generators are specifically designed for automatic systems applications. Both instruments can be programmed in frequency, function and amplitude from a remote digital source. The Model 155 also can be operated manually. The frequency of both generators can be controlled by a dc voltage or modulated by an ac signal. Output may be continuous, triggered, or gated by an external signal.

Model 154
Programmable DC/Signal Generator
0.001 Hz to 10 MHz
$1995

The Model 154 Programmable Generator provides sine, square and triangle waveforms from 0.001 Hz to 10 MHz. In addition to the waveforms, dc voltage output to ±10 volts may be selected. The instrument may be controlled by front panel controls or remote logic level digital programming of all functions. To add to the versatility of the unique instrument, the frequency and amplitude may be modulated by an external analog signal.

Models 157
Programmable Waveform Synthesizer
100 μHz to 1 MHz
$2995

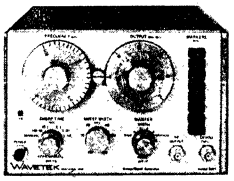


The Model 157 allows frequency, function and amplitude to be controlled locally with front panel switching or remotely by BCD programming. There are 10 ranges of frequency with 5-digit resolution and 4 ranges of amplitude with 3-digit resolution. Local or remote control is provided for triggering one cycle or gating a burst of cycles. The frequency may be modulated or swept through external analog or digital control.

Sweep/Signal Generators

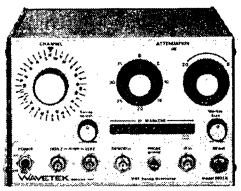
WAVETEK®

Models 1001-1005 Sweep/Signal Generator
0.5 MHz to 1.4 GHz
$995/$1095



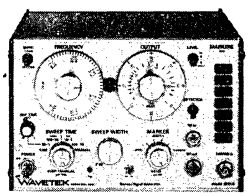
The 1000 Series Sweep Generators are wide-band general purpose instruments offering selected frequency bands and multifunction capabilities. The four instruments and their frequency ranges are 1001 — 0.5 to 300 MHz; 1002 — 1.0 to 500 MHz; 1004 — 500 to 1000 MHz; 1005 — 700 to 1400 MHz. The output signal is controllable over a 77 dB range and sweep width can be adjusted from 200 kHz to the full band of the instrument.

Model 1402 Sweep/Marker Generator
5 MHz to 25 MHz
$1295



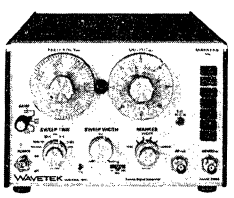
This specialized CATV instrument provides 36 fixed tuned positions centered at 12 broadcast TV channels (2-13) and 23 lettered CATV channels (A-W). Markers are at video and aural carriers of all 35 channels and automatically turned on when a channel is selected. An IF position has markers at 41.25 and 45.75 MHz. Five additional markers may be added optionally at trap frequencies for use with TV receivers or at channel boundaries for the manufacturers of up and down CATV converters.

Model 1801A CATV Sweep/Signal Generator
1 MHz to 500 MHz
$1245
1 MHz to 950 MHz
(in 2 bands) $1445



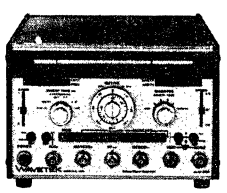
The Model 1801A is ideal for testing cable TV (CATV) systems. Fully automatic or manual sweep and CW operation over bands of 1-500 MHz and 450-950 MHz (optional). Built-in RF detector and crystal controlled marker system for internal modulation of the RF signal so marker information travels with the RF. Simultaneous sweep position with sweep time adjustable from 1-5 ms and repetition rate from 1-10 s. Electronic + and — 0.5 dB reference switch and calibrated output from +57 to —33 dBmV.

Model 2000 Sweep/Signal Generator
1 MHz to 1.4 GHz
$1375



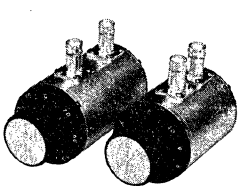
The Model 2000 is a three band Sweep Generator, simple to operate and very economical. Tuning is ΔF only. Resolution is excellent since a 3-position switch reduces maximum sweep width from 500 MHz to 50 MHz to 5 MHz allowing fine adjustment of the SWEEP WIDTH control. Output level is controllable over a 90 dB range, from +10 dBm to —80 dBm.

Model 2001 Sweep/Signal Generator
1 MHz to 1.4 GHz
$1695



The Model 2001 is a three band Sweep Generator with exceptional versatility in a rugged inexpensive instrument. The easy-to-use controls allow precise selection of operational mode (Start/Stop, ΔF, or CW) and frequency limits. Sweep width can be up to 500 MHz. Output level is controllable over a 90 dB range, from +10 dBm to —80 dBm. The capabilities of the 2001 are equally suited to laboratory or production applications.

Attenuators
0 to 80 dB
50 or 75 Ohm
Impedance



The 5000 series and 7500 series of precision rotary coaxial attenuators have 50Ω or 75Ω impedance, respectively. Attenuation steps of 0.1 dB, 1.0 dB, and 10 dB are available with total attenuation up to 80 dB. Type BNC, N, SMA, and F connectors may be specified. Other types are available on special order.

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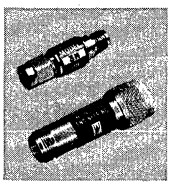
The products described below are only a sample of our complete line. Please inquire for detailed catalog. We also have years of experience in reliable custom designs.

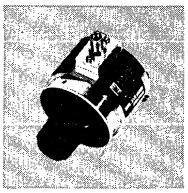
FIXED COAXIAL ATTENUATORS Weinschel has the most extensive line of fixed RF attenuators in all sizes and in a wide choice of frequency ranges, attenuation values, and input power ratings. All feature low SWR, long-term stability, high quality resistive films, and stainless steel construction. Type N, Type WPM (SMA), and other type connectors are available.



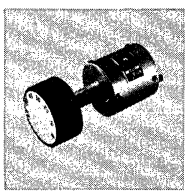
FREQ. RANGE (GHz)	ATTENUATION VALUE (dB)	AVG. POWER (W)	SWR[1] (MIN. TO MAX.)	MODEL NO.	PRICE[2]
dc-26.5	3,6,10,20	2	1.15-1.60	9*	$150
dc-18.0	3,6,10,20,30,40, 50,60	2	1.15-1.35	4M*	$ 70 (to 20 dB) $ 80 (30 dB) $ 95 (to 40 dB) $115 (to 60 dB)
dc-18.0	3,6,10,20,30,40, 50,60	2	1.15-1.35	4**	$ 80 (to 20 dB) $125 (to 60 dB)
dc-18.0	3,6,10,20,30,40, 50,60	2	1.15-1.40	2	$ 80 (to 30 dB) $105 (to 60 dB)
			1.20-1.50	2A	$ 50 (to 40 dB) $ 60 (to 60 dB)
dc-18.0	3,6,10,20,30,40, 50,60	5	1.15-1.40	8	$120 (to 20 dB) $135 (to 60 dB)
dc-18.0	3,6,10,20	5-8.7	1.20-1.35	21*	$100
0.4-18.0	1 thru 10,20	1-5	1.25-1.50	210A	$ 65
dc-12.4	3,6,10,20,30,40, 50,60	2	1.15-1.25	3M*	$ 45 (to 20 dB) $ 65 (to 30 dB) $ 80 (40 dB) $ 95 (to 60 dB)
dc-12.4	3,6,10,20,30,40, 50,60	2	1.15-1.25	3**	$ 60 (to 20 dB) $ 95 (to 60 dB)
dc-12.4	3,6,10,20,30,40, 50,60	2	1.10-1.20	1	$ 75 (to 20 dB) $100 (to 60 dB)
			1.15-1.20	1A	$ 45
			1.30-1.35	1B	$ 35 (to 20 dB) $ 40 (to 60 dB)
dc-12.4	3,6,10,20,30,40, 50,60	5	1.15-1.25	7	$100 (to 20 dB) $115 (to 60 dB)
dc-12.4	3,6,10,20,30,40,	5	1.20-1.35	20	$ 80
dc-12.4	3,6,10,20	5-8.7	1.20-1.25	21A*	$ 85
0.4-12.4	1 thru 10,20	2-5	1.25-1.30	530A	$ 50
0.4-12.4	1 thru 10,20	1-5	1.25-1.35	210	$ 50
2-10.0	3,6,10,20	1-5	1.35-1.40	HF	$ 20
dc- 8.0	3,6,10,20	10-15	1.20-1.30	5	$ 95 $105 (20 dB)
dc- 8.0	3,6,10,20	20-25	1.20-1.30	6	$105 $115 (20 dB)
dc- 3.0	1 thru 10,20,30, 40,50	1-2	1.02-1.20	50	$ 65 (to 20 dB) $ 80 (to 50 dB)
dc- 2.0	1,2,3,6,10,20	1	1.20	L	$ 12-$15
dc- 1.5	1 thru 10,20	10-35	1.15-1.30	10	$165 $220 (20 dB)
dc- 1.5	3,6,10,20	20-30	1.15-1.30	693	$225 $275 (20 dB)

*Subminiature size. **Miniature size. [1] Varies with frequency. [2] Subject to change.

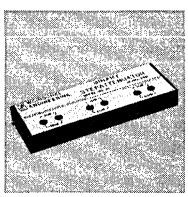
VARIABLE ATTENUATORS A wide selection of continuously variable attenuators for the dc to 11 GHz frequency range are available, in both bench and panel type. Many incremental attenuation ranges are available including 0 to 114 dB. All models feature low frequency sensitivity, individually calibrated dials, and low insertion loss. Uncalibrated versions also available for signal trimming. Connectors are stainless steel Type N or WPM (SMA). New miniature size Model 907 with dc to 2 GHz range features incremental phase shift of RF signal of only 1° /dB x f(GHz) and attenuation ranges of 0 to 10 dB and 0 to 20 dB.



STEP ATTENUATORS Weinschel has the largest selection of off-the-shelf step attenuators. They are available with manual or programmable control and with right-angle and in-line drive. All models are bi-directional. Numerous attenuation ranges are standard including 0 to 129 dB in 1 dB steps. Many frequency ranges are available including dc to 18 GHz. Prices start at as low as $295 for 0 to 60 dB in 10 dB steps. Weinschel has hundreds of custom designs to suit special applications.



BINARY STEP ATTENUATORS The Models 123 & 124 and 131 through 134 are fast switching (<25 msec), remotely controllable step attenuators for computer and automatic applications. All models are available with dc to 18 GHz or octave frequency bands. Life is 2 million steps per cell. Numerous combinations of attenuation range and incremental steps are available, including 0 to 110 dB in 10 dB steps (0 to 121 dB in 1 dB steps with 2 units in series). A logic driver for the binary attenuator is available to simplify computer interface.



RF COMPONENTS Our selection of RF components includes terminations, power dividers, mismatches, attenuation control heads, coaxial switches, stub tuners, barretter mounts, adapters, and connectors. Most of our components operate over the dc to 18 GHz frequency range. Some are available in miniature size.

ATTENUATION MEASUREMENTS We offer a variety of instruments for use in microwave parameter measurements. The Model 1810 RF Ratio Meter permits rapid and accurate insertion loss, gain, and SWR measurements at both fixed and swept frequencies. It has a dynamic measurement range of 30 dB RF and an accuracy of 0.02 dB/10 dB. Adding the Model 1811 RF Attenuation Controller to the Model 1810 system increases swept dynamic range to 60 dB. Accuracy remains 0.02 dB/10 dB.

SWEEP OSCILLATORS The Model 430A Solid State Sweep Oscillator has plug-in versatility for complete coverage of the 0.01 to 18 GHz range. All plug-in units are solid state fundamental oscillators, including 4 to 8 GHz, and are available with or without leveling. The Model 4310A Multiband Sweeper System is available in a choice of 19 configurations covering six frequency ranges. Electronically multiplexed systems cover any part of or the entire 0.01 to 18.0 GHz range in one continuous sweep. Features are optional 10 mW minimum leveled output (4 mW standard) to 18 GHz; electronically multiplexed RF output flat to ±1 dB; 13 msec continuous sweep of 4 bands provides flicker-free display; RF level and frequency programming; 0 to 100% symmetrical multiband sweeping, and exclusive automatic functions.

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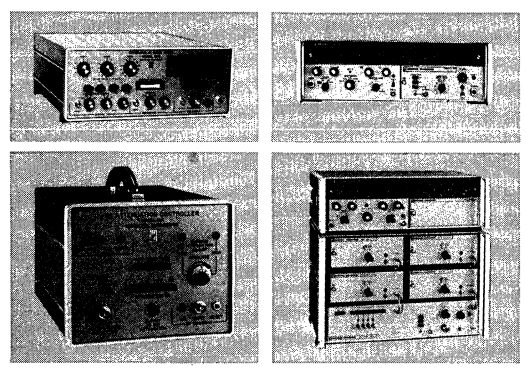

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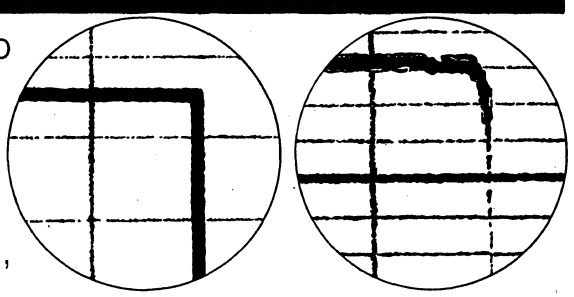
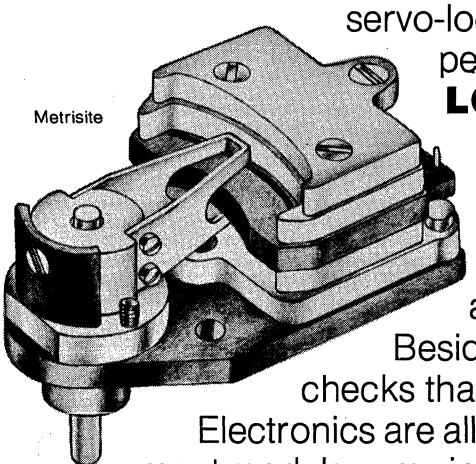
Why we think Brush recorders are your best choices.

CLEANEST TRACES. When you say hello to your Brush Recorder, you say good-bye to smudging, smearing, skipping and puddling traces. The reason: pressurized inking that forces a crisp, clean trace not just onto, but into the paper. Our pens never need priming, even after long periods of not being used.



Our traces Thermal traces

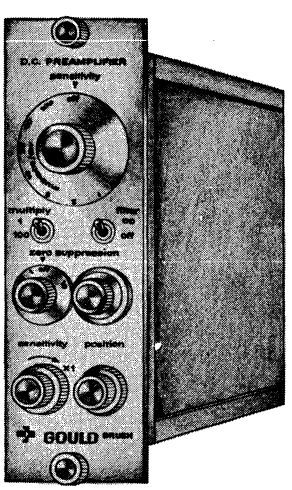
ACCURACY. Another plus for the Brush Recorders is our Metrisite® non-contact servo-loop feedback device. A system so accurate it enforces pen positioning at better than 99½% linearity.



Metrisite

LOW MAINTENANCE. We've carefully designed each instrument to require minimal care. For example, our Metrisite system eliminates bothersome maintenance problems. Like dirty pots, wear, cleaning. The Metrisite also eliminates slide wires and all the maintenance problems that go with them. Besides, we put every instrument through quality control checks that simply don't forgive mistakes.

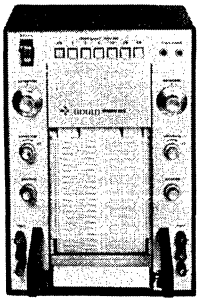
Electronics are all solid-state in the recorders. And most models come in either portable or rack-mounted versions. All of them are compatible with our wide range of signal conditioners, so you can get the exact signal conditioners to suit your requirements.



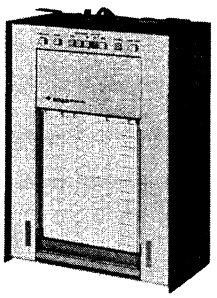
If you'd like to know more about Brush Recorders, contact your nearest Gould Sales Engineer or Representative. Or write for detailed performance information and specifications. Gould Inc., Instrument Systems Division, 3631 Perkins Avenue, Cleveland, Ohio 44114 or Rue Van Boeckel 38, Brussels 1140, Belgium.

BRUSH INSTRUMENTS

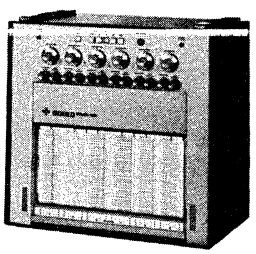
GENERAL PURPOSE



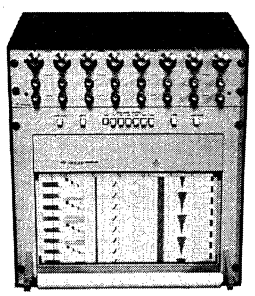
BRUSH 222 • 2-CHANNEL. Portable battery operated version of popular Brush 220 recorder. Internal recharger. 30Hz frequency response. Sensitivity 1mV/div. to 500V f.s.



BRUSH 440 • 4-CHANNEL. Designed for maximum versatility at low cost per channel. 40Hz frequency response.

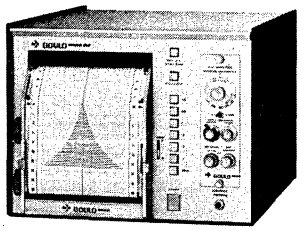


BRUSH 260 • 6-CHANNEL. High precision and maximum operator convenience. Built-in preamps. 1mV/div. to 500V f.s. sensitivity.

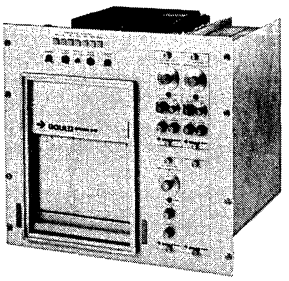


BRUSH 481 • 8-CHANNEL. Our newest 1mV/div. to 500 V f.s. sensitivity. Model 480 available without preamps.

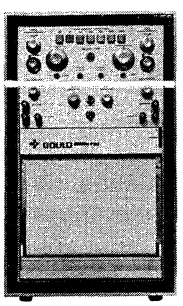
HIGH PERFORMANCE



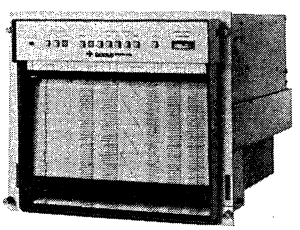
BRUSH 250 SINGLE CHANNEL. Fastest, most versatile strip-chart recorder anywhere. Useful response to 100Hz. Detachable chart paper magazine.



BRUSH 240 • 4-CHANNEL. Frequency response to 55Hz on 40mm and 35Hz on 80mm channels.

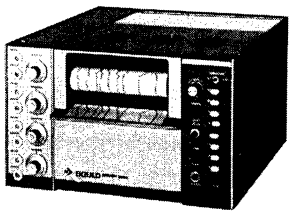


BRUSH 280 • 2-CHANNEL. Double width 80mm channels. Built-in preamps. 35Hz frequency response.



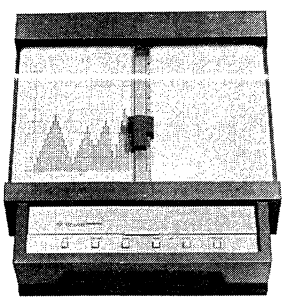
BRUSH 200 • 8-CHANNEL. The world's standard for high performance recorders. Tailored to your specific requirements.

SPECIAL PURPOSE

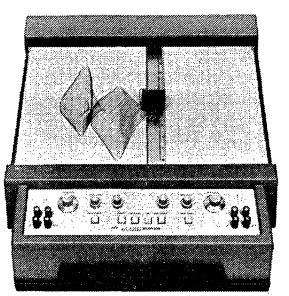


BRUSH 2300 LIGHTBEAM OSCILLOGRAPH. Dual tungsten filament optical oscillograph. From 1 to 16 channels. To 1000Hz response.

BRUSH 816 • 8-CHANNEL HI-SPEED MULTIPOINT Scans and displays up to 8 channels. Data is recorded at a rate adjustable from 2 seconds per point to 16 points per second.



BRUSH 511 DIGITAL PLOTTER. Absolute coordinate plotter. Non-cumulative errors. No permanent offsets due to transmission line disturbances. 99.85% linearity.



BRUSH 500 X-Y RECORDER. A rugged, low-priced recorder. 99.85% linearity. Pressurized ink writing. Electrostatic hold-down. Built-in preamps.

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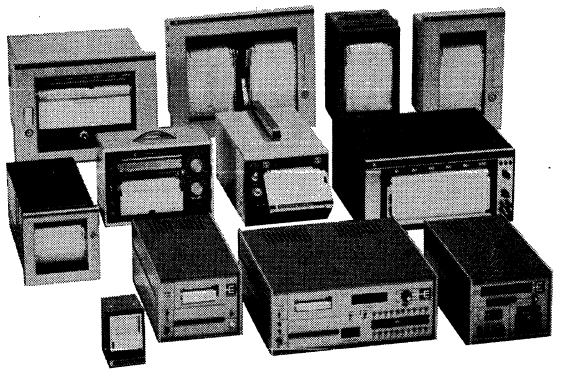

Esterline Angus manufactures one of the most complete lines of data recording instruments available. In the line are servo, direct writing and event recorders; miniature recorders, dual data system, 20 channel printer, one of the lowest-cost programmable data acquisition systems available, and high performance X-Y recorders. Recorders for OEMs are a specialty.

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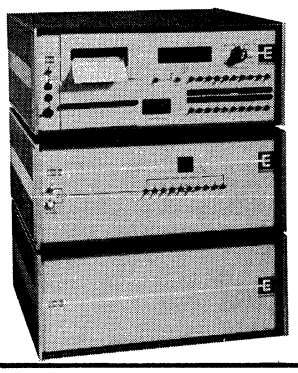
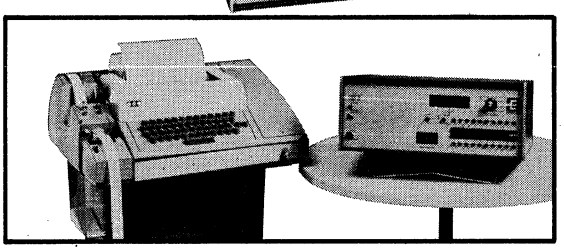




Programmable Data Acquisition Systems (PDAS): gathers data from 5-200 channels, converts readings to digital display, printout and optional computer interface signals. Low level 1, 10, 100 MV or high level 100 MV, IV, 10V switch selectable models available. Switch programmed, self-contained printer. High-low alarm option, input option accepts T, J, K, R or S thermocouples. For lab, pilot plant, start-up and process monitoring and portable applications. D-2020.

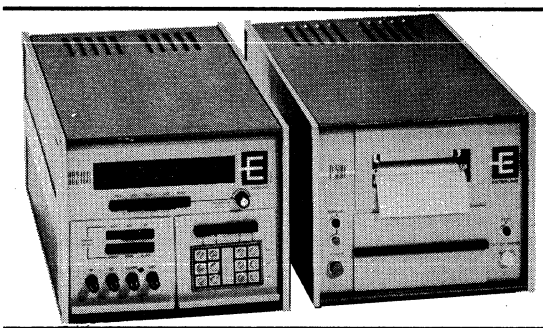
5 channels, analog or on-off data (add to 20 channels) from $3400.

20 channels, same as base unit. Accepts alarm option: 10 or 20 channel capacity. Under $3800

100 and 200 channels, complete programmable package. Omniuse. Simple computer interface. $6500 and up

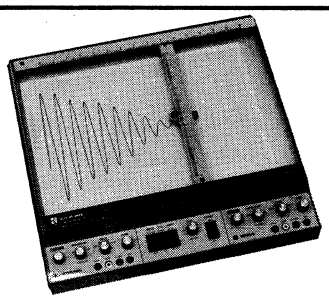
Teletype, ASR 33 and D-2020 under $4500. CRT unit too.

Tape, internal interface or paper tape perforator or 7- or 9-track incremental magnetic tape or cassette recorder available.



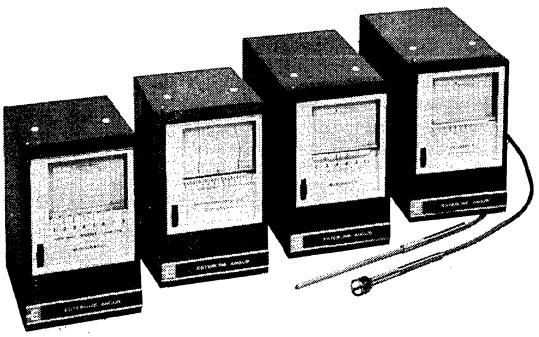
2-channel D2400: rationally priced, computer compatible multirange or two-function unit designed for temperature, pressure, strain measurements through digital techniques. Accept two interchangeable plug-in modules: low-level DC and thermocouple. For physical measurements in lab, pilot or production plant. Takes J, T, K or R thermocouples.

D-2400: Priced from $1300. **P-500:** 20 active column, red or black printer, adapts to D-2400. Printer is $1095.

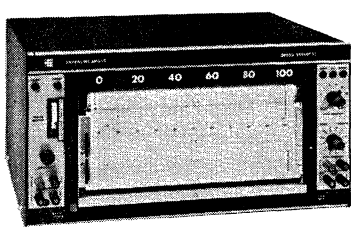


X-Y Recorders for every need: Model 530 is for general lab use, with a sensitivity of 1 mv/in. to 10 V./in. Model 540 is a two-pen crossover, ideal for analytical readout, plotting dependent vs. independent voltages, and statistical plotting. Model 560 has same feaures as Model 530 plus outstanding sensitivity, variable time base reset and other extras. 10 microvolt to 50 V./in. Other models available. Prices start under $1000.

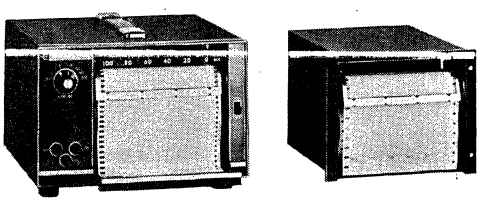
DATA RECORDING INSTRUMENTS



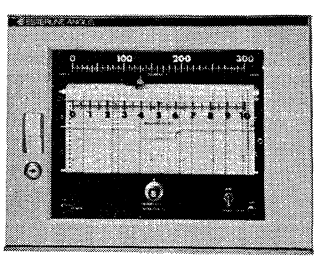
Minigraph recorders: small (3⅔"w x 5⅝"h x 4⅜"d typical) inkless recorders, available in 70 chart speeds. For lab, industry, aerospace, education.
Single channel: analog records of AC or DC current or voltage over 2⅛" channel. Priced from $99.50.
Two-channel: 2 independent galvonometer systems, record on 1 1/16" side-by-side channels. $143.50.
Time share: switching of two variables produces two independent traces over single 2⅛" channel. $149.50.
Temperature: 0-500°F to 0-2000°F or 0-300°C to 0-1000°C with J or K thermocouple. Thermistor models for general, surface and air temperature (−20 to 130°F typical) $150.00.
Event: for 4 or 8 channel on/off or yes/no applications for 6-48 VDC or 120 or 240 VAC, 50 or 60 Hz ratings. $119.00
Hook-on current transformer: 50 or 60 Hz, indoor rated (to 750 V), 5-250 Amp range dial-set. $160.00.



Servo recorders: Speed Servo® II—single pen, two-pen cross-over, two-pen side-by-side. 0.3 sec. response, 10" recorder available fully equipped for versatile lab use or stripped for OEM use. All feature linear servo motor, wireless feedback potentiometer, and disposable writing system or inkless writing system. 2, 5, or 10 chart speed drives; accessible front controls 0.5 MV-100VDC input spans; E, J, K, R, S and T thermocouple compatible. Alarms. Bench, rack mount or panel mount styles. Prices begin below $1000.



Miniservo recorder—lowest price servo recorder for laboratory, industrial and OEM applications. 10 cm wide Z-fold or roll chart, single or multiple chart speeds 1.5 to 1200 cm/hr. Sensitivity 100 MVDC, 10 MV optional. Portable, flush mount or stripped down for custom installation. Generous quantity discounts. List price, single unit, from $250.



Multipoint: a 24 point 10" rotary servo recorder with manual point advance for instant select of any point for identification. Slide-switch programmed to preselect points to be deleted or printed. ½ second response, 1 second print rate. Gear change = x 4 print rate. Simply converted to analog. 1MV minimum span. Covers any thermocouple, most resistance bulbs. $1555 up

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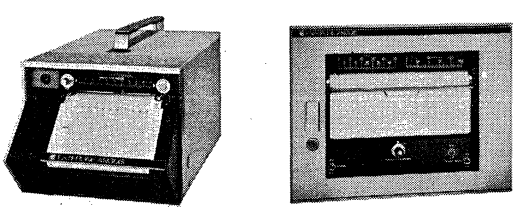
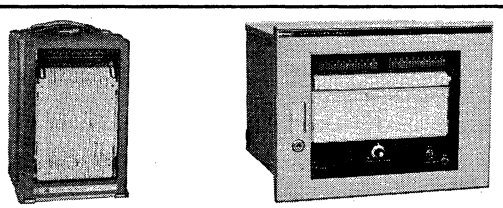


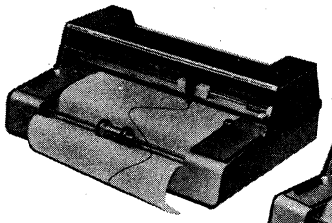
Direct writing recorders: widest range of direct writing instruments—from 4½" single channel curvilinear to four 2 3/16" channel RectiGraph recorders. Electrodynamometer or permanent magnet moving coil drives. To record (generally) MA, A, V, W, Vars, KVA, frequency, pressure, vacuum, speed, position. Electric or spring drives with hour, minute, and second chart speeds. From $515



Event recorders: 5, 10, 15, 20 or 40 channels ink or inkless for yes-no, on-off recording of events. 8" x 8" flush cases, front switch board or wall mounted cases too. Electric or spring chart drives with hour, minute and second speeds. Hundreds of varieties possible in A, E or S Series. Priced from $500

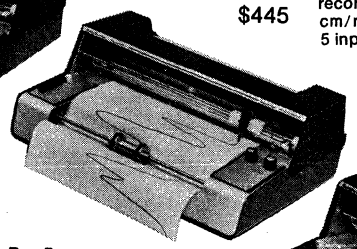
$395

Model 5112-1 single pen recorder with 1, 2, 5, 10 in/min. chart speeds and 10 mv fixed input spans.



$445

Model 5110-2 single pen recorder with 2.2, 5, 10, 20 cm/min. chart speeds and 5 input spans of 10 mv up.



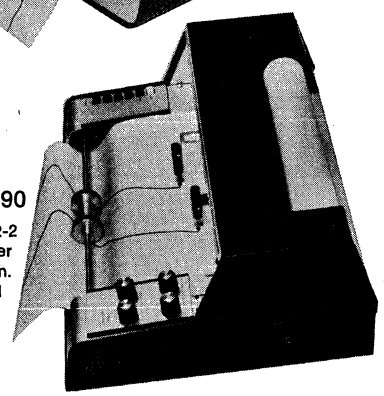
$595

Model 5212-1 two pen recorder with 1, 2, 5, 10 in/min. chart speeds and 10 mv fixed input spans.

Here's how you draw the right conclusions:

$690

Model 5212-2 two pen recorder with 1, 2, 5, 10 in/min. chart speeds and 5 input spans of 10 mv up.

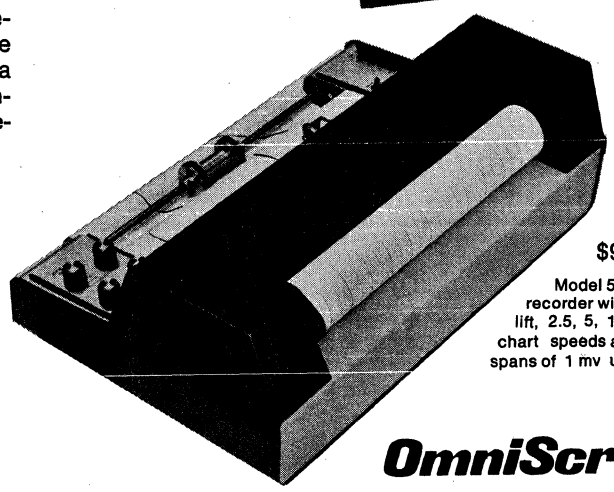


Omnigraphic®

x-y and strip chart recorders

If you want one pen or two . . . for GC or spectrometry . . . for thermo-couple or strain gauge . . . the Omnigraphic recorder with options will give you a full range of inputs combined with operational conveniences. Consider switching to Omnigraphic recorders . . . built by The Recorder Company.

27-plug-in modules for virtually every laboratory function make this the most versatile recorder



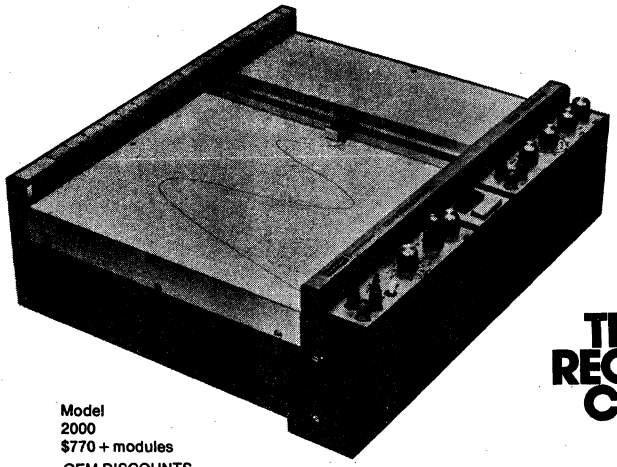
$990

Model 5220-5 two pen recorder with electric pen lift, 2.5, 5, 10, 20 cm/min. chart speeds and 5 input spans of 1 mv up.

OmniScribe™

strip chart recorders

Here's the newest low cost strip chart recorder from The Recorder Company. And when you compare the costs with the performance you'll understand why it pays to buy from a company whose entire resources are devoted to building and servicing the finest laboratory recorders in the world. Mail for your copy of the OmniScribe brochure today.



Model 2000 $770 + modules OEM DISCOUNTS

THE RECORDER COMPANY

houston instrument

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(713) 667-7403 CABLE HOINCO TWX: 910-881-5782

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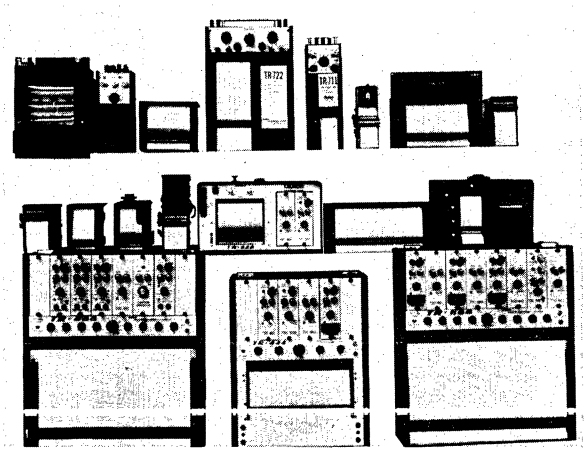
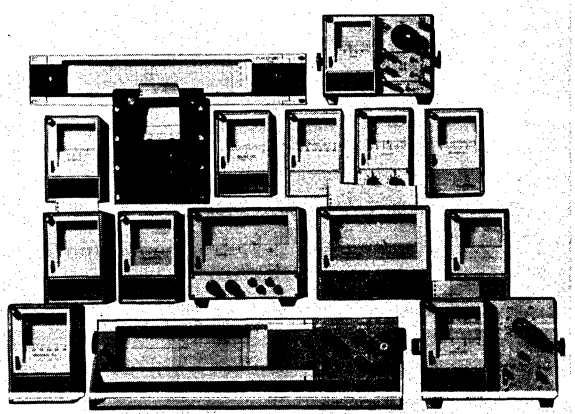
Gulton produces the most complete line of recorders available from one source.





Miniature • Servo • Oscillographic

Miniature Recorders
Solid state recorder/controller
DC recorder
Dual channel DC recorder
DC potentiometric recorders
AC recorder
Dual channel AC recorder
Power recorder
Watt and Var recorder
Strain gage recorders
Recording pyrometer
Thermistor probe recorder
Nickel wire probe recorder
Thermocouple recorder
Pressure recorder
Dissolved oxygen/temperature recorder
Combination voltage/current, analog/event, etc.
Refrigerator recorders
Temperature/humidity recorders
Volt-Amp recorders
Multi-range DC millivolt

Miniature Event Recorders
4, 8, 16 Channel
Analog/Event

Medium Speed Portable Wide Channel Recorders
1, 2 and 3 channel with plug-in preamps

Medium Speed Portables
2, 4, 6, 8 channel with plug-in preamps

Medium Speed Portables For Field Use
One and two channels with AC/DC operation

Portable Event Recorders
High speed stylus deflection—20, 40 or 60 channels—20 channel thermal printing—no moving styli—non-impact thermal printing of numeric data optional

Medium Speed Industrial/Medical OEM Recorders
1, 2, 3 and 4 channel units—non-impact thermal printing of numeric data optional

High Speed Portable Recorders
18 channel Light Beam Recorders

RECORDER SYSTEMS DIVISION
Gulton Industries Inc.
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rustrak/techni-rite graphic recorders

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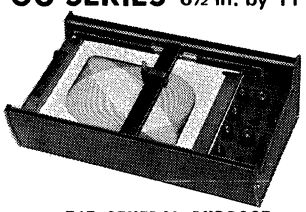
Keewaydin Drive, Salem, New Hampshire 03079
Tel. 603-893-1921 TWX 710-366-1887 Telex 94-7477

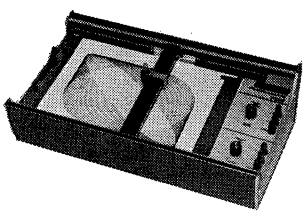
X-Y PLOTAMATIC RECORDERS

high performance at LOW COST

700 SERIES 8½ in. by 11 in. (DIN A4)



715 GENERAL PURPOSE



705 DEDICATED OEM

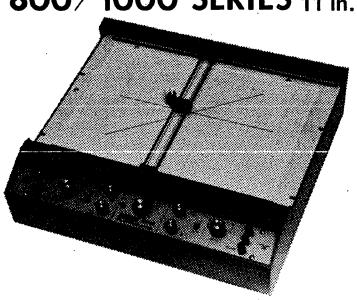
700 Series Recorders with Pad/Load®

The 700 Series recorders, while low in cost, still meet or exceed the performance specifications of many higher priced recorders. The new "PAD/LOAD®" paper handling system, operates three times faster than those available on conventional single sheet machines. A 50-sheet pad of paper is loaded into the recorder, and as each page is consumed, the operator simply tears off the used sheet, exposing a new sheet.

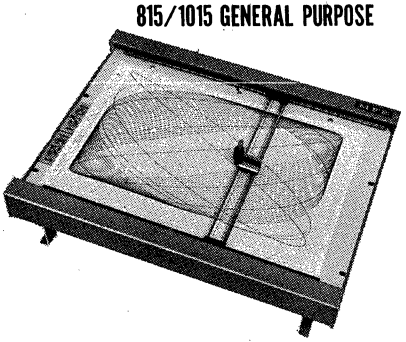
All 700 Series PLATAMATICS have ● I/C circuitry ● no mechanical or photo choppers ● clean fibre-tip pens ● electronic over-drive protection ● operate from switchable 115/230 V, 50-400 Hz power ● buffered feedback potentiometers for noise immunity ● ± 0.2% F.S. accuracy ● differential guarded inputs with 140 dB CMR ● constant 1 meg input impedance ● no servo gain adjustments

MODEL NO. English	MODEL NO. Metric	APPLICATION	RANGE	SLEWING SPEED	PRICE
705		dedicated - OEM	1 range: 100 mV/in	17 in/sec	$ 750
	705M	dedicated - OEM	1 range: 40 mV/cm	43 cm/sec	$ 750
715		general purpose	5 ranges: 1 mV/in to 10 V/in	17 in/sec	$ 880
	715M	general purpose	5 ranges: 0.5 mV/cm to 5.0 V/cm	43 cm/sec	$ 880
7T		plug-in time base generator (use with 700, 800 or 1000 series)	0.5, 1, 2, 5, 10, 20, 50 sec/in and 0.25, 0.5, 1, 2.5, 5, 10, 25 sec/cm		$ 180

800/1000 SERIES 11 in. by 17 in. (DIN A3)



815/1015 GENERAL PURPOSE



810/1010 OEM REMOTE CONTROL

800/1000 Series Recorders with PAD/LOAD® Option

800/1000 Series recorders meet or exceed the performance specifications of many higher-priced units.

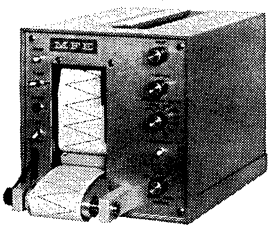
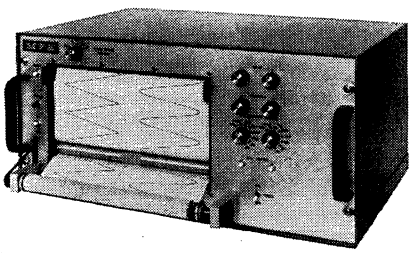
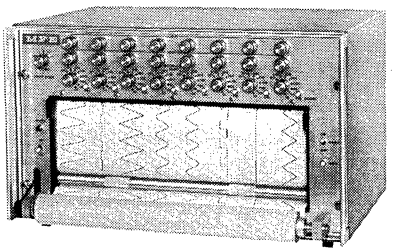
All 800/1000 Series PLOTAMATICS have • I/C circuitry • no mechanical or photo choppers • fibre-tip or optional capillary pens • electronic overdrive protection • differential-pressure paper hold-down • buffered feedback potentiometers for noise immunity • ± 0.2% F.S. accuracy • differential, guarded inputs with 140 dB CMR • constant 1 meg input impedance • no servo gain adjustments • holds either 8½ in. x 11 in. or 11 in. x 17 in. paper.

MODEL NO. English	MODEL NO. Metric	APPLICATION	INPUT RANGES	SLEWING SPEED	PRICE
805		dedicated - OEM	1 range: 100 mV/in	30 in/sec	$ 850
	805M	dedicated - OEM	1 range: 40 mV/cm	76 cm/sec	$ 850
810		remote control - OEM	1 range: 1 mV/in	30 in/sec	$ 950
	810M	remote control - OEM	1 range: 0.5 mV/cm	76 cm/sec	$ 950
815		general purpose	5 ranges: 1 mV/in to 10 V/in	30 in/sec	$ 980
	815M	general purpose	5 ranges: 0.5 mV/cm to 5.0 V/cm	76 cm/sec	$ 980
1005		dedicated - OEM - high speed	1 range: 100 mV/in	50 in/sec	$1195
	1005M	dedicated - OEM - high speed	1 range: 40 Mv/in	127 cm/sec	$1195
1010		remote control - OEM - high speed	1 range: 1 mV/in	50 in/sec	$1250
	1010M	remote control - OEM - high speed	1 range: 0.5 mV/cm	127 cm/sec	$1250
1015		general purpose - high speed	5 ranges: 1 mV/in to 10 V/in	50 in/sec	$1295
	1015M	general purpose - high speed	5 ranges: 0.5 mV/cm to 5.0 V/cm	127 cm/sec	$1295

MFE
Keewaydin Drive, Salem, New Hampshire 03079
Tel. 603-893-1921 TWX 710-366-1887 Telex 94-7477

STRIP CHART RECORDERS

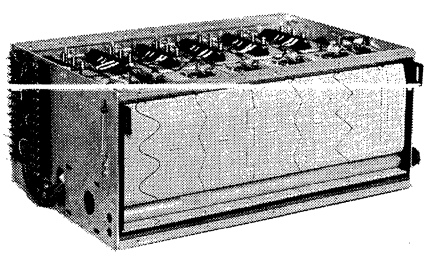
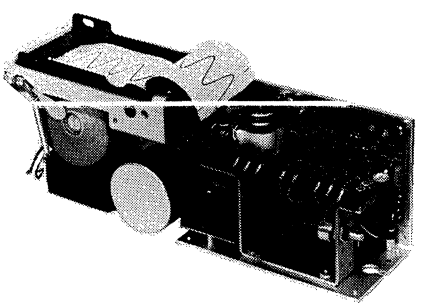
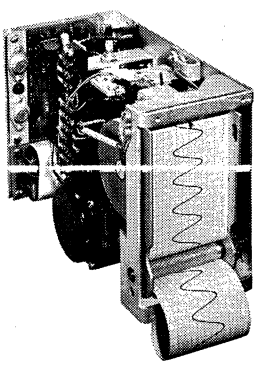
PORTABLE/RACK MOUNT RECORDING SYSTEMS

MFE portable or rack mount single and multichannel recording systems are completely self-contained lightweight instruments. Features include • inkless heated stylus writing • solid state design • 40 HZ full scale bandwidth • 50 mm channels • dc to 100 Hz (-3db) 10 mm pp • 7 step attenuator • 10 mv/mm sensitivity or optional 1 mv/mm up to 14 electrically switchable chart speeds

MODEL	NO. CHANNELS	CHANNEL WIDTH	PANEL HEIGHT	WT.	PRICE
M-21CAHA	1	50 MM.	8¾"	15 lbs.	$ 675
M-51	1	100 MM.	8¾"	20 lbs.	$1095
M-22CAHA	2	50 MM.	8¾"	22 lbs.	$1175
M-52	2	100 MM.	10½"	40 lbs.	$1875
M-23CAHA	3	50 MM.	8¾"	39 lbs.	$1875
M-53	3	100 MM.	10½"	48 lbs.	$2475
M-24CAHA	4	50 MM.	8¾"	45 lbs.	$2475
M-26DAHA	6	50 MM.	10½"	57 lbs.	$3675
M-28D	8	40 MM.	10½"	64 lbs.	$3975
OPTION 01	1 mv/mm, add $100/channel.				

OEM RECORDER MODULES

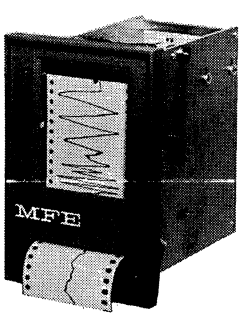




MFE single through 8 channel thermal writing recorder modules are designed for maximum flexibility. The basic transport is equipped with the MFE moving iron pen motor(s), chart drive motor(s), stylus heat power supply and control potentiometer, for each channel and front loading paper supply and drive mechanism. To the basic module are added MFE plug-in solid state drive amplifiers, power supplies and accessory equipment: event marker(s), paper take-up, front panel, and portable case.

Request detail data sheets and prices on all models and options

M 12 SERIES

MINI-STRIP CHART RECORDER



- Continuous Rectilinear Trace
- Inkless Thermal Recording
- Completely Self-contained with Electronics and Pen Heat
- Chart Paper Capacity of 100 feet
- Quiet Operation
- Simple Paper Loading from Front Panel
- Portable or Rack Mounting
- Lightweight – 4.5 pounds
- Wide Range of Speeds
- Low Power Consumption
- Solid State
- 2 Inch Wide Chart

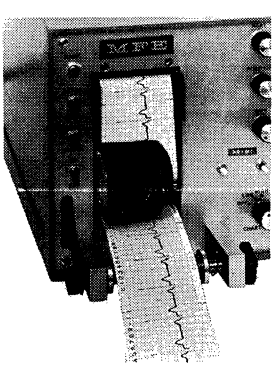
Optional Configurations

- Line Voltage Monitor
- Line Frequency Monitor

Price $250

ADP SERIES

OEM DIGITAL PRINTER ACCESSORY

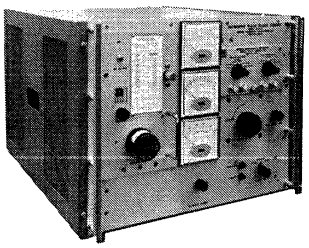


Simultaneous Digital Printing and Analog Recording. Chart speeds up to 50 mm/sec. Print Rate 5 Characters/sec.

Price $300

HIGH POWER SIGNAL SOURCES AND OSCILLATORS

PULSE SIGNAL SOURCES



MODEL PH40K

the highest pulse power available in a single generator

Covering the range from 150 to 6100 MHz, tuneable plug-in oscillator heads provide guaranteed minimum powers as high as 40 KW. Pulses are continuously variable in width from 0.4 to 25 μs and in repetition rate from 10 to 10,000 pps. Available also in pulse modulator configuration.

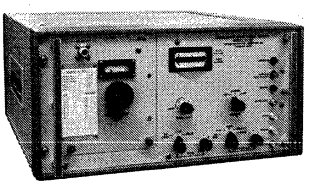
Frequency (MHz)	P_{min} (KW)
150 to 500	10
500 to 700	15
700 to 1200	40
1200 to 3000	10
3000 to 6100	0.5

MODEL PG5K

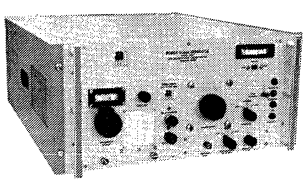
wide range, medium power unit

With guaranteed minimum powers as high as 5 KW, the Model PG5K covers 150 to 6100 MHz with plug-in heads. Pulses are continuously variable in width from 0.3 to 50 μs and in repetition rate from 20 to 25,000 pps.

Frequency (MHz)	P_{min} (KW)
150 to 2000	5
2000 to 3000	4
4000 to 6100	0.2



CW SIGNAL SOURCES



MODEL C203

the highest CW power available in a single instrument

Covering the range from 190 to 6100 MHz with plug-in heads, the Model C203 provides full power modulation at 0.5 duty cycle with internal 1000 Hz square wave generator or from an external pulse source.

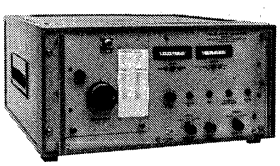
Frequency (MHz)	P_{min} (W)
190 to 500	100
500 to 1000	75
1000 to 2000	50
2000 to 3000	15
3000 to 6100	0.5

MODEL C201

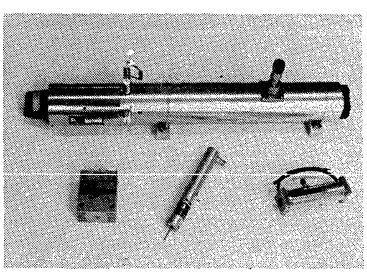
economical, medium power CW unit

Tuneable plug-in oscillator heads cover the range from 150 to 6100 MHz. Internal 1000 Hz square wave modulation. External pulse modulation. Excellent frequency stability.

Frequency (MHz)	P_{min} (W)
150 to 500	60
500 to 1000	50
1000 to 1900	25
1900 to 2700	10
2700 to 6100	1



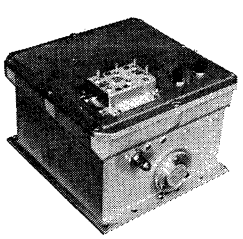
CAVITY OSCILLATORS



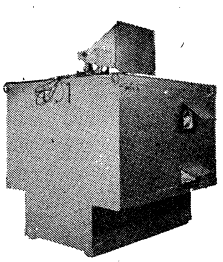
Standard models for CW or pulse applications in a variety of configurations cover selected frequency bands from 150 to 6100 MHz. Some special designs that have become standard:

Model 519	40 KW peak power, UHF.
Model 505	Conduction-cooled, high power, C-band.
Model 428	Wide tuning, CW for local oscillator applications.
Model 498	High power, duty cycle, and stability; wide pulse.

CUSTOM PRODUCTS



The same high performance and reliability characteristics that distinguish our standard models are also evident in the custom product designed to your specifications. In single units or production quantities. Our extensive experience covers the spectrum from the smallest high-performance cavity to large transmitter systems in environmentally controlled transportable shelters. If your requirements are for high power and stability, take it from a reliable source, send for complete catalog.



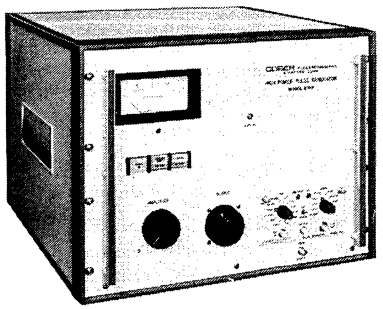
APPLIED MICROWAVE Division of Epsco INCORPORATED

411 Providence Highway, Westwood, Massachusetts 02090 • Tel.: (617) 329-1500 • TWX: 710-348-0484

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

COBER MEANS HIGH POWER!

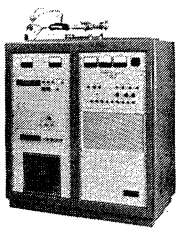
PULSE GENERATORS



Model 605P provides 24Kw pulses, 2200 volts at 11 amps. Pulse width is 50 nanoseconds to 10 milliseconds, rep rate 1 shot to 1MHz, with rise time of 20 nanoseconds. It drives microwave tubes, Gunn Diodes, and optic modulators, and is a versatile lab instrument.

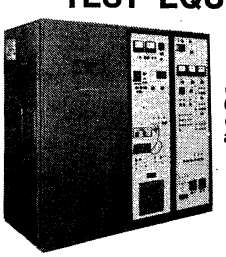
Cober's pulse generators feature high power (kilowatts) with fast rise time (nanoseconds). A broad line is available from stock with pulse widths out to DC, both positive and negative polarities, and outputs floating to 50Kv. Plug-in accessories provide an extensive range of voltage and current combinations. One unique product is a universal grid pulser for microwave tubes and electron guns.

MICROWAVE GENERATORS



RFI, EMI and Microwave Component Testing needs require special microwave generators. Cober makes it almost as easy to obtain a special as it is a standard unit. Illustrated is Model 1326 which provides both pulse powers of 1.8KW and CW outputs of up to 500 watts. Frequency coverage is 350MHz to 10.475GHz.

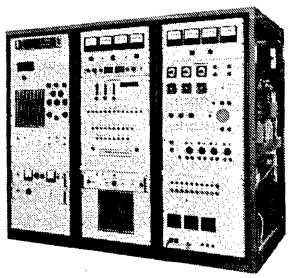
MICROWAVE TUBE TEST EQUIPMENT



Model 1643 High Power TWT Test Set permits operation of dual mode TWTs in CW, grid pulse, cathode pulse and mod anode pulse modes.

Cober is recognized as the leading supplier of high power microwave tube test facilities. Included are highly regulated power supplies, modulators, T.U.T. chambers and protective circuitry for load, personnel and equipment. Models are manufactured to age and test T.W.T.'s, B.W.O.'s, CFA's, magnetrons as well as triodes and tetrodes.

PULSE MODULATORS



Model 1826 Universal Hard Tube Modulator drives broadest range of microwave tubes. 20Kv pulses at rise times less than 100 nanoseconds are provided in a system that is fully automated and instrumented.

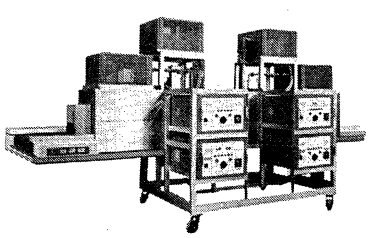
Cober's line of pulse modulators include units to drive high powered pulsed microwave tubes, high power lasers, plasma tubes, and ultraviolet sources. Power levels range from a few kilowatts to over 100 megawatts. In addition to standard modulators, we specialize in the generation of state of the art nanosecond rise times and high rep rates. Full Mil Spec solid state modulators are supplied for systems use, and soft tube and hard tube units are furnished for laboratories and particle accelerator facilities.

DC POWER SUPPLIES

Cober Laboratory and Mil Spec DC Supplies operate over 5Kw and at voltages between 5Kv and 1000Kv. Standard electromechanical or electronic regulator modules can be incorporated to furnish regulation and ripple to 0.001%. Our Systems Engineering Group designs full Mil Spec units and provides all integration and software to satisfy Government requirements.

MICROWAVE INDUSTRIAL HEATING

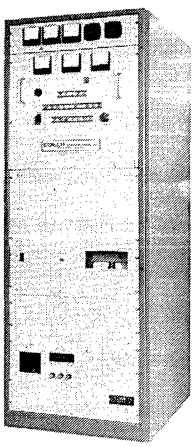
Cober Microwave Heating System and Power Packs operate at 915MHz and 2450MHz. Standard units are available delivering 2.5Kw, 5Kw, and 30Kw as well as complete systems of multiple units with powers up into the hundreds of kilowatts.



Model LSC05 Dual Frequency Conveyorized Microwave Oven delivering 5Kw at 2450MHz and 4Kw at 915MHz is used for laboratory studies and pilot production.

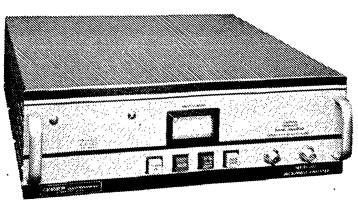
MICROWAVE COMMUNICATIONS POWER AMPLIFIERS

Model 5964-CK30 Intelsat 3Kw Klystron Power Amplifier is the work horse of international and domestic satellite communications at 5.9 to 6.4GHz. It transmits data, voice and T.V.; and can be supplied with up to 24 pre-set channels.



Cober's Microwave Transmitters and Power Amplifiers are used in satellite and troposcatter communication systems. Units are available with power outputs from a few watts to tens of kilowatts.

TWT LABORATORY MICROWAVE AMPLIFIERS SERIES LMA



Series LMA TWT Laboratory Microwave Amplifiers — at powers of 1, 2, 10, 20, 100 or 200 watts in octaves covering 1-18GHz have regulated solid state power supplies.

Cober broadband TWT Amplifiers are available as CW or pulsed units with powers up to 100Kw. Instruments from 1 watt up to 200 watts of power are available from stock at prices starting at approximately $2,000 with a full year warranty on the equipment and tube.

The products shown on this page are representative of Cober's very broad line. They have in common a concept of standard packaged modules and designs which make it as easy and as economical for our customers to buy units to their own specifications as it is for them to buy our standard products. If your need is in the area of high power electronics won't you please call us.

Cober electronics, inc.

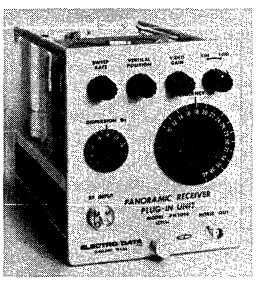
Send for our New 16 page catalog (#HPP) showing products and specs for High Power applications.

"THE HIGH POWER PEOPLE"
7 GLEASON AVENUE • STAMFORD, CONN. 06902
PHONE: (203) 327-0003 TWX: 710-474-3371

SPECIAL PRODUCTS DIVISION ELECTRO/DATA, INC.

- **Microwave Test Equipment**
- **Swept Microwave Receivers**

YIG TUNED SPECTRUM ANALYZER PLUG-INS



Ten models cover the entire frequency spectrum from 100 MHz to 40 GHz with greater than decade band tuning ranges. With these units, an ordinary oscilloscope is converted into a pre-selected wide band microwave receiver which gives a panoramic display of signals on the oscilloscope. The entire frequency spectrum or any segment of it, may be displayed in a single sweep.

SPECIFICATIONS

Model	Tuning Range (GHz)	Dispersion (GHz)	Resolution Typ. (MHz)	TSS (—dbm)
PN1010A/1060A	.1-1.0	.1-1.0	3-6	60-75
PN1011/1061A	1.0-12.4	.4-11	4-10	45-58
PN1012/1062	.5-5.0	.4-4.5	4-7	42-56
PN1013/1063	2-25	2-23	10-15	40-55
PN1014/1064	10-40	2-30	15-20	35-50

Model PS 1150 power supply carrying case permits operation of all PN1000 models from 117 Vac.

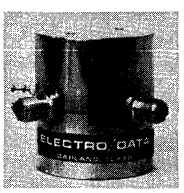
PN1010-14 series for these Tektronix oscilloscopes: 531A, 532, 533A, 536, 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 549, 551, 556, 581A, 585A.

PN1060-64 series for Tektronix 561 and 564 scopes.

LOW DRIFT, LOW NOISE VCO'S

Looking for voltage tuned oscillators in the 5-500 MHz frequency range, having low incidental FM and good short term stability? Then consider this typical 50 MHz VCO performance:

Tuning range ..... ±1.5%
Linearity ..... better than 1%
Control voltage ..... ±5V
Supply voltage ... +15V@50 ma
−15V@ 5 ma
Output power .. 0 dbm/50 ohms
Incidental FM ..... ±10 Hz
(±2 ppm)
Short term stability
(3 sec avg) ..... ±10 Hz
(±2 ppm)
Temp. range ...−20°C to +50°C
Drift over
temp. range ..... 50 KHz
(15 ppm/°C)
(oven stabilized .. 5 ppm/°C)
Package size ..... 3" x 3" x 1"



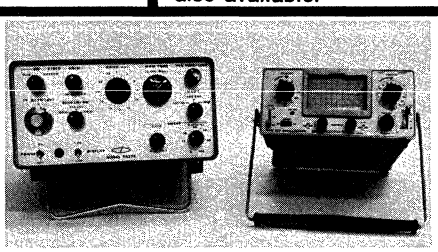
YIG FILTERS

Eleven models cover from 100 MHz to 40 GHz with greater than decade electronic tuning ranges. Solid state, rugged compact construction. Companion driver circuits also available.

NEW PRODUCTS

A series of comb generators with spacing from 50 MHz to 1000 MHz and response extending to 12 GHz . . . with integral power supply.

MODEL #	*COMB. SPACING*	*UPPER FREQ. LIMIT*	*OUTPUT LEVEL*	*SIZE*
MK-1	50 MHz	6 GHz	−20 dbm	3¼ x 4 x 6
MK-2	100 MHz	12 GHz	−30 dbm	3¼ x 4 x 6
MK-3	500 MHz	12 GHz	−20 dbm	3½ x 5 x 8½
MK-4	1000 MHz	12 GHz	−15 dbm	3½ x 5 x 8½

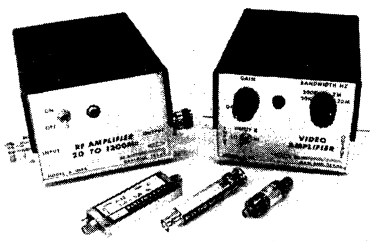


NEW FROM ELECTRO/DATA

SA-225 SPECTRUM ANALYZER

Most recently the Special Products Division has developed an extremely compact spectrum analyzer covering the 2-25 Ghz frequency range. The unit is a yig preselected double conversion superhet, and provides high resolution and sensitivity in a 5 x 9 x 13-inch package (less display) weighing only 25 lbs. It is intended for use with such portable scope displays as the Tektronix 323.

• Wideband Amplifiers • YIG Devices • Marker Generators • RF Subsystems



BROAD BAND AMPLIFIERS

LOW NOISE

SOLID STATE

MINIATURE SIZES

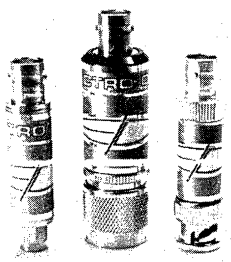
Model	A-5B	*A-10A	A-12
Freq. Range	5 — 500 MHz	20 — 1200MHz	1000 — 2000 MHz
Noise Figure	5 db Typical	4 db Typical	6 db Typical
Gain	20 db Typical	18 db Typical	17 db Typical
Power Req.	18V @ 18MA	15V, 34MA	—12V, 14 MA
Size	½" dia x 3" long	½" dia x 2" long	⅜" x 1" x 2⅝"
In/Out Imp.	50 OHMs (Nominal)	50 OHMs (Nominal)	50 OHMs (Nominal)
Gain Comp.	—10 dbm Output	—10 dbm Output	—12 dbm Output

*Lab version for A-10A available in 3¼"x 4"x 6" pkg. 115 VAC. (Model A 100)

V 20

Freq. Range	5Hz — 20 MHz
Noise	8uV Ref to input (50 OHM Source)
Gain	Variable to 80 db
Bandwidth	Decade Select from 20 KHz
Output Voltage	5Vp-p max. 2 V p-p min. in 93 ohm load
Power Req.	115 VAC, 1.6 W
Size	4" x 3¼" x 6"

TUNNEL DIODE DETECTORS



- Highest sensitivity
- Broadband, flat response
- Field replaceable diodes

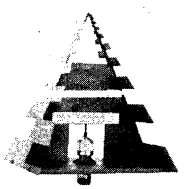
SPECIFICATIONS

Type N Input	Freq. GHz	Tss —dbm
D10	1-12.4	50
D11	1-2	54
D12	2-4	54
D13	4-8	52
D14	8-12.4	50
3 MM Input	**Freq. GHz**	**Tss —dbm**
D30	1-12.4	50
D31	1-2	54
D32	2-4	54
D33	4-8	52
D34	8-12.4	50
BNC/ TNC Input	**Freq.**	**Tss —dbm**
D40	100KHz-2.5GHz	48
D41	100KHz-4GHz	45

Add R to model number for integral DC return

LOG PERIODIC ANTENNAS

Broad Band Coverage 1-12.5 GHz Compact, Rugged, Lightweight Portable. Measured antenna patterns show only a single main lobe with a 15 db front to back ratio over the entire 1 to 12.5 GHz band.

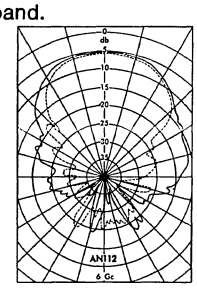


SPECIFICATIONS

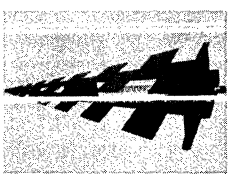
- Broad bandwidth — 1 to 12.5 GHz
- High Gain — 11 db (50° beamwidth)
- Linear Polarization 20 db

AN112 6¼" x 6½" x 8"

- High front to back ratio in both horizontal and vertical planes — 15 db.
- Low VSWR — 2: 1 nominal with 50 ohm input.
- Connectors: Type "N" or miniature.



Measured typical radiation pattern
Solid, vertical
Dashed, horizontal



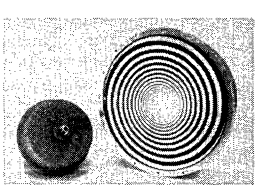
AN112F 1¾" x 6½" x 8"

SPECIFICATIONS

- Broad bandwidth — 1 to 12.5 GHz
- High Gain — 8 db (90° bandwidth)
- Linear polarization 15 db front to back ratio

CAVITY BACKED SPIRAL ANTENNAS

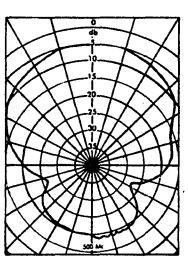
- Broadband Coverage UHF Thru L-Band
- Circular Polarization
- Lightweight



These compact, lightweight antennas are ideal for portable survey applications.

SPECIFICATIONS

	MODEL AN012	MODEL AN013
Frequency	750MHz—2.3GHz	300MHz—1.5GHz
Beamwidth	70 to 110°	80 to 120°
VSWR	2:1	2:1
Connector	N Female	N Female
Size	7½" Dia. x 3¾" H.	13½" Dia. x 5" H.
Weight	1 Lb.	4 Lbs.



Measured pattern of the AN012-L Circular polarization.

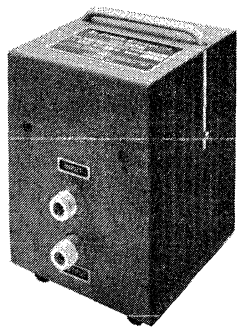
Write for detailed price and product information:

1621 Jupiter
Garland, Texas 75042
214/341-2100

SPECIAL PRODUCTS DIVISION
ELECTRO/DATA, INC.

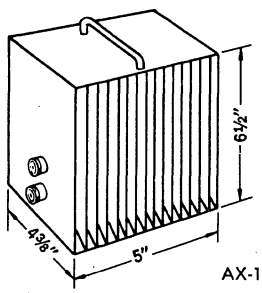
ATTENUATORS

AX - TX SERIES ATTENUATORS



AX-100-20

- Oil-filled Self-Cooling
- 50 ohm impedance.
- VSWR 1.1:1 to 700 MHz; 1.2:1 to 1 GHz
- Frequency Range DC-1 GHz.
- Stock values of attenuation are 3, 6, 10, 20, 30db.



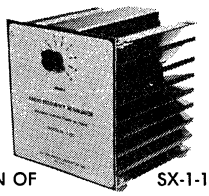
AX-100-20

Model*	Max. Power Watts	Type	Attenuation Specify
AX-100	100	L Pad	3, 6, 10 20, 30db
AX-500	500	L Pad	
TX-100	100	T Pad	
TX-500	500	T Pad	

*Choose Stock Attenuation Value.

ALSO AVAILABLE

SX SERIES STEP ATTENUATORS

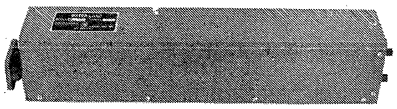


SX-1-100

INSTANT SELECTION OF ATTENUATION LEVEL FOR HIGH POWER RF APPLICATIONS

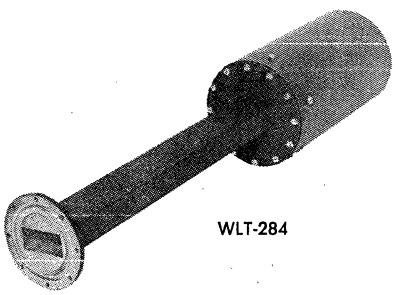
DUMMY LOADS

WL SERIES WAVEGUIDE WATER LOADS



WL-112

- Calibration resistor precisely located in coolant flow path permits calibration of Load using only a source of DC or 60 Hz power.
- Quick-connect couplings on coolant connections guarantee safe, sure and convenient operation.
- Extremely low RF radiation.
- Optional equipment includes closely coupled Thermopiles, Output Meters reading directly in watts, and Flow Meters.



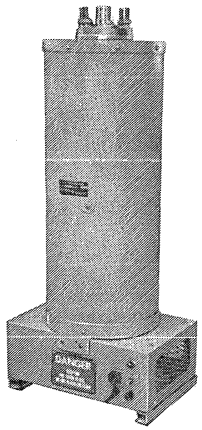
WLT-284

WAVEGUIDE LOADS

Model	EIA Desg.	Frequency Range GHz	VSWR Max.	Power Rating Average
WL-650	L	1.12-1.70	1.2	40KW
WL-430	LS	1.70-2.60	1.2	30KW
WL-340	340	2.20-3.30	Special Order Only	
WL-284	S	2.60-3.95	1.15	25KW
WL-187	C	3.95-5.85	1.15	10KW
WL-159	159	4.90-7.05	Special Order Only	
WL-137	XN	5.85-8.20	1.15	5KW
WL-112	XB	7.05-10.0	1.15	3KW
WL-90	X	8.20-12.4	1.15	2KW
WL-62	KU	12.4-18.00	1.15	1KW
WL-42	K	18.00-26.5	1.15	500W
WL-28	V	26.5-40.0	1.15	500W

For Loads with Thermopiles, add T to designation. Example: WLT-284 (For use with Calorimeters).

DPTC-FM SERIES FM BAND DRY LOADS



DPTC-10KFM

Model	Average Power	Connector	VSWR
DPTC-10KFM	10KW	3⅛	1.2:1
DPTC-20KFM	20KW	3⅛	1.2:1
DPTC-30KFM	30KW	3⅛	1.2:1
DPTC-40KFM	40KW	3⅛	1.2:1
DPTC-50KFM	50KW	6⅛	1.2:1
DPTC-75KFM	75KW	6⅛	1.25:1

Specifications: Model DPTC-10KFM

Power Rating: 10,000 watts
Duty: Continuous
Frequency: 85-110 MHz
VSWR: 1.2:1
Weight: 37 pounds
Connector: 3⅛ standard
Finish: Light Grey
Power Required: 110VAC 50/60Hz Std.
Ambient Temp. Range: −40° to 52°C
Dimensions: 38 h x 11 d x 16" w.

The new Electro Impulse Dry FM Band Termination will save the costs of water or expensive installations for other types of Loads.

Consisting of a practically indestructible resistive element in a stream of forced ambient air, the DPTC-10KFM will operate silently for just a few pennies a year . . . **and we guarantee it for 2!**

APPLICATION: Highly dependable Termination for FM Transmitters. Requires only 110 VAC, 30 watts power.

UNIQUE WARRANTY

"This Termination is Unconditionally Guaranteed against defects in parts or workmanship for a period of 25 months, provided it is operated within recommended parameters."

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

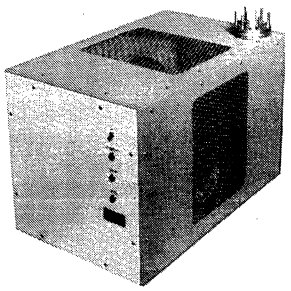
Electro IMPULSE, INC.
116 CHESTNUT STREET • RED BANK, NEW JERSEY 07701
TELEPHONE: 201 - 741-0404

SEE OUR OTHER PRODUCTS IN Vol.1•432; Vol.3•1044

DUMMY LOADS

Electro IMPULSE, INC.

CPTC SERIES



CPTC-20K

- 5,000 to 100,000 watts average power
- Continuous duty
- Completely self-contained, requiring only a power line connection
- Nominal input impedance is 50 ohms — others available (at extra charge).

These units are fully self-contained, incorporating an oil-filled termination, an oil to air heat exchanger and circulating system.

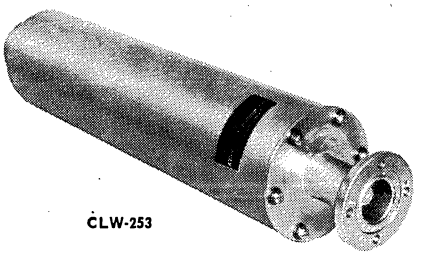
Pressure, flow and temperature interlocks insure complete protection for both transmitter and termination.**

Although 50 ohms is the standard input impedance for this series, impedances of 72, 300 or 600 ohms can be supplied. Please specify all requirements when ordering.

** On most units.

Model	Frequency Range MHz	Suggested Connector Choice Available	Total Average Power Watts
CPTC-5K	DC-1000	1⅝	5,000
CPTC-10K	DC-1000	3⅛	10,000
CPTC-20K	DC-1000	3⅛	20,000
CPTC-30K	DC-1000	3⅛	30,000
CPTC-50K	DC-1000	6⅛	50,000
CPTC-100K	DC-1000	6⅛	100,000

CLW SERIES WATER COOLED



CLW-253

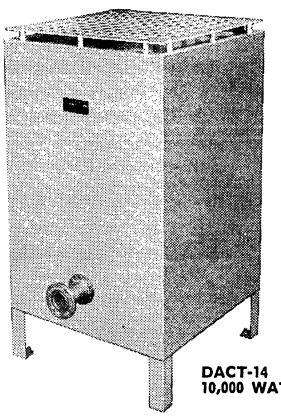
- **ECONOMICAL** — Use only tap water to absorb heat dissipated by resistive elements
- **COMPACT** — Smaller and lighter than Oil-Filled Terminations with corresponding power ratings
- **HIGH OVERLOAD CAPACITY** — Resistive element is practically indestructible
- Cooling Units can be supplied for closed system operation
- Available in three frequency ranges to 1 GHz*
- Nominal impedance is 50 ohms. Other impedances available.
- Specify connector type desired when ordering
- Use with Tap Water Calorimeter

Model	Max. Power Watts	Frequency Range	VSWR**
CLW-14	10,000	DC-1GHz	1.25
CLW-253	25,000	DC-1GHz	1.25
CLW-54	50,000	DC-1GHz	1.25
CLW-15	100,000	DC-1GHz	1.25
CLW-25	200,000	DC-1GHz	1.25

* DC-32MHz, DC-110MHz, DC-1GHz.
** Values for DC-1GHz range. Lower for other ranges.

DACT SERIES CONVECTION COOLED

UNIQUE 25-MONTH WARRANTY!



DACT-14
10,000 WATTS

ABSOLUTELY NO MAINTENANCE!

NO POWER REQUIREMENT!

Power Ratings Available:
1000, 3000, 5000, 10,000, 15,000, 20,000, 25,000 watts.

VSWR:
1.15:1.

Frequency Range:
Standard to 30 MHz — Models available to 55 MHz.

Impedance:
50 ohms standard. 72, 300, 600 ohms available at extra cost.

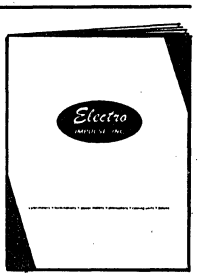
Maximum Ambient Temperature:
52°C. No minimum!

Mounting Orientation:
Non-critical.

UNITS MAY BE PULSED

WRITE FOR CATALOG #800
FOR OTHER ELECTRO IMPULSE PRODUCTS

- CALORIMETERS
- COOLING UNITS
- ATTENUATORS
- BALUNS
- POWER METERS
- WAVEGUIDE LOADS
- COMPLETE LINE OF TERMINATIONS



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Electro IMPULSE, INC.

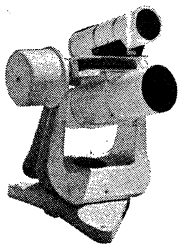
116 CHESTNUT STREET • RED BANK, NEW JERSEY 07701
TELEPHONE: 201 - 741-0404

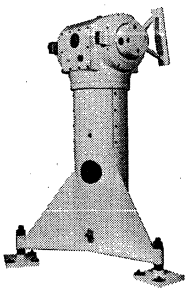
SEE OUR OTHER PRODUCTS IN Vol.1•432; Vol.3•1044

RANGE INSTRUMENTATION EQUIPMENT, PRECISION PEDESTALS & OPTICAL MOUNTS

SERVO CONTROLLED INSTRUMENT POSITIONER

A rugged, lightweight positioner capable of remote control, auto-track, and preprogramming. Handles typical symmetrical loads of 75 pounds. Has DC servo control in a closed loop system.



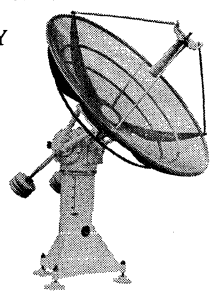


PRECISION SERVO-CONTROLLED PEDESTAL

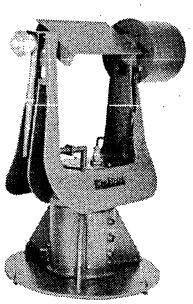
Continuous azimuth travel with ±100° elevation. Capable of symmetrical loads to 500 pounds with typical static positioning accuracy of ±0.10°. Solid state servo controller. Can be preprogrammed, operated in preposition select or auto-track mode with rates to 30°/sec.

AUTOMATIC TELEMETRY TRACKING SYSTEMS

Designed to use GSS precision servo-controlled pedestal and a variety of antennae from conical scanning to helix and cross dipole arrays. Positioning is by servo drive. A variety of frequencies and polarizations can be provided with remote control and auto-track.



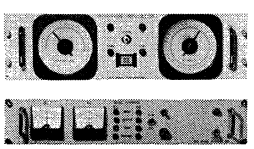
AZIMUTH/ELEVATION POSITIONER



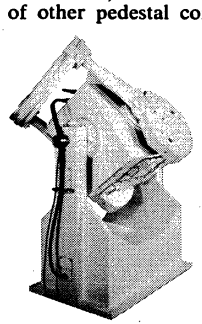
Model 8175 is a lightweight, precision Az/El positioner operated manually, by remote control, or by auto-track. Handles typical balanced loads of 75 pounds with rated velocity of 30°/sec. Acceleration of 30°/sec². Elevation −10° to 190°. Azimuth approximately ±360° or continuous. Drive by dual-channel, complementary transistor servo amplifier.

AUTO-TRACK INTEGRATION ACCESSORIES

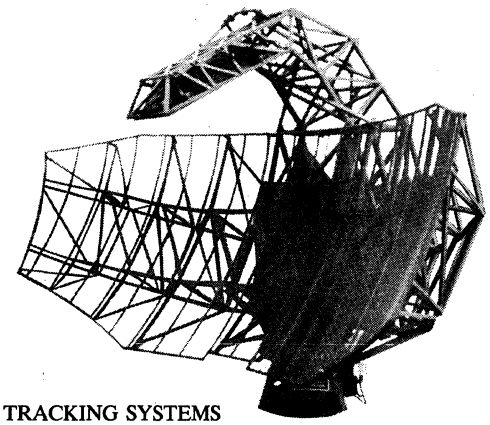
Solid state couplers of angle-error sensing devices to Az/El pedestals for automatic tracking. Also provided is joystick control, automatic switchover to null detection, position indications, and retention of other pedestal control.



XY PEDESTAL POSITIONER



A high-rigidity antenna positioner capable of maximum sky coverage. Unique X-shaft cam minimizes keyhole around support pillows. 6000 pounds can be positioned to 0.2° static accuracy. 30°/sec tracking rate with dynamic error of 0.3° maximum. 35°/sec² maximum acceleration.



TRACKING SYSTEMS AND PEDESTALS

Typical Geo Space systems include pedestals such as the rotary mount above. It uses two rotary joints feeding both a radar and an IFF antenna. Continuous rotation in azimuth. Capable of handling high powered transmission (225KW peak radar). Low VSWR.

GEO SPACE SYSTEMS INC.

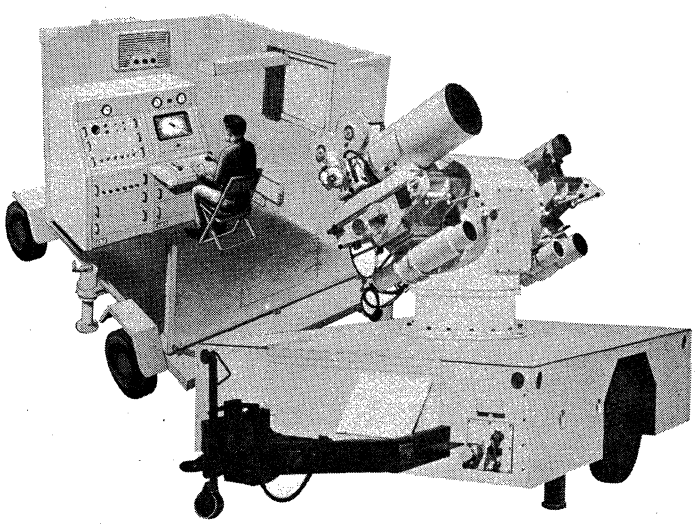
4722 Eisenhower Boulevard, Tampa, Florida 33614, (813) 884-0492

MOBILE OPTICAL TRACKING SYSTEM

The Mobile Optical Tracking System is a precision, high load capacity, servo-controlled position pedestal, mobilized for rugged terrain. It can be controlled locally from the pedestal, from its mobile control van or from a permanent site located up to 12 miles from the pedestal.

The pedestal is controlled by infrared or TV edge track auto-track systems, or by manual joystick control. Auto-override allows momentary selection of manual mode. A coast function allows the pedestal to continue at the established rate for a minimum of 10 seconds if target is lost.

Only two hours site installation and calibration time is required. Position accuracy is 4 arc seconds (static) and 0.003 mr/mr/sec (dynamic). Its angular displacement is 345° azimuth, −15° to +100° elevation. Stable tracking rates in the speed range of 5 arc sec/sec to 75 deg/sec may be obtained. Maximum symmetrical and balanced load capacity is 1480 pounds.



MCL INC LA GRANGE ILL

MICROWAVE...
CAVITIES COMPONENTS SYSTEMS AND SUB SYSTEMS

The following pages reflect the results of over a decade of effort devoted to the design and development of microwave components and systems.

Dealing successfully, during that time frame, with almost every conceivable problem associated with cavity and system design has given us the confidence to boastfully exclaim "If we can't satisfy your microwave equipment requirements it can't be done"!

MCL/INC has designed and developed over 300 systems and subsystems, approximately 200 microwave accessories and over 400 different cavities, many of which are depicted in this catalog.

Browse through our microwave market place, assured that if you can't find the equipment to meet your needs, MCL can readily alter an existing unit or custom design to your exact specifications.

40 TO 18000 MEGAHERTZ
MILLIWATTS TO MEGAWATTS

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PRODUCT WARRANTY

Under recommended use and service, all MCL products are warranteed against defects in material and workmanship for nine (9) months from the date of original shipment. Material returned after 90 days of the original shipping date will be repaired on a pro-rata basis. MCL's obligation is limited to repairing or replacing, at our plant, products which prove to be defective during the warranty period. Tubes, transistors, and other solid state devices are covered by the respective manufacturer's warranty which applies from the date of shipment of the unit from MCL.

MCL is not liable for consequential damage resulting from the use of MCL equipment.

There will be no charge for repair of units under warranty except non-authorized shipping charges. In the event that responsibility for repair lies with the customer, customer will be charged for the cost of re-testing, repair and shipment. Estimates of charges will be supplied before work begins.

CLAIM FOR DAMAGE IN SHIPMENT
Your unit should be inspected and tested as soon as it is received. Claims for damage should be filed with carrier.

SHIPPING
Upon receipt of shipping instructions, forward the unit to the destination indicated. For non-warranty service, the unit must be shipped prepaid.

MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

TWT CW AMPLIFIERS

10, 20, 100 AND 200 WATTS

STOCKED (LESS TUBES) FOR IMMEDIATE SHIPMENT

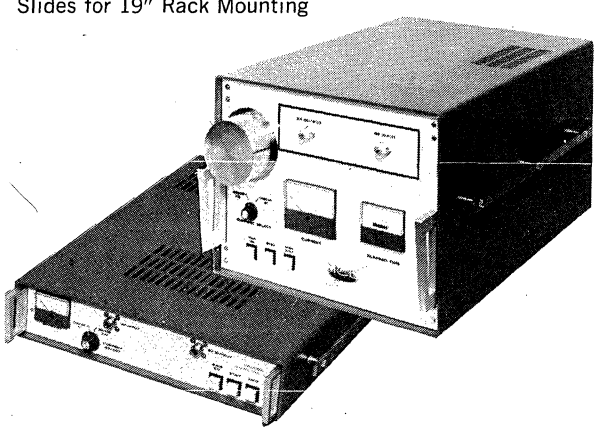
The Industry's most advanced Traveling Wave Tube Amplifiers have broadband microwave amplifying capabilities and supply stable and powerful signals for calibration testing and other high power applications.

The power supplies are designed to maintain excellent regulation with a line input voltage variation of ±10%. The filament voltage is a regulated DC voltage supply. The helix voltage is maintained with ±0.1% with a ripple of less than .05%. The beam supply is regulated to ±.02% and filtered to provide a ripple less than 0.1%. These characteristics result in superior spectral purity of the output signal. Tubes are operated in a depressed collector mode to reduce collector heat dissipation and prolong tube life.

Interlocks, overheat and overcurrent protective circuitry de-activate high power circuits should there be a fault. Metering is also included to provide performance verification and ease of maintenance.

Solid state modular design offers a wide variety of TWT Amplifier capabilities. In addition to the standard 10 to 200 watt amplifiers described in this brochure; custom modifications and designs are available on special order. MCL offers the following accessories on most models.

VSWR Protection
Output Power Monitoring
Slides for 19" Rack Mounting



GENERAL SPECIFICATIONS

Circuitry:	Solid State, except for series regulator and TWT tubes
Protection:	Time delay (filament warmup) Beam/Helix overcurrent protect Service interlocks Thermal cutout Power lines fused or circuit breakers
Controls:	Power on Standby Operate Beam/Helix current switch Illuminated power controls
Indicators:	Beam current/Helix current meter Elapsed time meter (100/200 w)
RF Connectors:	Type "N" standard or waveguide where required, other connector types available. Front panel mounted.
Cooling:	Air
Input/Output Impedance:	50 ohms (nominal)
Input/Output VSWR:	< 1.3:1 (< 1.5:1 on 10 w units)
Load VSWR:	< 2.5:1
Operating Temperature:	0°C to +50°C
Storage Temperature:	−20°C to +70°C

SPECIFICATIONS

10 WATT

Frequency Range	Gain db	Model
1-2 GHz	30	10520
2-4 GHz	30	10521
4-8 GHz	30	10522
8-12.4 GHz	30	10524
12.4-18 GHz	30	10525

Power:
Single phase — 105-125V, 3A, or 210-240V, 1.5A, 48-63 Hz

Size:
25" D. x 19" W. x 3½" H.

20 WATT

Frequency Range	Gain db	Model
1-2 GHz	35	10450
2-4 GHz	35	10451
2-4 GHz	54	10452
4-8 GHz	35	10453
4-8 GHz	54	10454
6-11 GHz	35	10455
6-11 GHz	54	10456
8-12.4 GHz	35	10457
8-12.4 GHz	54	10458
12.4-18 GHz	30	10459
12.4-18 GHz	45	10460

Power:
Single phase — 105-125V, 6A, or 210-240V, 3A, 48-63Hz

Size:
25" D. x 19" W. x 5¼" H.

100 WATT

Frequency Range	Gain db	Model
1-2 GHz	30	10480
2-4 GHz	30	10481
2-4 GHz	50	10482
4-8 GHz	30	10483
4-8 GHz	50	10484
7-11 GHz	30	10488
8-12.4 GHz	30	10485
12.4-18 GHz	30	10487

Power:
Single phase — 15A, 210-240V, 57-63 Hz

Size:
26" D. x 19" W. x 12¼" H.

200 WATT

Frequency Range	Gain db	Model
1-2 GHz	30	10500
2-4 GHz	30	10501
4-8 GHz	30	10502
8-12.4 GHz	30	10503
12.4-18 GHz	30	10504

Power:
Single phase — 210-240V, 20A, 57-63 Hz

Size:
26" D. x 19" W. x 12¼" H.

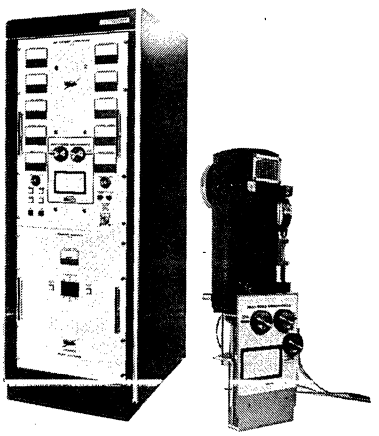
MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

1000-WATT RF, CW POWER AMPLIFIER SYSTEM 50 TO 1100 MHZ* COVERAGE IN ONE PACKAGE WITH BANDCHANGE CAVITIES

ALL UNITS STOCKED FOR IMMEDIATE SHIPMENT

- **FRONT PANEL DIAL TUNING OF EACH RF CAVITY.**
- **FRONT PANEL DIAL VS. FREQUENCY CALIBRATION CHARTS ON EACH CAVITY.**
- **INDIVIDUAL FRONT PANEL METERING OF PLATE, SCREEN, GRID AND FILAMENT CIRCUITS AND FORWARD AND REFLECTED POWER OF INPUT AND OUTPUT CIRCUITS.**
- **ELAPSED TIME INDICATOR.**



Model 10270 is the ultimate in RF power amplifier design... affording maximum utility in commercial, military and similar installations where space must be budgeted. Its modular cavity bandchange feature provides users with a high degree of flexibility, high power efficiency and extreme economy in one quality constructed package.

FEATURES AND SPECIFICATIONS

Power output: 1.0 kilowatt*

Operation: Class B. (Other operating modes supplied upon special order.)

Maximum input VSWR: 2:1

Nominal impedances: 50 ohms, input and output. Terminated in standard military connectors — Type "N" input, Type "LC" output.
Amplifier drawer assembly equipped with tilt-out sliderails to facilitate cavity changing, and servicing. Sliderails will fit any standard relay rack cabinet.
Solid state high voltage supply.
Filament, grid and screen supplies regulated for maximum stability.
Standby operation feature.

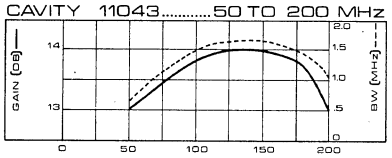
Primary Power Requirements: 208 or 220 VAC, three-phase, four-wire 60 Hz or optional 220 VAC, single phase, 60 Hz or optional 208/220 VAC three-phase, four-wire 400 Hz. 50 Hz also available upon special request.

Cooling: Air is drawn in through top louver and exits through rear louver.
Quality components throughout.

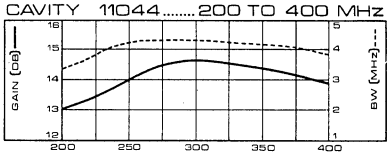
Dimensions (In Cabinet): 61½ High x 24 Wide x 26 Deep.

Weight (In Cabinet): 475 lbs.
Individual Cavity Weighs 40 to 75 lbs.

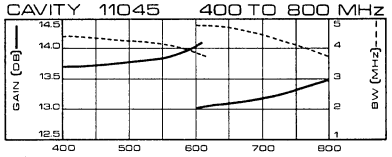
CAVITY 11043.....50 TO 200 MHz



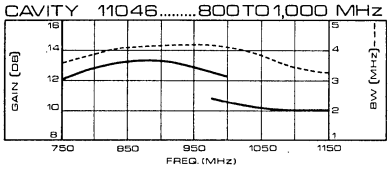
CAVITY 11044.....200 TO 400 MHz



CAVITY 11045 400 TO 800 MHz



CAVITY 11046.....800 TO 1,000 MHz



* 11046 cavity is available with a frequency range of 800 to 1100 MHz with a power output of 500 watts

PROTECTIVE DEVICES

Operator:
High voltage chassis interlocks.
High voltage points shielded for servicing.

Amplifier:
Excessive plate current trip-out relay.
Excessive screen current trip-out relay.
Screen voltage interlocked with plate voltage.
Screen and plate voltages interlocked with grid voltage.
Cooling failure trip-out.
Primary circuit breaker for short-circuit protection.
Time delay relay for filament warm-up.
Delayed blower turn-off cycle. (Blower continues running for 2 minutes after circuit breaker turns power off.)

HOW TO ORDER

To order a complete amplifier system (in cabinet) specify model number according to frequency range desired.

Example: MODEL 10270 — 11043 (50 - 200 MHz)
MODEL 10270 — 11044 (200 - 400 MHz)
MODEL 10270 — 11045 (400 - 800 MHz)
MODEL 10270 — 11046 (800 - 1000 MHz)

To order separate, modular RF bandchange cavities specify cavity model number according to desired frequency range.

Example: CAVITY MODEL NUMBER 11045 (400 TO 800 MHz)
Cavities are equipped with tube and all accessories for band changing.

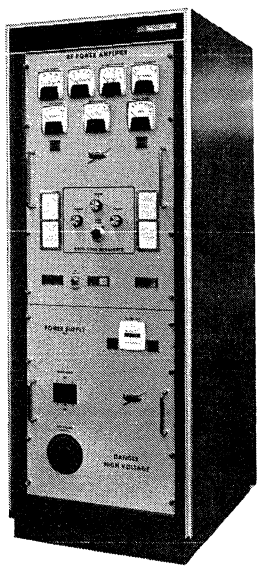
Note: System is shipped complete with cabinet as shown unless otherwise specified.

MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

1000-WATT KLYSTRON CW AMPLIFIER SYSTEMS

STOCKED (LESS TUBES) FOR IMMEDIATE SHIPMENT



An exclusive MCL achievement in design and development of self-contained, rack-mounted Klystron cavity amplifier-power supply systems that eliminates clutter and contributes to work area efficiency.

Suggested applications include mobile or tranportable, tropospheric forward scatter communications, CW and radar equipment.
This series includes 8 individual systems, each embodying highly desirable features such as high power capability, broad frequency range. (Any of these systems can be custom modified.) Each system is engineered conservatively and quality built, affording users maximum reliability and economy.

- **RACK-MOUNTED, COMPLETELY SELF-CONTAINED**
- **1700 to 18,000 MHz COVERAGE**
- **HIGH GAIN, HIGH EFFICIENCY OR BROAD BAND TUNING**
- Individual front panel cavity tuning dials and dial vs frequency calibration charts.
- Individual front panel metering of beam voltage and current, body current, filament voltage and current, forward and reflected power of input and output circuits.
- Elapsed time indicator.
- Illuminated, function indicating switches for measuring forward and reflected power of input and output circuits. Also for power on-off, standby, VSWR and air-fail circuits.
- Front panel high voltage control.

GENERAL FEATURES AND SPECIFICATIONS
PROTECTIVE DEVICES

Operator:
- High voltage chassis interlocks.
- High voltage points shielded for servicing.

Amplifier:
- Adjustable time delay — beam voltage.
- Relay — excessive beam current.
- Relay — excessive body current.
- Relay — insufficient filiment voltage.
- Excessive VSWR — beam voltage cut-off.
- Primary circuit breaker for short-circuit protection.

WEIGHT: 700 lbs.

DIMENSIONS: (IN CABINET)
61½ HIGH x 24 WIDE x 26 DEEP

- **Cooling:** Air is drawn in through rear and exits through top.
- Cooling failure trip-out.
- **Operation:** High gain, high efficiency or broad band tuning modes.
- Delayed blower turn-off cycle. (Blower continues running for at least three minutes after circuit breaker turns power off.)
- **VSWR:** 2:1, maximum — output load; 1.1:1, maximum — input circuit.
- **Nominal impedance:** 50 ohms, input and output through individual, directional couplers. Input connector — Type "N."
- Arc detection circuitry available on special order.
- Solid state high voltage supply unregulated.
- Front panel high voltage control.
- Regulated filament supply.
- Standby operation feature.
- **Main power requirements:** 208 or 220 VAC, 15 ampere, 60 Hz, three-phase, four-wire. 50 Hz operation available upon special order.
- Quality components throughout.

Freq. MHz	Power Output	Tube Type	Max. Gain Tuned		Max. B.W. Tuned		Output Connector	Model
			Gain db.	BW MHz	Gain db.	BW MHz		
1700-2400	1.0 KW	4K3SJ	47-45	4-6	—	—	1⅝ AL	10282
1700-2400	1.0 KW	4K3SL	41-38	9-12	38.3	13-14	1-⅝ AL	10283
2400-2700	1.0 KW	4K3SK	43-42	10-15	—	—	1⅝ AL	10284
2850-3050	1.0 KW	4K3SN	45	7	—	—	1⅝ AL	10285
4400-5000	1.0 KW	VA888	51	6-8	41	13-19	UG-149 A/U	10276
5900-6400	1.0 KW	VA861	58	7-8	48	11	UG-343 A/U	10278
7100-8500	1.0 KW	VA866	59	12	50	20	UG-51/U	10286
15000-18000	0.5 KW	VA930	50	12	40	20	UG-419/U	10287

HOW TO ORDER

TO ORDER COMPLETE AMPLIFIER SYSTEM, SPECIFY ACCORDING TO MODEL NUMBERS:

EXAMPLE: MODEL 10276 (4400 - 5000 MHz)

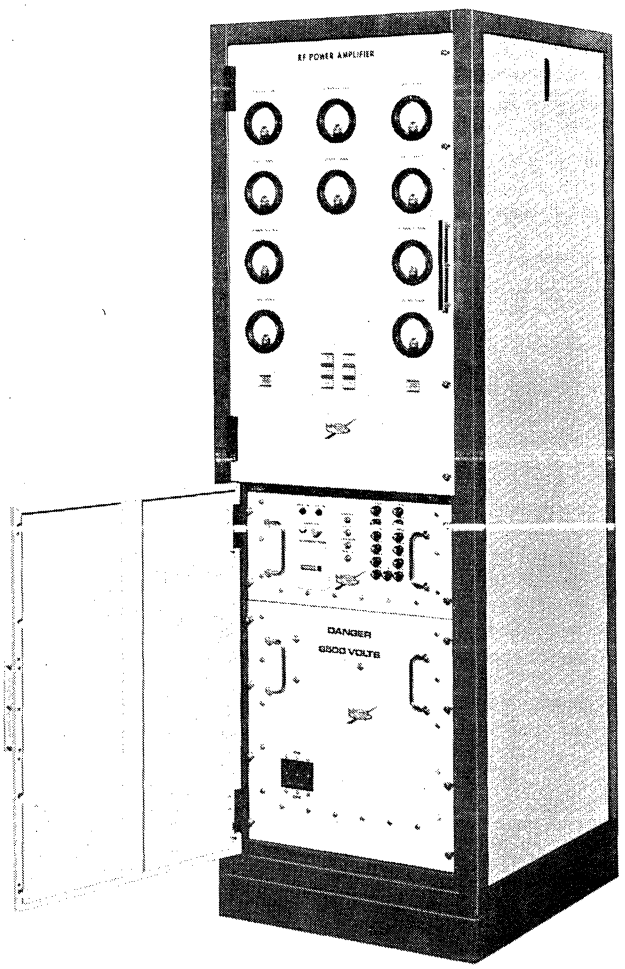
NOTE: SYSTEM IS SHIPPED COMPLETE WITH CABINET AS SHOWN UNLESS OTHERWISE SPECIFIED.

† Eliminates need for external monitoring scope.

MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

COMMUNICATION AMPLIFIERS



MODEL 10581
225-400 MHZ

This line of high power amplifiers was designed specifically to fill the need for high power linear amplification to extend the communication range of existing AM transmitters. The amplifiers are also useful in Class B television or Class C FM service. The models 10333 and 10581 are suitable for use in SSB or DSB AM service where high peak powers and low IM products are required. The amplifiers are a complete package providing metering, safety features, and support circuitry. These versatile quality constructed units provide a simple and convenient means of obtaining increased power.

- Front panel dial tuning. Some models available with servo/local remote tuning.
- Individual front panel metering of plate, screen, grid and filament circuits plus input, output, forward, and reflected RF power.
- Elapsed time indicator.

PROTECTIVE DEVICES

Operator:

High voltage chassis interlocks.
High voltage points shielded for servicing.

Amplifier:

Excessive plate current trip-out relay.
Excessive screen current trip-out relay.
Screen voltage interlocked with plate voltage.
Screen and plate voltages interlocked with grid voltage.
Cooling failure trip-out.
Primary circuit breaker for short-circuit protection.
Time delay relay for filament warm-up.
Delayed blower turn-off cycle. (Blower continues running for 2 minutes after circuit breaker turns power off.)

OPTIONS

The following items are available as options on most models:

Automatic tuning
Harmonic Filters
Antenna Transfer Relay and Control
Antenna tuner
Dummy load
VSWR fault trip circuit

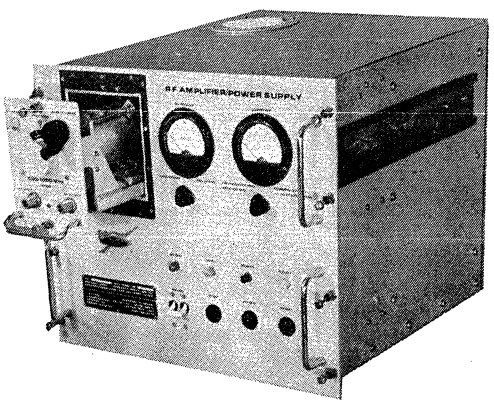
SPECIFICATIONS

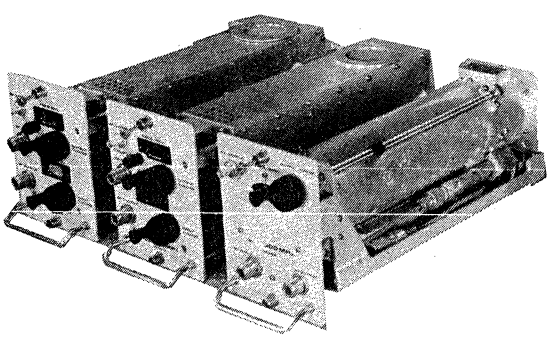
Frequency MHz	Power Out (FM)	Power Out (PEP)	Power Out CW 90% AM	Bandwidth @ 3 db	Gain	Size	Primary Power	Output VSWR	Model Number
120-160	2000 W	4000 W	1500 W	4 MHz	12 db	79″ H. x 24″ W. x 24″ D.	380 V, 3 phase, 50 Hz	1.25	10297
148-154	2000 W	4000 W	1500 W	6 MHz	10 db	61″ H. x 25″ W. x 28″ D.	208 V, 3 phase, 50 Hz	1.25	10288
148-156	2000 W	7.2 KW	2.0 KW	4 MHz	12 db	80″ H. x 24″ W. x 24″ D.	208 V, 3 phase, 60 Hz	1.25	10333
225-400	2000 W	4000 W	1400 W	4 MHz	13 db	72″ H. x 19″ W. x 24″ D.	208 V, 3 phase, 60 Hz	1.25	10581

MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

200 WATT CW AMPLIFIER
MODEL 10358
PLUG-IN—10 TO 1000 MEGAHERTZ





The 10358 is a versatile amplifier system which offers the user a high degree of flexibility. The choice of five plug-in amplifier cavities provides continuous frequency coverage from 10 MHz to 1000 MHz. The amplifier can be used to drive higher power amplifiers or as a final amplifier driven by a lower power source. The equipment is available in a commercial version or a military version under FSN 4931 - 130 - 5378.

GENERAL FEATURES AND SPECIFICATIONS

Power Output: 200 Watts (cavity 10365 100W)

Operation: Class C

Maximum Input VSWR: 2:1

Nominal Impedances: 50 ohm input and output terminated in standard type "N" connectors.

RFI: Shielded to meet MIL STD 461.

Solid State: Solid state except for amplifier tube.

Regulation: Filament, grid screen supply regulated for maximum stability.

Mounting: Designed for 19" relay rack mounting or bench top use.

Input Power Requirements: 105/125 VAC, 60 MHz.

Dimensions: $15\frac{23}{32}$" H x 19" W x 18" D.

Weight: 225 lbs. with cavity amplifier.

Cooling: Forced air.

Protective Devices:

Operator: High voltage chassis interlocks.

Amplifier: Sequential turn-on control cooling failure trip-out primary power circuit breakers.

ADDITIONAL FEATURES

- Front panel dial tuning of each plug in head.
- Front panel metering of plate and screen currents.
- Front panel metering of forward and reflected power of input and output circuits.
- Direct dial frequency read out.

19" rack mounting storage drawer available for storage of any three of the above plug-in cavities.

Size: 7" High x 19" Wide x 20" Deep.

When ordering specify storage drawer Model 10362.

Frequency MHz	Gain db	Bandwidth at 3.0 db	Plug-in Cavity Drawer Nos.
10-50	13	2.5 MHz	10359
50-200	13	2.5 MHz	10363
200-500	13	2.5 MHz	10364
500-1000	12	2.5 MHz	10365

ORDERING INFORMATION

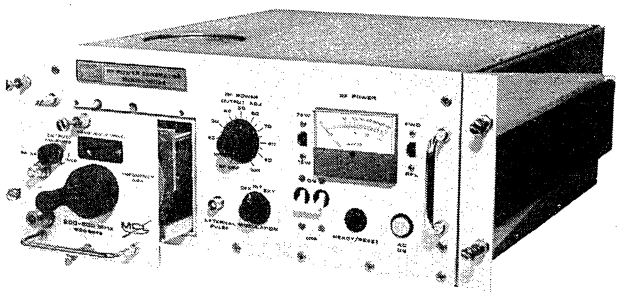
Complete amplifier system — specify model number 10358 which designates the main frame. Each head desired to be specified by model number indicated in chart ie, 10 - 50 MHz Model 10359, etc.

MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

MODEL 15022
65 WATT 10 TO 2,500 MHZ
CW SIGNAL GENERATOR

ALL UNITS STOCKED FOR IMMEDIATE SHIPMENT

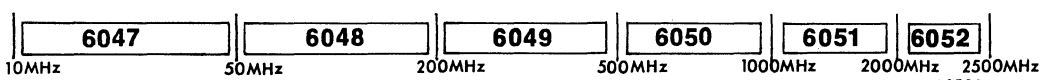


The Model 15022 is a compact high power signal generator which is completely solid state except for the long life vacuum tube used in the cavity oscillator. This highly reliable generator covers the 10 to 2500 MHz band with six plug-in cavity oscillator heads. A version which meets or exceeds MIL-STD-462 (RFI) and MIL-STD-810 (environmental) is widely used by the military in calibration laboratories and has been assigned a Federal Stock Number which is FSN 4931-152-1774 (MCL Model Number 15009).

This modern generator design provides the convenience of one knob frequency tuning which will permit frequency settings within ±1%, and front panel metering is provided to read forward or reflected power. Additional features include internal or external amplitude and pulse modulation. Optional external AM modulation is variable from 0 to 90%, 150 Hz to 10 KHz with an external source of 18 V across 16 Ohms. Amplitude level adjustment and a decoupled RF output sample port are also provided.

Regulated power supplies, conservative design, all solid-state (except oscillator) provides reliability and stability. Frequency stability of ±.003% after 10 minutes and power stability of ±.2db after one hour are minimum performance characteristics.

Plug-in cavity oscillator is protected against mismatch or loss of load. Other protection includes time delay sequenced turn-on and turn-off to insure adequate filament heating and adequate cooling at shut-down. These features make the 15022 an ideal laboratory tool.



Plug-in heads for Model 15022

DESCRIPTION

	Power Output	Model Number
10-50 MHz plug-in Oscillator	65 watts	6047
50-200 MHz plug-in Oscillator	65 watts	6048
200-500 MHz plug-in Oscillator	65 watts	6049
500-1000 MHz plug-in Oscillator	65 watts	6050
1000-2000 MHz plug-in Oscillator	40 watts	6051
2000-2500 MHz plug-in Oscillator	25 watts	6052

GENERAL SPECIFICATIONS

• Weight	Less than 50 pounds, without plug-in head.
• Dimensions	16½" W. x 7" H. x 18" D. (19" W. with panel adaptors)
• Output Impedance	50 ohms
• Primary Power	115 volts ±10%, 5 amps, 50/60 Hz
• Spurious Output	>30 db down
• RF Sample Output	−30 db down

ACCESSORIES

Rack mount storage drawer which accommodates three plug-in heads. Specify storage drawer model #15026.

Need rack and slide mounting?? Please **specify!** All units are shipped **without** 19" panel adaptors and slides unless specified.

ORDERING INFORMATION

Models #15022 indicates mainframe (generator less plug-in head). Please specify model number according to frequency range. Example: 15022-6047 (10-50 MHz).

MCL INC LA GRANGE ILL

CAPABILITIES/APPLICATION

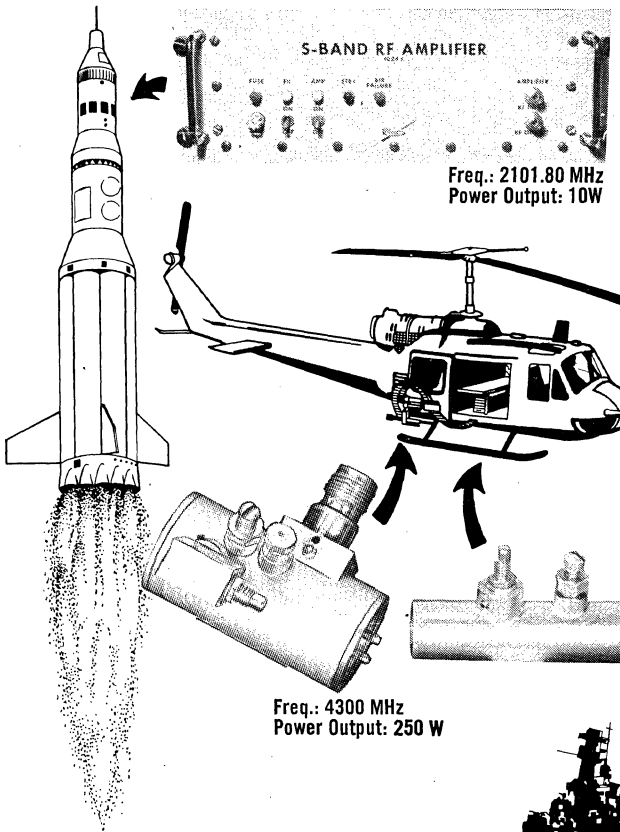
CAPABILITIES

MCL has been in the business of providing microwave cavities and high power amplifier systems to the electronics industry for over a decade. In an effort to prevent dilution of technical strength, the company has limited its product lines to cavities, cavity related systems and R.F. accessories. This intense concentration in a limited area has created a pool of technical excellence without peer.

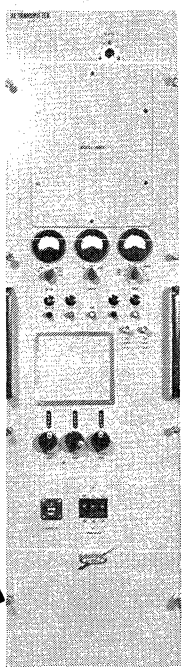
The competence and imagination of MCL engineering has been tested repeatedly by the electronic industry, and MCL has successfully answered the call, delivering in excess of 400 different cavity designs and over 300 unique systems and subsystems.

MCL products are in use throughout the world performing a myriad of tasks that stagger the imagination. MCL cavities are used to provide pin-point accuracy for offshore drilling operations, to test the electromagnetic susceptibility of heart pacemakers, to maintain control of weather satellites, to determine the altitude of commercial and military aircraft, and many other operations. Our equipment has been used to communicate with the Apollo capsule and will be used on the Sky Lab program. Some of our equipment has gone into space on unmanned space probes. Be it satellite, ground, ship or shore, plane, helicopter, or missile MCL has built an equipment to operate in the environment. We cover the field from cavities three inches long delivering 10 milliwatts to cavities four feet long delivering 100 plus kilowatts.

This experience can be applied **to your** microwave requirements by considering MCL a part of your design/development team.

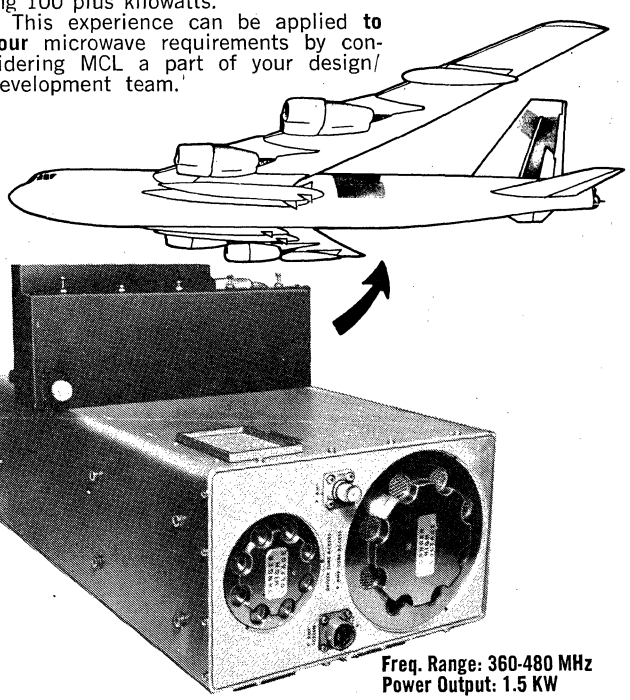


Freq.: 2101.80 MHz
Power Output: 10W

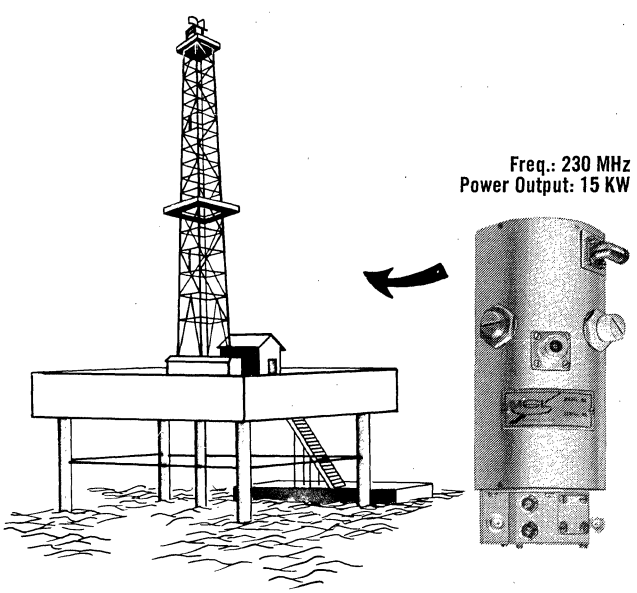


Freq.: 960 - 1200 MHz
Power Output: 10 KW

Freq.: 4300 MHz
Power Output: 250 W



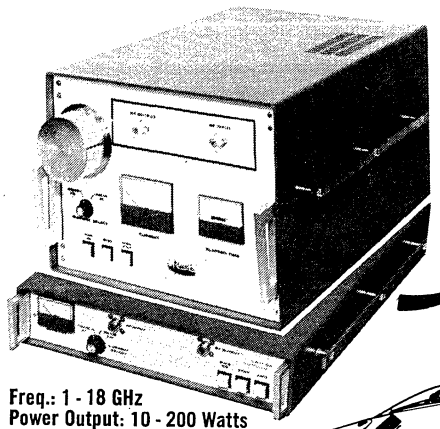
Freq. Range: 360-480 MHz
Power Output: 1.5 KW



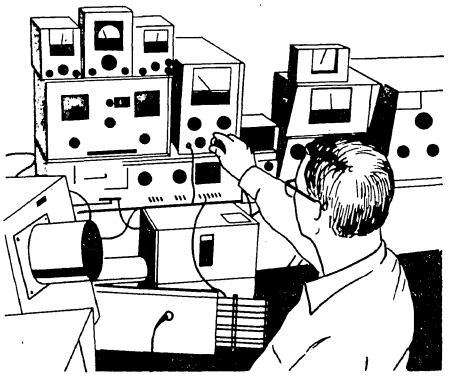
Freq.: 230 MHz
Power Output: 15 KW

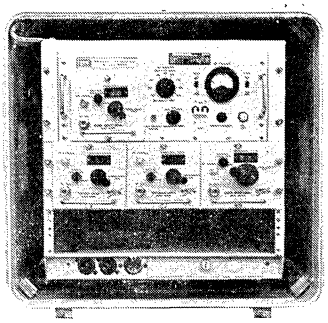
MCL INC LA GRANGE ILL

CAPABILITIES/APPLICATION

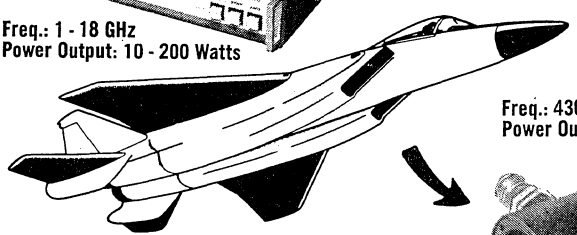


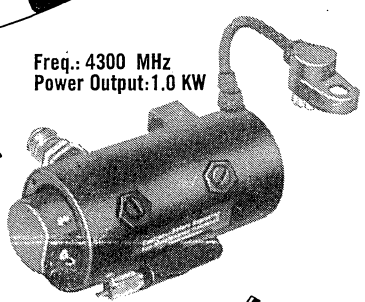
Freq.: 1 - 18 GHz
Power Output: 10 - 200 Watts



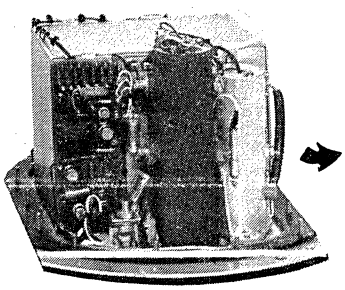


Freq. 10 - 2500 MHz
Power Output: 15 - 65 Watts

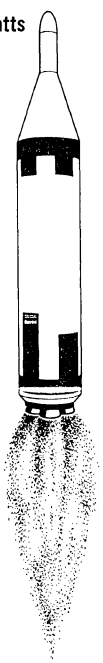


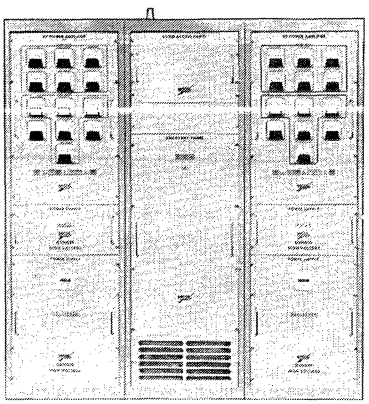


Freq.: 4300 MHz
Power Output:1.0 KW

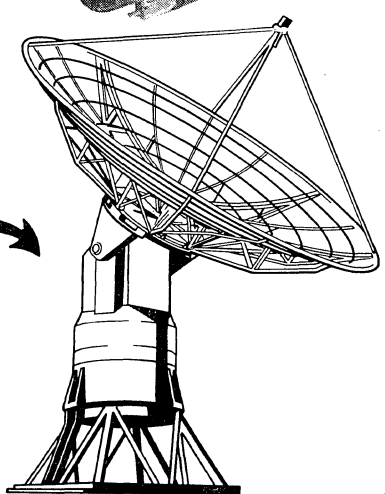


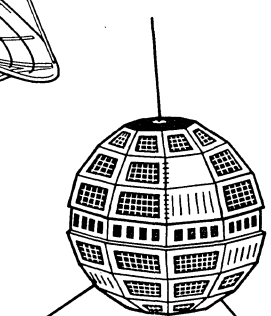
Freq.: S Band
Power Output: 2.3 KW

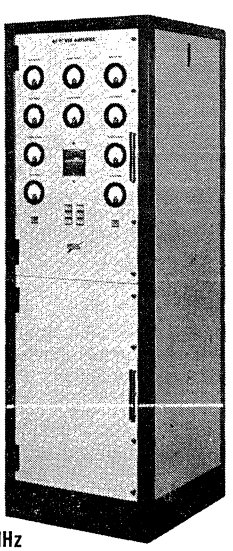


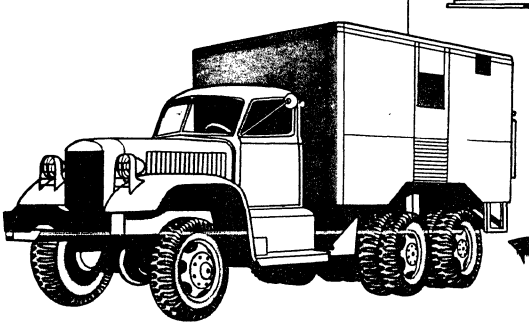


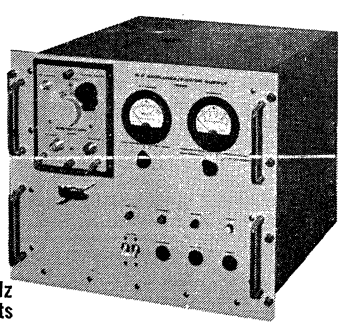
Freq.: 375 MHz — Power Output: 1.0 KW











Freq.: 10 - 1000 MHz
Power Output: 200 Watts

Freq.: 148 - 154 MHz
Power Output: 2 KW

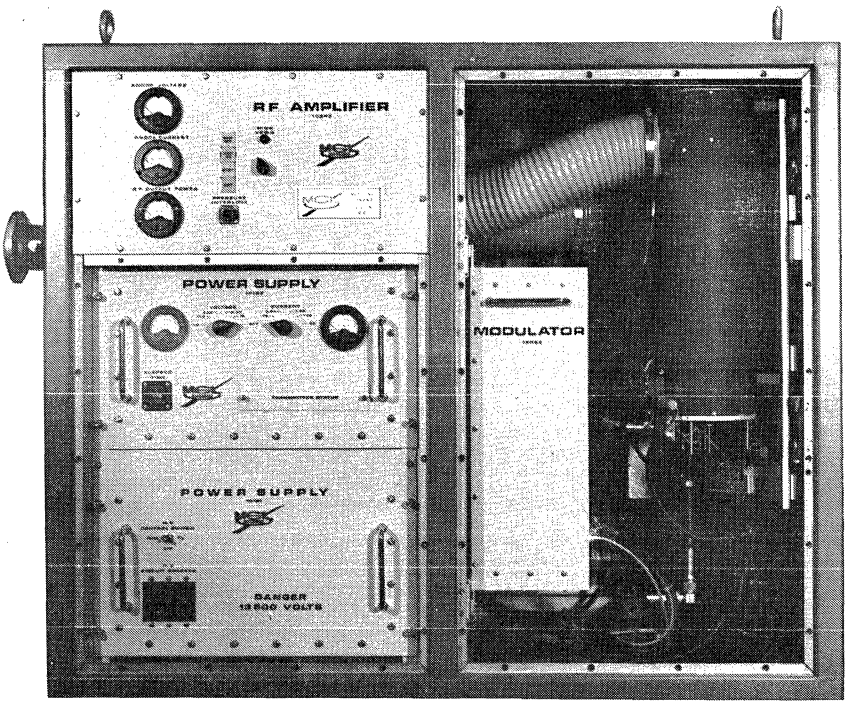
MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

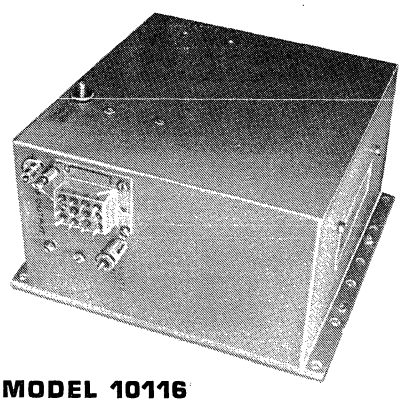
PULSE SYSTEMS

MCL has designed a number of high power pulse systems for special applications. The systems listed are but a few of the many designed and have been selected since they typify the broad capability of MCL. These equipments are complete assemblies and include the necessary power supplies, protective circuits and control circuitry to provide turn-key operation. The applications vary from ground and airborne radar to laboratory test instrumentation.

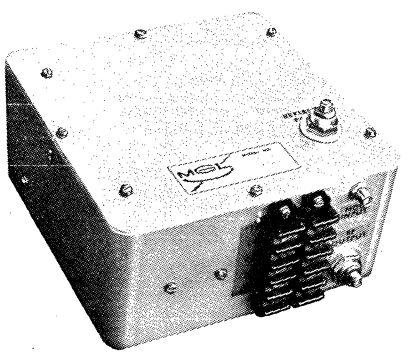
The capability and expertise represented by this array of systems are available to solve your system problems.



MODEL 10343 (WITH PANELS REMOVED)
146M HZ



MODEL 10116
2300-2450 MHZ



MODEL 10109
1010-1050 MHZ

PULSE SYSTEMS SPECIFICATIONS

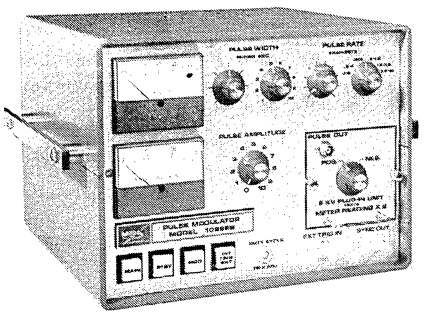
Frequency	Power Out	Gain	Bandwidth @ 3 db	Duty Cycle	Pulse Width in μSec.	Input Requirements	Dimensions	Model
120-400	2 KW	23 db	4.5 MHz	.025	1	115 VAC, 60 Hz	32″ H. x 19″ W. x 25″ L.	10224
145-154	50 KW	—	—	.0015	2-5	115 VAC, 60 Hz	42″ H. x 52″ W. x 30″ L.	10258
146	100 KW	—	6.5 MHz	.005	.25	115 VAC, 3 phase, 400 Hz	40″ H. x 46″ W. x 32″ L.	10343
150-160	125 KW	—	—	.0028	4-7	208 VAC, 3 phase, 60 Hz	68″ H. x 29″ W. x 28″ L.	10275
216	30 KW	—	3 MHz	.001	10	115 VAC, 60 Hz	32″ H. x 19″ W. x 25″ L.	10264
476	10 KW	—	—	.00087	14	115 VAC, 60 Hz	21″ H. x 19″ W. x 26″ L.	10315
500	15 KW	46 db	150 MHz	.003	1.5	208 VAC, 3 phase, 400 Hz	AMP. 23″ H. x 22″ W. x 27″ L. P/S 11″ H. x 22″ W. x 27″ L.	10292
1010-1050	1 KW	—	—	.005	.5	24 VDC @ 5.5 A. Trig: +3.5 V into 72 ohms	4″ H. x 6″ W. x 7″ L.	10109
2300-2450	350 W	—	—	.0146	28	24 VDC Trig: 4.0 V into 680 ohms	5¼″ H. x 6″ W. x 6½″ L.	10116

MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

SERIES 10299C HIGH POWER PULSE MODULATORS

ALL UNITS STOCKED FOR IMMEDIATE SHIPMENT



FEATURES AND SPECIFICATIONS

- Output pulse polarity: positive or negative.
- Internal or external triggering. (External: +2.0 V into 75 ohms.)
- Input power: 115 VAC, 50/60 Hz @ 300 watts.
- Conservative dimensions: 14" L x 8½" H x 11" W, permit ready usage on lab bench or in crowded areas.
- Built-in, floating, 6.3 VAC, 3.0 ampere filament supply for external tubes and tube cavity combinations.
- Weight: 35 pounds, approx.

Adjustable Output Voltages	Peak Output Current	Rise Time	Fall Time	Droop @ 10 μsec Pulse Width	Overshoot at Full Rated Output
0-1.5 KV	6.0 amp.	170 NS	200 NS	8.0%	12%
0-3.0 KV	3.0 amp.	170 NS	200 NS	8.0%	10%
0-6.0 KV	1.5 amp.	400 NS	400 NS	8.0%	8.0%

(See ordering information for plug-in output voltage module numbers.)

** **Application Engineering Note:** Rise and fall times, overshoot, maximum pulse widths and output impedance parameters are necessarily interrelated; therefore, they may be combined in various values for specific applications. Example: Output rise times of < 100 nanoseconds are available on special order. Likewise, we can furnish modulators with other output voltages and currents at average power levels to 100 watts. We invite you to discuss your requirements with your MCL sales engineer or write to the factory.

- Peak output voltage readout accuracy to 2.0% of full scale, from 100 pulses per second up.
- Pulse repetition rate: adjustable, 100 Hz to 10 kHz, via front panel step switch and vernier control.
- Pulse width: adjustable, 0.5 to 10 microseconds, via front panel step switch and vernier control. Switch accuracy, 2.0%.

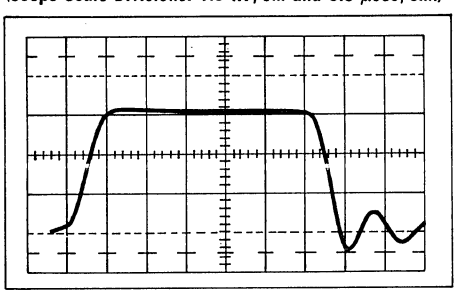
Designed to fulfill the diversified and sophisticated demands of contemporary test equipment users, this unit embodies many "look ahead" features:

- Selection of three standard voltage ranges and accompanying sets of parameters:**
- Duty cycle readout: .001 to .01, with 2.0% accuracy.
- Overload cut-off: adjustable from .001 to .01, via front panel. Protects external equipment from damage.

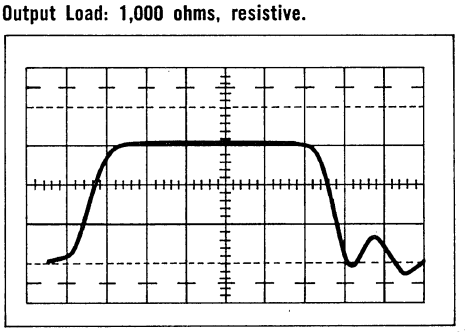
This versatile instrument offers virtually unlimited usage in laboratory or field. It is designed as a companion unit to MCL's popular Series "E" pulsed oscillators. Also interfaces readily with other plate pulsed oscillator cavities, beacon type magnetrons, experimental laser circuitry and low power microwave tubes.

TYPICAL OUTPUT WAVEFORMS

(Scope Scale Divisions: 1.0 KV/cm and 0.5 μsec/cm.)



Output Load: 1,000 ohms, resistive.



Output Load: 1,000 ohms, paralleled by 100 Pf capacitor.

Note: Series 10299C pulse modulators are available as integral units with MCL Series "E" RF Power Oscillator test instruments.

HOW TO ORDER

Output voltage ranges are covered by plug-in modules as follows:

Range	No.
1.5 KV @ 6.0 amperes, peak	**16072**
3.0 KV @ 3.0 amperes, peak	**16073**
6.0 KV @ 1.5 amperes, peak	**16074**

Modulator purchase price includes choice of one of these modules.

Ordering example: Specify "Model 10299C pulse modulator with #16072 plug-in output voltage module." (Covers 0 - 1.5 KV range @ 6.0 amperes, peak.)

MCL INC LA GRANGE ILL

MICROWAVE SYSTEMS

MODEL 10461 PULSE GENERATOR

FIVE KILOWATT PULSE GENERATOR

The Model 10461 Pulse Generator is continuously tunable from 900 to 1220 MHz which is the Tacan Band. The generator is extremely useful as a Tacan test set. Peak power output is five kilowatts at .01 duty cycle. Pulse width and pulse repetition rates are adjustable.

The instrument is complete with power supplies, grid pulse modulator, cavity oscillator, cooling, output circulator, and protective circuitry.

The power output is adjustable from 50 watts to 5.0 kilowatts. A three digit numerical read-out with calibration chart provides accurate frequency setting.

The 10461 is a solid state instrument except for the planar triode oscillator. An output circulator is provided to minimize frequency pulling and power variations due to load mismatch; operation into open or short circuit conditions will not damage the equipment.

*Please specify voltage desired.

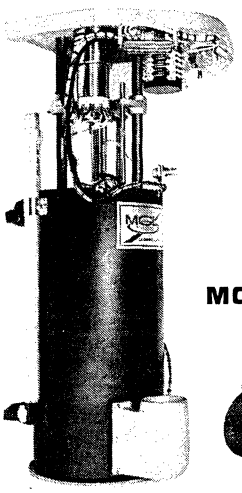
SPECIFICATIONS

Frequency:	900-1220 MHz tunable	Weight:	85 pounds
Power Output:	50 W - 5.0 KW adjustable	Primary Power:	110 or 220 volts* (unregulated) 50-60 Hz
Duty Cycle:	.01 maximum	Frequency Stability:	0.1%/hour after 15 minutes operation
Pulse Width:	0.5 - 10.0 microseconds adjustable	Power Stability:	0.02%/10 minutes after 1 hour operation
Pulse Repetition Rate:	10 - 4000 Hz adjustable	Sync Output:	±4 volts at 50 ohms
Pulse Rise Time:	50 nanoseconds maximum	Trigger Input:	+4 volts. High impedance
Pulse Fall Time:	100 nanoseconds maximum	Pulse Droop:	<5.0%
Maximum Load VSWR:	Open or short circuit (circulator protected)		
Dimensions:	19″ rack panel, 10½″ high x 20¼″ deep		

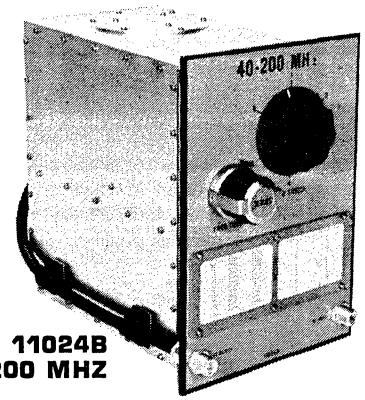
MCL INC LA GRANGE ILL

MICROWAVE CAVITIES

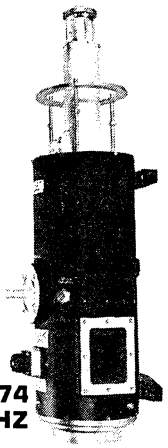
CW AMPLIFIERS



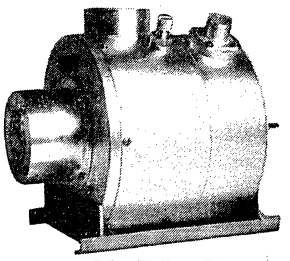
MODEL 11010
225-400 MHZ



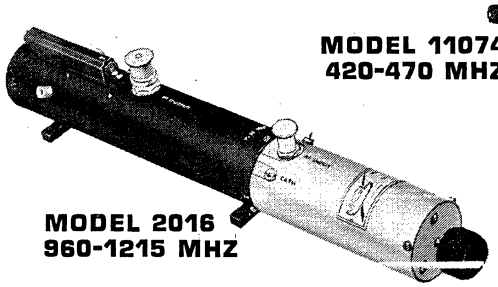
MODEL 11024B
40-200 MHZ



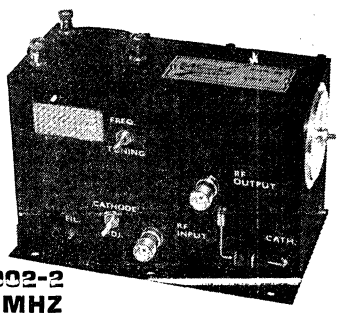
MODEL 11074
420-470 MHZ



MODEL 11056
374-376 MHZ



MODEL 2016
960-1215 MHZ



MODEL 2002-2
225-250 MHZ

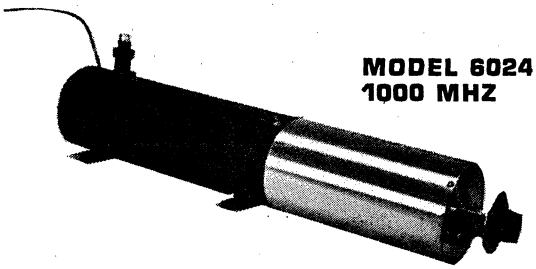
Freq. in MHz	Power Output	Gain	Bandwidth	Dimensions	Model
30/150	40 W	13 db	3.0 MHz	7¼" H. x 11¼" W. x 13¼" L.	2052
40/200	100 W	13 db Min.	1.5 MHz	11¼" H. x 7½" W. x 15" L.	11024
150/300	40 W	13 db	3.0 MHz	4" dia. x 32½" L.	2051
225/250	25 W	12 db Min.	3 MHz	4⅝" H. x 6¼" L. x 3¾" W.	2002-2
225/400	2 KW	13 db	4 MHz	11¾" H. x 18½" L. x 10" W.	11097
225/400	1 KW	10 db	3 MHz	8¼" H. x 19¾" L. x 8¼" W.	11099
225/400	120 W	13 db	4 MHz	8⅞" H. x 20⅜" L. x 9$\frac{7}{32}$" W.	11010
280/315	25 W	11 db	3 MHz	3¾" H. x 4⅝" L. x 3½" W.	2002-4
360/480	1.5 KW	10 db	6.0 MHz	6" dia. x 21" L.	11030
360/480	120 W, Min.	13 db	6.0 MHz	3¾" dia. x 15¾" L.	11029
374/376	1.4 KW	13 db	10 MHz	6" dia. x 15⅝" L.	11057
374/376	60 W	13 db	8.0 MHz	6" dia. x 10$\frac{3}{16}$" L.	11056
420/470	2.5 KW	13 db	3.0 MHz	6" dia. x 27½" L.	11074
500/560	25 W	10 db	6 MHz	2" H. x 9" L. x 5⅝" W.	2002-9
560/630	25 W	11 db	6 MHz	2" H. x 8¾" L. x 2⅝" W.	2002-10
630/710	25 W	11 db	6 MHz	2" H. x 7¾" L. x 2⅝" W.	2002-11
710/800	25 W	10 db	3 MHz	2¼" H. x 7½" L. x 3" W.	2002-12
800/900	25 W/CW	12 db	4 MHz	2¼" H. x 7½" L. x 3" W.	2002-13
900/1000	22 W, CW	10 db	3 MHz	2⅛" H. x 11⅛" L. x 3½" W.	2002-14
960/1215	20 W	12 db	4.0 MHz	2¼" dia. x 17⅜" L.	2016A
960/1000	100 W	10 db	2.5 MHz	2¼" dia. x 16¼" L.	2043
1260/1420	25 W	9 db	3 MHz	2$\frac{5}{16}$" H. x 8⅛" L. x 2¾" W.	2002-17
1260/1540	25 W, CW Min.	9.2 db Min.	10 MHz Min.	2$\frac{3}{16}$" H. x 4½" L. x 2¼" W.	3051
1650	30 W	10 db	10 MHz Min.	2¼" H. x 4¼" L. x 2⅜" W.	2063
1650	125 W, CW	10 db	8 MHz Min.	3" H. x 5" L. x 2¼" W.	2065
1650	250 W	10 db	8 MHz	2$\frac{15}{16}$" H. x 7$\frac{3}{32}$" L. x 2$\frac{15}{16}$" W.	2062
2000	20 W	10 db	30 MHz	5" H. x 4½" W. x 8½" L.	3028
2000	50 W	7.0 db	3.0 MHz	4½" H. x 3" W. x 8" L.	2047
2101.8	15 W	11 db Min.	15 MHz	5½" H. x 3½" W. x 8¾" L.	3020
2106	10 W	7.0 db	10 MHz	3¼" H. x 4⅞" W. x 7" L.	3006B
2125/2350	1.0 W	10 db	3.5 MHz	1½" dia. x 5½" L.	2014A
2200/2300	85 W	9.0 db Min.	10 MHz	2⅜" dia. x 3¾" L.	3018
2282.5	50 MW	10 db	15 MHz	1½" H. x 3⅞" W. x 4⅛" L.	1010
2250	22 W	9.0 db Min.	4.0 MHz	2⅜" H. x 6" W. x 4" L.	3040
2846/2866	500 W	9 db	26 MHz	2⅜" H. x 6" W. x 7" L.	3005

MCL INC LA GRANGE ILL

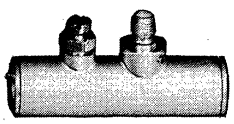
MICROWAVE CAVITIES

CW OSCILLATORS

The CW Oscillator cavities designed by MCL cover a very wide range of frequencies, power levels and applications, and have been used by OEM in industrial and military applications ranging from oil exploration to aircraft altimeters. The listings below though not complete, typify the broad expanse of MCL's experience in CW Oscillator design and manufacture. If your exact requirements cannot be met using a listed cavity, call us for assistance.



MODEL 6024
1000 MHZ

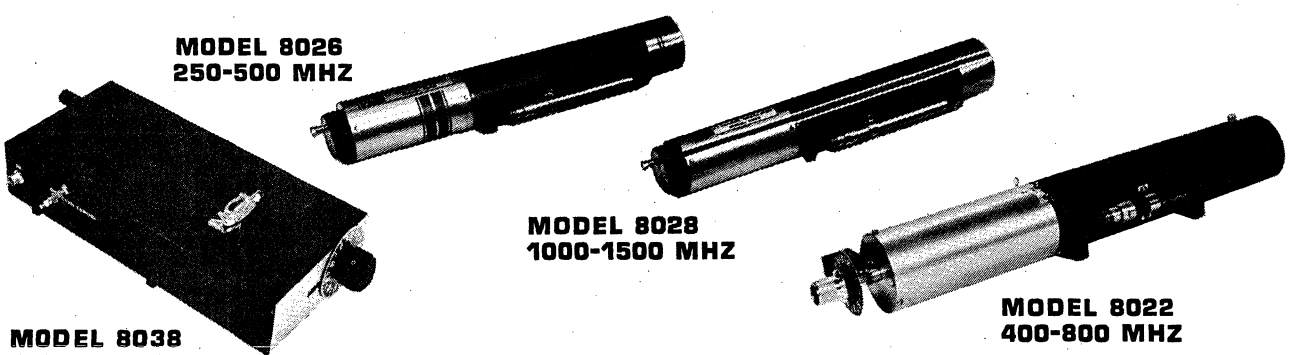


MODEL 9015
4300 MHZ

SPECIFICATIONS

Frequency in MHz	Power Output	Dimensions	Model
400/500	1.5 W	1⅞" W. x 2 1/16" H. x 8 1/16" L.	6002-7
800/900	40 W	3" W. x 2" H. x 6" L.	6003-13
10000	20 W	3¼" H. x 2 3/16" W. x 5⅞" L.	6024
4300	2.0 MW, Min.	⅝" dia. x 2⅝" L.	9015
4300	5.0 MW	1 1/16" dia. x 2⅞" L.	7200
5250/6050	5.0 MW, Min.	⅝" dia. x 3" L.	7014

EXTENDED RANGE PULSE CAVITIES



MODEL 8026
250-500 MHZ

MODEL 8028
1000-1500 MHZ

MODEL 8022
400-800 MHZ

MODEL 8038
150-300 MHZ

Coverage: 150 to 4000 MHz (VHF, P. L. S. and C Bands) Extended tuning ranges combined with overall frequency coverage and power output make these cavities readily applicable to a broad variety of industrial, military and scientific requirements.

Frequency Range MHz	Minimum Power Output KW	Dimensions	Model Number
150-300 (VHF Band)	1.5	2 5/16" H. x 6" W. x 12½" L.	8038
200-400 (P Band)	1.5	3" dia. x 22" L.	8021
250-500 (P Band)	1.5	3" dia. x 22" L.	8026
300-600 (L Band)	1.5	3" dia. x 22" L.	8018
400-800 (L Band)	1.5	3" dia. x 17" L.	8022
500-1000 (L Band)	1.5	3" dia. x 17" L.	8024
600-1200 (L Band)	1.0	2¼" dia. x 15" L.	8019
1000-1500 (L Band)	1.0	3" dia. x 22" L.	8028
1450-2000 (S Band)	1.0	3" dia. x 19½" L.	8029
2000-3000 (S Band)	1.0	2¼" dia. x 17¾" L.	8027
3000-4000 (C Band)	1.0	2¼" dia. x 11" L.	8030

APPLICATIONS

- RF Pulse Signal Source
- Test Equipment
- Component Breakdown Testing
- Systems Components
- Radar Beacon Simulator

FEATURES

- Digital Readout
- Single Knob Tuning
- Forced air cooling not required
- Ease of Tube Replacement
- Output impedance: 50 ohms, nom.

DUTY CYCLE: .001 **PULSE WIDTH:** 1.0 μsec

MODULATOR REQUIREMENTS: 3.0 KV @ 2.5 amperes. Internal impedance: 600 ohms. (See Series 10299C Pulse Modulators.

POWER VARIATION: 2.0 db, max.

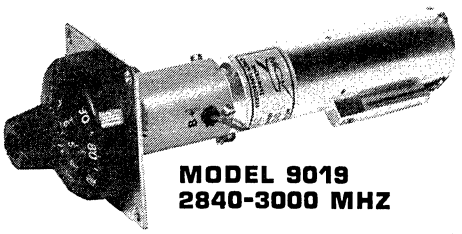
ANODE TO GROUND CAPACITANCE: 150 Pf, nom.

MCL INC LA GRANGE ILL

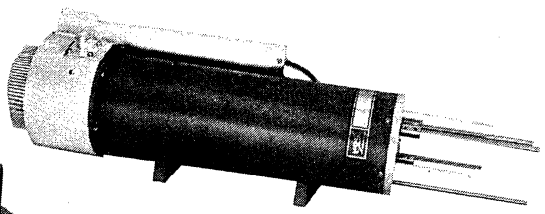
MICROWAVE CAVITIES

PULSE OSCILLATORS

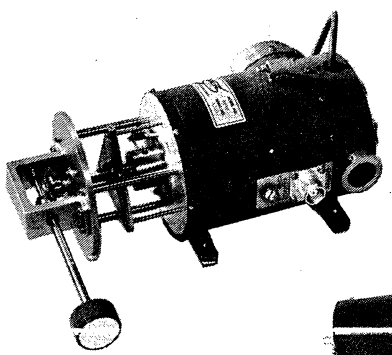
The pulse oscillator cavity line demonstrates with dramatic clarity the wide range of MCL's design expertise. These units cover a wide range of output powers, frequencies, pulsewidths and duty cycles. The listed models are MCL standards, produced to satisfy the demanding needs of the original equipment manufacturer engaged in producing industrial or military equipment. These reliable, rugged cavities have been used in missiles, helicopters, ships and mobile applications. If your cavity needs are not listed here, minor modifications to existing units or custom design by MCL could make your requirements a reality.



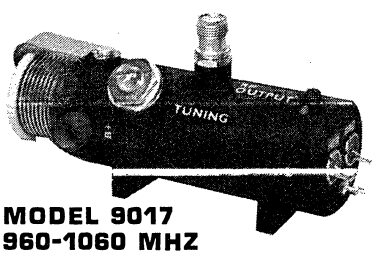
MODEL 9019
2840-3000 MHZ



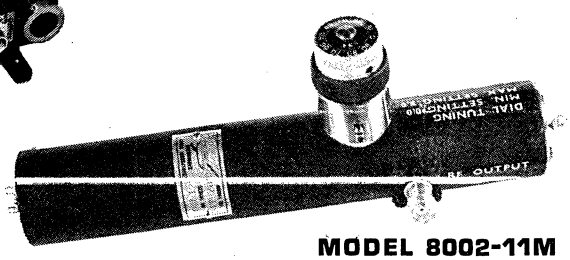
MODEL 6057
500-1000 MHZ



MODEL 9048
415-475 MHZ



MODEL 9017
960-1060 MHZ



MODEL 8002-11M
630-710 MHZ

SPECIFICATIONS

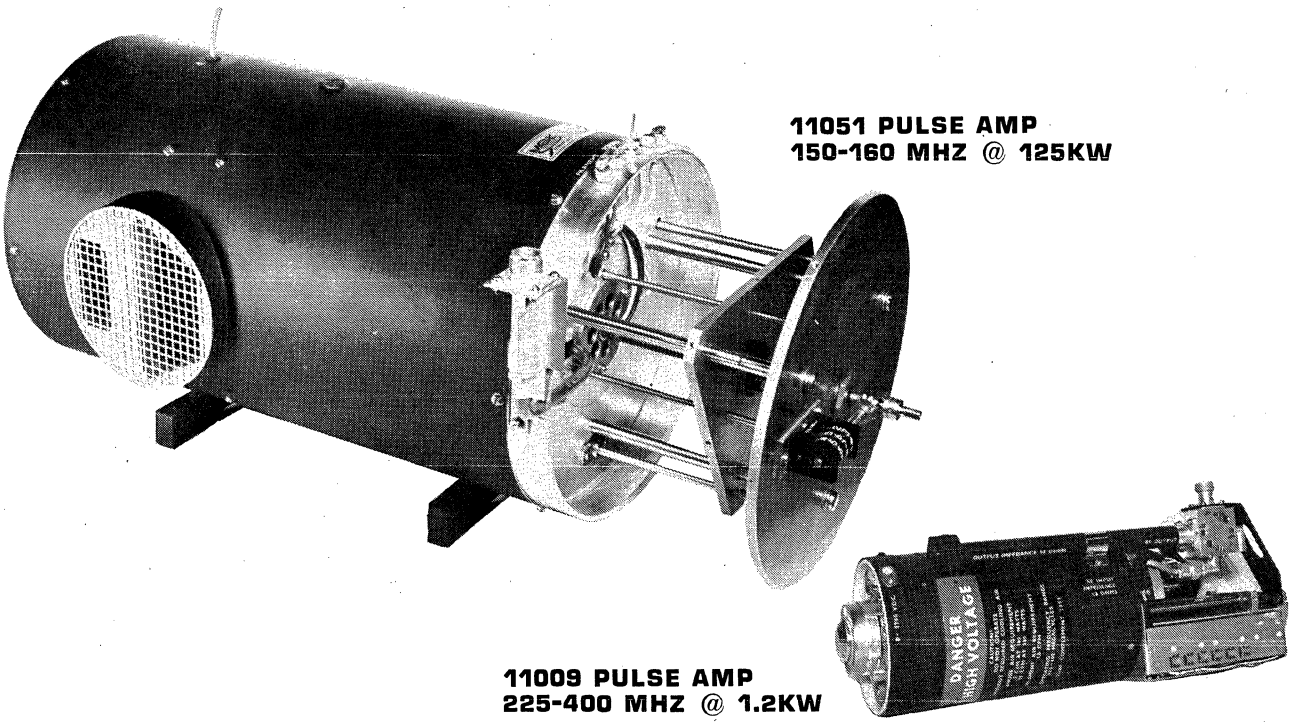
Freq. in MHz	Power Output	Duty Cycle	Pulse-Width	Dimensions	Model
150/160	25 KW	.005	5 μSec	6" dia. x 24¼" L.	11050
230	2.5 KW	.001	1 μSec	3¼" dia. x 8" L.	8035
415/475	20 KW	.001	1 μSec	6¼" W. x 7" H. x 12" L.	9048
450/500	1.5 KW	.001	1 μSec	2 7/16" H. x 1⅝" W. x 8 9/16" L.	8002-8
500/1000	50 KW	.003	6 μSec	6½" H. x 5¼" W. x 18" L.	6057
630/710	2 KW	.001	1 μSec	3" W. x 3" H. x 9" L.	8002-11M
900	20 W	.001	1.5 μSec	2⅛" H. x 1" W. x 2" L.	8063
900/1050	1.0 KW	.01	.5 μSec	1¾" H. x 1¾" W. x 4¾" L.	8041
960/1060	2.5 KW	.0006	1 μSec	1½" dia. x 5½" L.	9017
990/1010	3250 W	.0006	1 μSec	4⅝" L. x 2 5/16" H. x 1 9/16" W.	9010B
1090	150 W	.01	45 μSec	⅞" dia. x 4⅜" L.	8042
1260/1420	15 W	.001	1 μSec	2¼" H. x 3 1/16" L. x 2" W.	8000-17
1420/1600	1.5 KW	.003	1 μSec	8 15/16" L. x 2⅜" W. x 4¼" H.	8003-18
1500	1.0 KW	.001	1 μSec	20⅜" H. x 3" W. x 8⅛" L.	8044
2300/2450	1.0 KW	.015	28 μSec	1½" dia. x 4¼" L.	8043B
2400	500 W	.001	1.5 μSec	2" H. x 2 7/16" W. x 4 9/16" L.	8075
2700	20 W	.001	1.5 μSec	2⅛" H. x 9/16" W. x 2" L.	8064
2840/3000	10 W	.00125	1 μSec	1" dia. x 6½" L.	9019
2840/3180	10 W	.00125 Max.	1 μSec	2" H. x 6 3/16" L. x 2" W.	9012
3380/4000	2 KW	.005	.3 μSec	3¼" L. x 1¼" dia.	9057
3500/3520	2 KW	.005	.3 μSec	3¼" L. x 1¼" dia.	9058
3575/3635	500 W	.005	250 μSec	1⅜" dia. x 3⅛" L.	9021
4275/4325	100 W	.001	100 nSec	1" dia. x 3" L.	9202
4300	1.0 KW	.00029 Max.	100 nSec	1⅜" dia. x 3½" L.	9009
4300	250 W Max.	.0015	100 nSec	1" dia. x 2⅜" L.	9018
4820/5220	10 W	.00125 Max.	1 μSec	1" dia. x 6 3/16" L.	9013
5000	20 W	.001	1.5 μSec	2⅛" H. x 1" W. x 4" L.	8065
5000	20 W, Peak	.001	1 μSec	¾" dia. x 2½" L.	9014
5300/5500	15 W, Min.	.0016	100 nSec	⅝" dia. x 3" L.	9022B
8500	20 W, Peak, Min.	.001	1.5 μSec	2⅛" H. x 1 1/16" W. x 2 7/16" L.	8066

MCL INC LA GRANGE ILL

MICROWAVE CAVITIES

PULSE AMPLIFIERS

A broad line of pulse amplifiers are available ranging from 100 MHz up to 2500 MHz with power outputs at 100 watts thru 125 KW typically depicted by the 11009 and 11051. These cavities have been used in a wide variety of applications ranging from search radar to navigational aids and could be readily extended to meet your microwave equipment requirements.



11051 PULSE AMP
150-160 MHZ @ 125KW

11009 PULSE AMP
225-400 MHZ @ 1.2KW

Freq. in MHz	Power Output	Gain	Bandwidth	Dimensions	Model
100/200	10 KW	8 db	4 MHz	12½" L. x 29 1/16" H. x 14" L.	11087
150/160	125 KW	5.0 db	10 MHz	9⅝" dia. x 24¼" L.	11051
180/220	2.5 KW	8 db	5 MHz	3½" H. x 5 23/32" L. x 4⅜" W.	3058
200/400	10 KW	8 db	4 MHz	11⅛" L. x 28¾" H. x 9" W.	11088
216	3.0 KW	10 db	4.0 MHz	5¼" H. x 4¾" W. x 3¾" L.	3031
216	300 W	10 db	4.0 MHz	5¼" H. x 4¾" W. x 3¾" L.	3029
225/400	1.2 KW	12 db	35 MHz	4¾" dia. x 15" L.	11009
400/800	10 KW	8 db	6 MHz	28¾" H. x 8¼" L. x 9¾" W.	11089
420	5.0 KW	10 db	20 MHz	2⅞" H. x 10" W. x 5" L.	3021
420	200 W	23 db	20 MHz	3¾" H. x 8 " W. x 7¼" L.	3022
425	400 W	27 db	50 MHz	3½" H. x 12¼" W. x 7¾" L.	3014
430.5	8.0 W	7.0 db	33 MHz	6" dia. x 7½" L.	11033
470	2.0 KW	19 db	100 MHz	4¾" H. x 9½" W. x 15⅞" L.	3045
476	250 W	12 db	8.0 MHz	2⅛" dia. x 10" L.	3023
512	2.5 KW	20 db	75 MHz	19¼" L. x 8¾" W. x 3¼" H.	3044B
512	10 KW	6.0 db	75 MHz	17½" L. x 7⅛" H. x 6" dia.	11067
550/1212	100 W	10 db	3.0 MHz	1½" dia. x 8½" L.	2045
600/700	.55 KW	11 db Min.	3.0 MHz	2" H. x 3" W. x 8½" L.	2044
700/800	15 KW	10 db	5.0 MHz	6" dia. x 20" L.	11031
800/1000	10 KW	8 db	8 MHz	28¾" H. x 13" L. x 10" W.	11090
1000	2.0 KW Min.	9.0 db	12 MHz	3⅜" H. x 7⅝" W. x 5½" L.	2023A
1025/1150	1.5 KW	7.0 db	120 MHz	2¼" dia. x 6" L.	3042
1025/1350	10 KW Peak	6.0 db	6.0 MHz	3½" dia. x 13" L.	11011
1434/1487	63 W, CW	10 db	15 MHz at 1 db	2" H. x 2¼" W. x 5⅜" L.	3057
1545	2.0 KW	13 db	20 MHz	3½" H. x 3½" W. x 6" L	3047
1545	100 W	23 db	20 MHz	3" H. x 3½" W. x 6" L.	3046
2300/2450	2.5 KW	8 db	5 MHz	3 3/16" H. x 5⅛" L. x 1½" W.	3059

SCIENTIFIC COMMUNICATIONS INCORPORATED

PARAMETRIC AMPLIFIERS ■ TRANSISTOR AMPLIFIERS ■ SURVEILLANCE RECEIVERS

TRANSISTOR AMPLIFIERS

GENERAL PURPOSE SERIES

30 to 1200 MHz

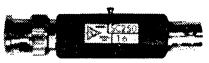
DESCRIPTION: The SC series is an exceptional line of low noise broadband solid state amplifiers offering high performance at a moderate price. These amplifiers utilize hybrid manufacturing processes to provide high reliability in a miniature package. Their small size and weight and rugged construction make them ideally suited for stringent operational requirements.

ELECTRICAL SPECIFICATIONS:

Model	Frequency Response MHz	Noise Figure dB max	Noise Figure dB typ	Gain dB min	Gain Flatness ±dB	Power Output (1 dB comp.) dBM min	VSWR in/out	DC Pwr v	DC Pwr ma	Standard Package
SC330	30-300	4	3	23	.5	−3	2.0:1	−15	15	B
SC240	20-400	5	4	20	1.0	−3	2.0:1	−15	15	B
SC550	50-500	4	3	20	.75	−3	2.0:1	−15	15	B
SC250	20-500	4	3	20	1.0	−3	2.0:1	−15	15	B
SC250M	20-500	4	3	40	1.0	−3	2.0:1	−15	30	B*
SC204	200-400	5	4	20	.5	−3	2.0:1	−15	15	B
SC255	250-500	4	3	20	.5	−3	2.0:1	−15	15	B
SC306	300-600	4	3	20	.5	+3	2.0:1	−18	50	A or B
SC408	400-800	5	4	20	.5	+3	2.0:1	−18	50	A or B
SC501	500-1000	5	4	20	.5	+3	2.0:1	−18	50	A or C
SC612	600-1200	6	5	20	1.0	+3	2.0:1	−18	50	A or C
SC2001	20-1000	5	4	18	1.0	+3	2.0:1	−18	50	A or C
SC2012	20-1200	6	4	18	1.5	+3	2.0:1	−18	50	A or C
SC2012M	20-1200	6	4	35	1.5	+3	2.0:1	−18	90	C*

* Package .70 inch longer than standard.

A.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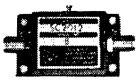
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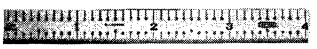


Operation from −54 to 71° C
Positive Bias Option add $25

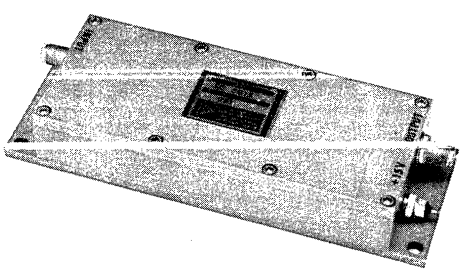
TELEMETRY AND COMMUNICATIONS SERIES

.95 to 4.2 GHz

This Series of microwave transistor amplifiers is designed for optimum performance in the commonly used communication and telemetry bands. Special emphasis is placed on the gain and noise characteristics. The amplifiers provide low noise amplification with high reliability under adverse operating conditions.

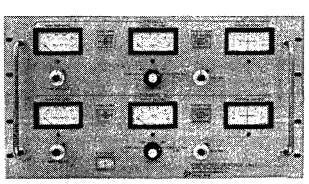
ELECTRICAL SPECIFICATIONS:

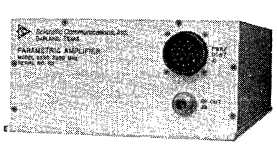
Model	Frequency Response (MHz)	Noise Figure Max.	Noise Figure Typ.	Gain (dB) min.	Gain Flatness ±dB	Power Output -1dB Comp. dBM. min.	Typical Intercept Point dBm	VSWR 50 ohms max. IN	VSWR 50 ohms max. OUT	DC Power
SC-3007	950-1250	3.5	3.0	20	.5	+ 7	+19	2.0	2.0	+15V
SC-3001	1200-1400	4	3	20	.5	+ 7	+19	2.0	2.0	+15V
SC-3005	1400-1700	4.5	3.5	20	.5	+ 7	+19	2.0	2.0	+15V
SC-3008	1435-1540	4	3	20	.5	+10	+23	2.0	2.0	+15V
SC-3004	1700-2300	4.5	4.0	18	1.0	+ 7	+19	2.0	2.0	+15V
SC-3002	2200-2300	4.5	4	18	.5	+ 7	+20	2.0	2.0	+15V
SC-3015	2200-2300	4.5	4	25	.5	+ 7	+20	2.0	2.0	+15V
SC-3016	2200-2300	4.0	3.5	25	.5	+ 7	+20	2.0	2.0	+15V
SC-3003	2800-3100	5.0	4.5	17	.5	+ 5	+18	2.0	2.0	+15V
SC-3006	3700-4200	6	5.5	18	.5	+ 5	+18	2.5	2.0	+15V
SC-3022	3700-4200	5.5	5.0	25	.5	+ 5	+18	2.5	2.0	+15V



For all your transistor amplifier requirements, contact Jim Austin.

PARAMETRIC AMPLIFIERS



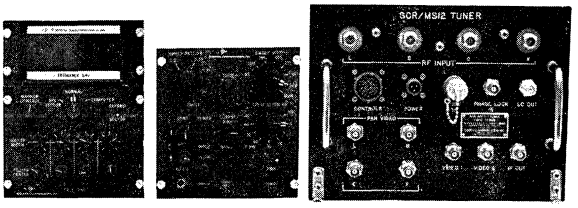


S290 Cntr. Freq. 2.95 GHz Gain =30dB Min., 1dB B.W. = 250 MHz Min., Noise Figure = 1.5dB Max.

SCI designs and builds parametric amplifiers, cryogenic and uncooled, from below 400 MHz to above 30GHz. Standard and custom built models are available for a variety of commercial and military applications. Most models feature solid state pumps and closed-loop pump leveling.

We specialize in satisfying such customer objectives as minimum cost, small size and weight and unattended remote operation. Contact Marvin Wallace for data sheets and technical information.

SURVEILLANCE RECEIVERS



SCR/MS12. 1 to 12 GHz. Designed for and used in Airborne applications, offering high performance and comprehensive operational flexibility. Simultaneous panoramic reception and special sector controls allow each tuner to function independently.

All SCI Microwave Surveillance receivers feature YIG tuning, frequency meter accuracy, computer interface circuitry, and state-of-the-art performance capability. We are interested in supplying special options and configuring our receivers to customer specifications. Call Ted Hart with your special needs.

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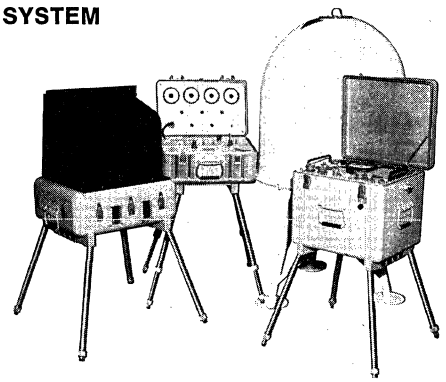
VEGA PRECISION LABORATORIES, INC.

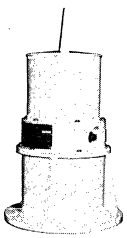
VEGA MAJOR PRODUCTS: Portable Radar Tracking Systems • Command and Data Systems • Target Control Systems • Radar Transponders • Radar Beacons • Transmitters • Receivers • Location and Navigation Systems • Radar Augmentation Devices • Special Test Equipment • R-NAV Devices • Antennas and Microwave Devices • Ranging Systems

VEGA TARGET CONTROL SYSTEM

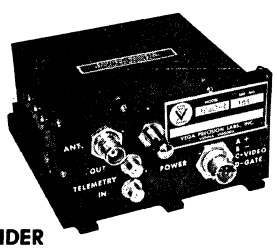


Vega's Target Control System (VCTS) offers an extremely low cost method of accurately tracking and controlling target vehicles. VTCS is actually two electronic systems—a Portable Radar Tracking System and a Command and Telemetry System. Modular design makes the VTCS readily adaptable to a wide variety of vehicles and operational environments. The command and telemetry system can be incorporated into existing instrumentation radar systems for use on national and service ranges. The Vega portable tracking radar with command and telemetry meets all requirements for remote site target control. Portable, self-contained tracking, command and telemetry system; less than 250 pounds; more than 100 mile range; one Mil angular accuracy; twenty yard range accuracy; scoring; operational setup in 30 minutes; modular design and low cost.

MODEL 227X RACON



This completely solid-state transponder is suitable for buoy installations and other navigational seamark and landmark installations. RACON transmits a preselected Morse Code reply when interrogated by a shipboard X-Band radar operating in the 9300-9500 MHz range. The reply appears on the radar scope, positively identifying the seamark or landmark in any type of weather. **Specs:** Swept frequency band sweep rate: 9310 to 9490 MHz ± 10 MHz. Forward: 10, 30, 60, 90 and 120 seconds ± 10%. Return: 1 second. Output power: 200 mw minimum. Pulse length: 25-45 μsec adjustable. Rise time: 0.05 μsec maximum. Internal delay: 0.05 ± 0.1 μsec maximum. Coding: Morse Code equivalent of alpha letters D,G,O,K,M and N.



C-BAND RADAR TRANSPONDER

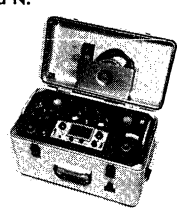
MODEL 302C-2 Freq: 5.4-5.9 GHz; **Receiver Type:** Superhet with sensitivity of - 70 dbm; **Transmitter Type:** Magnetron wity 400 w min. peak power output; **Input Power:** 22 to 32 VDC; **Size:** 43 cu. in.; **Weight:** 43 oz.; **Temp:** - 35°to + 75° C; **Altitude:** 230,000 ft.; **Humidity:** 100%; **Shock:** 125 g in any direction, 3 shocks in opposite directions along each axis for 6 μ sec each; **Acceleration:** 125 g applied along any axis for 3 minutes; **RFI:** Per MIL-I-26600. **Vibration:** sinusoidal, 5 to 25 Hz 0.4 in. DA and 15 g 15 to 2500 Hz.

X-BAND RADAR TRANSPONDER

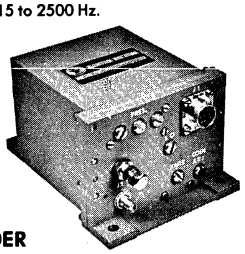
Vega's Model 229X miniature all solid-state radar transponder is smaller than a king size pack of cigarettes and weighs only 10 ounces. This X-Band (9.1—9.6 GHz) employs the latest state-of-the-art solid-state devices and construction techniques, and features high sensitivity (—40 dBm full-firing) with a power output of 5 watts peak. This miniature transponder operates with an input voltage from 24 to 32 VDC and draws only 60 milliamperes quiescent or 80 milliamperes at a PRF of 2500 PPS. Uses single or double pulse codes and operates with practically all X-band airborne, ship and ground radars in use today without any change to the radar. A circular polarized antenna is attached to the top of the unit. Optional battery pack available. Also available in C-Band (5.4—5.9 GHz).

RADAR SIMULATORS

C-BAND • X-BAND S-BAND



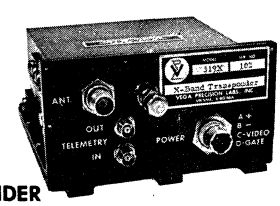
The 616C, 617X, and 627S Series are designed to interrogate and measure parameters of radar transponders or beacons during final checkout on a launch pad or flight line. They are particularly useful when tracking radars are located at great distances from launch sites. Transmitters and receivers are calibrated and controllable from the front panel in tuned frequency, output power, code spacing and sensitivity. Built-in oscilloscopes are hooded for daylight viewing. A resonant stubhorn antenna is standard. The internal battery supply includes a self-contained charging circuit. Telescoping legs are optional.



C-BAND RADAR TRANSPONDER

MODEL 321C

Freq: 5400-5900 MHz; **Receiver Type:** Superhet with sensitivity of - 70 dbm, 100% firing; **Transmitter Type:** Triode cavity with 300 w min. peak power outputs; **Input Power:** 24 to 32 VDC, 45 w; **Size:** 38 cu. in.; **Weight:** 44 oz.; **Temp:** -37° to +75° C.; **Altitude:** 230,000 ft.; **Acceleration:** 125 g; **Shock:** 125 g; **Vibration:** Sine, 5 to 25 Hz, 0.4 DA 25 to 2500 Hz, 15 g. **RFI:** Per MIL-I-26600.



X-BAND RADAR TRANSPONDER

MODEL 319X

Freq: 9100 - 9600 MHz; **Receiver Type:** Superhet with sensitivity of -65 dbm; **Transmitter Type:** Magnetron with 400 w min. peak power output; **Input Power:** 22 to 32 VDC; **Size:** 43 cu. in.; **Weight:** 43 oz.; **RFI:** Per MIL-I-26600; **Humidity:** 100%; **Temp:** -35°to +75°C.

S-BAND RADAR TRANSPONDER

MODEL 312S

Freq: 2775 - 3000 MHz; **Receiver Type:** Superhet with sensitivity of -70 dbm; **Transmitter Type:** Triode cavity with 300 w min. peak power output; **Input Power:** 22 to 32 VDC; **Size:** 50 cu. in.; **Weight:** 47 oz.; **Temp:** -55° to +75° C; **Altitude:** 230,000 ft.; **Humidity:** 100% **Shock:** 125 g in any direction, 3 shocks in opposite directions along each axis for 6 μ sec each; **Acceleration:** 125 g applied along any axis for 3 minutes; **RFI:** Per MIL-I-26600; **Vibration:** sinusoidal, 5 to 25 Hz, 0.4 in. DA and 15 g 15 to 2500 Hz.

Full specifications are available on request and quotations can be made to your requirements and special applications. All these units are of high environmental specifications for space, aircraft, targets and other uses.

For further details contact: **VEGA PRECISION LABORATORIES, INC.**
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or contact our overseas office: **VEGA-CANTLEY INSTRUMENT CO., LTD.** Uxbridge, England 38.26.2 • Telex: 26-3835

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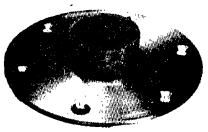
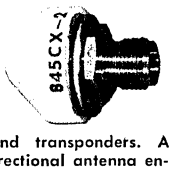
VEGA® PRECISION LABORATORIES



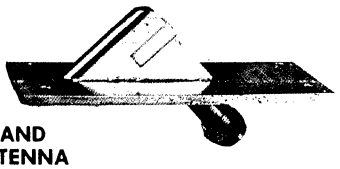
X-BAND ANTENNA
MODEL 835X

Loop Vee Antenna was developed primarily for aircraft application in association with an X-Band radar transponder. The antenna is a circularly polarized omni-directional antenna enclosed within a fiberglass radome. The antenna is characterized by its compactness and is extremely lightweight while still maintaining the electrical and environmental characteristics required by this type antenna. The height of the radome is approximately one-half inch and the diameter of the radome is approximately one inch. Mounting of the antenna is accomplished via a three-inch diameter mounting plate which also serves as a ground plane for the antenna. A C-Band version (Model 836C) of this antenna is available. **Freq.:** 9.0 - 9.69 GHz; **VSWR:** < 1.5:1; **Beamwidth:** 70° ; **Pol:** circular; **Power:** 1.5 kw peak; **Connector:** TNC; **Weight:** 1.5 oz.

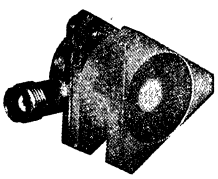
C AND X-BAND STUB ANTENNA



The Model 845CX-2 Stub Antenna was developed for airborne use with either C-Band or X-Band transponders. A vertical polarized omnidirectional antenna enclosed within a radome, it is compact and extremely lightweight while still maintaining the electrical and environmental characteristics of this type antenna. Height of the radome is approximately ¾"; diameter is approximately 1". The skin of the vehicle serves as the ground plane for the antenna due to the simplified mounting technique. Antenna mounting is accomplished via a "D" hole (.505 dia. X .480 flat) through the vehicle skin. It is then secured to the vehicle with a locking nut. **Freq:** 5.4-9.6 GHz; **VSWR:** ≤ 2.0:1; **Beamwidth:** omnidirectional; **Pol:** vertical; **Power:** 1.5 KW peak; **Connector:** TNC; **Weight:** 0.5 ozs.

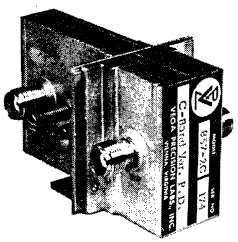


C-BAND ANTENNA
MODEL 801C is a lightweight slotted blade antenna developed as part of a C-Band Radar Transponder System for use on the Nike Apache Vehicle. Linear radiation coverage with minimum aerodynamic drag were key requirements in the design of this antenna. The body of the antenna is constructed of stainless steel which gives excellent reliability in missile environments with no degradation in electrical performance. The antenna may be used as a single element or in multi element arrays depending on the particular application and desired pattern coverage. The companion dividers are Models 853-2C, 854-3C and 855-4C (two-way, three-way and four-way respectively). **Freq.:** 5.4 - 5.9 GHz; **VSWR:** < 2.0:1; **Imp:** 50 ohms; **Pol:** Linear; **Connector:** TNC; **Weight:** < 3.0 oz.; **Power:** 1.0 kw peak.



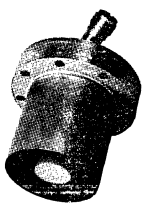
C-BAND ANTENNA
MODEL 820C

Antenna is an optical quartz-loaded, cavity backed helix radiator which produces a right hand circular polarized radiation pattern. The use of quartz material provides for high and low temperature stability with no degradation in electrical performance. Flush mounting is normally used on reentry vehicles with no performance deterioration as a result of reentry heat. Low thermal conductivity of the quartz material controls the heat transfer from the face of the antenna so that very little reentry heat is conducted to the antenna connector. This permits the use of standard mating connectors. Companion power dividers Models 853-2C, 854-3C and 855-4C are used for arraying two, three or four antennas about the missile. **Freq.:** 5.4 - 5.9 GHz; **VSWR:** < 1.5:1; **Pol:** RHC; power 1.5 kw peak; **Gain:** 6.0 db; **Beamwidth:** 130? **Temp.:** 1700° front surface exposure; **Weight:** < 2.0 oz.; **Shock:** 300 g's.

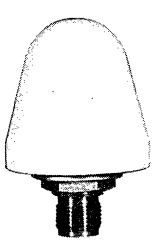


C-BAND POWER DIVIDER

MODEL 857-2C Variable Power Divider was designed to divide the output power of a C-Band Radar Transponder equally between two antenna elements when mounted in airborne vehicles and using unequal lengths of coaxial transmission lines. The design is such that the output power to each leg can be varied from a balanced condition to that of all power in either output leg. With the power divider adjusted to compensate for unequal cable losses, equal power will be radiated by each element of a two element array. The input VSWR is less than 1.3:1 and is tunable over the frequency range of operation. Also available are Models 856-2S (S-Band, 2.7 - 3.0 GHz) and 858-2X (X-Band, 9.1 - 9.6 GHz). **Freq.:** 5.4 - 5.9 GHz; **Insertion Loss:** < 0.5 db; **Power:** 1.0 kw peak; **Size:** 3 1/4" x 2 1/2" x 2"; **Weight:** 12 oz.

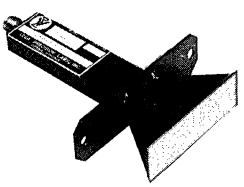


S-BAND ANTENNA
MODEL 815S was developed as part of a lightweight S-Band Antenna System for use in the Nike Tomahawk missile for purpose of transmitting tracking data. The antenna is a cavity backed helix with the helix embedded in quartz which is also used as the dielectric cavity. Mounting is accomplished via a mounting flange which can be adapted to a variety of mounting configurations. Flush mounting is used on reentry vehicles with no performance deterioration as a result of reentry heat. Low thermal conductivity of the quartz allows little of the heat to be conducted to the antenna connector therefore standard mating connectors may be used. A C-Band version of this antenna is also available. **Freq.:** 2.7 - 2.95 GHz; **Pol:** RHC; **Gain:** 7.0 db; **Beamwidth:** 130° nominal; **VSWR:** < 1.5:1; **Temp:** 1000° F, front surface exposure; **Vibration (random):** 48 g. rms; **Shock:** 78 g; **Acceleration:** 100 g.



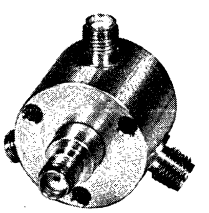
S-BAND STUB ANTENNA

The Model 832S Stub Antenna was developed for airborne application in association with S-Band transponders. It contains a vertical polarized omnidirectional antenna within the radome. The antenna is compact and extremely lightweight while still maintaining the electrical and environmental characteristics required by this type antenna. Height of the radome is 1½", diameter is 1⅜". The skin of the vehicle serves as the ground plane for the antenna due to the simplified mounting technique. Mounting of the antenna is accomplished via a "D" hole through the vehicle skin. It is then secured to the vehicle with a locking nut from inside the vehicle skin. **Freq:** 2.0-5.3 GHz; **VSWR:** ≤ 2.0:1; **Power:** 1.5 KW peak; **Connector:** TNC; **Weight:** 3.0 ozs.



X-BAND ANTENNA

The Model 844X-2 Flared Horn Antenna was developed for use in target drone applications. Radiation coverage is controlled to the desired beamwidths by the flared horn. A colinear type feed is employed to couple energy from the TNC input connector into the waveguide. Construction utilizes standard aluminum waveguide parts dip-brazed together. The radome is epoxied in position and covers the aperture. This flared horn antenna can be made available in other frequency bands utilizing the same design concept. Freq.: 8.4—9.6 GHz; VSWR: ≤2.0:1; Connector: Female TNC; Pol.: Linear; Gain (typical): +11.0 dB; Beamwidth (typical) E-Plane: 70°, H-Plane: 30°; Size: 5½ inches long; Weight: 3.0 oz.



POWER DIVIDERS

Versatility is the main feature of our two, three and four-way power dividers. Originally developed as part of an S-Band radar transponder system for the Nike Tomahawk missile, they are now used in a number of different instrumentation systems. Utilizing the appropriate power divider, pattern coverage can be obtained with two, three or four antennas in operation. The body of the power dividers is constructed of stainless steel, providing excellent reliability in any environment. The input arm goes through one or more transformer stages before coupling with two or more output arms to complete the power division. TNC connectors are brazed to the power divider body in which mounting holes are provided.

For further details write or phone:
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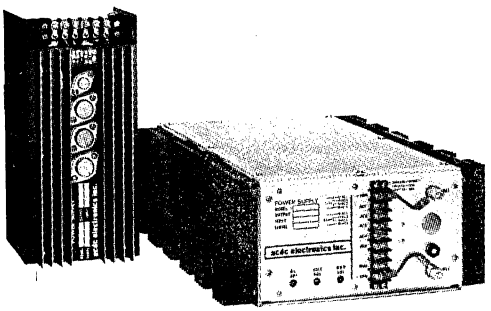
POWER SUPPLIES FOR THE OEM



UL RECOGNITION FOR OEM SERIES & HIGH CURRENT SERIES

All 85 models in our OEM series qualified for recognition under the Component Program of Underwriters' Laboratories, Inc. Every one: from 4 to 32 volts, from 0.9 to 36 amps.

All 10 models in our new High Current series are also recognized. Maximum current ratings cover 25 to 100 amps. Voltages available are 5, 12, 15, 24 and 28v.

That's another big bonus to boost your confidence in our power supplies. Proven in actual use, now they're proven through UL's exhaustive testing for cool operation and safety requirements.

Yes, these are low, competitively-priced units. But you still get 0.1% regulation, reliable overload protection, great stability, versatile mounting, off-the-shelf delivery, and our famous "guaranteed forever" performance. All the dependability you always get with any ACDC power supply, even at these low prices.

G.S.A.

All ACDC power supplies are available under GSA contract number GS-00S-17516.

ORDERING INFORMATION

MODEL CALLOUT: Order ACDC power supplies by Model Number and be sure to include the proper suffix for any options desired. (Example: OEM5N10-1 calls out the 5 Volt, 10 Amp model of the OEM Series and also calls for built-in overvoltage protection.)

PRICES: All prices quoted apply within the U.S. (Add 4% in Canada.) F.O.B. point is Oceanside, Calif. and Terms are Net 30 days.

DISCOUNTS: ACDC offers liberal quantity discounts to OEM buyers. Contact us for quotations for quantities beyond those called out in the catalog.

SOURCE INSPECTION: Government or Customer source inspection involves additional liaison and handling and is charged for at $25 extra per shipment. For DD250 Form add an extra $10 ea. Certificates of compliance may be ordered at no extra charge.

SHIPPING: Orders are shipped by best surface route collect unless otherwise instructed.

DELIVERY: Stock items are shipped within 3 days ARO. Contact ACDC or your local ACDC representative for delivery information on other models.

RETURN SHIPMENTS: If it should become necessary for you to ship a unit back to the factory, we suggest that you contact us first so that we can schedule a prompt turn-around time as soon as possible. Shipments to the factory must be prepaid and contain the reason for return. After processing, units will be reshipped via the best surface route, collect, unless other routing is expressly authorized by you.

acdc electronics inc.

Oceanside Industrial Center, Oceanside, California 92054,
(714) 757-1880

acdc electronics inc.

TR SERIES TRIPLE OUTPUT POWER SUPPLIES

5, ±12 volts or 5, ±15 volts, up to 10 amps.

NEW OFF-THE-SHELF

There are four basic models in this new series providing 5, ±12 volts and 5, ±15 volts in 5 and 10 amp current ratings. Overvoltage protection is built into the single output; optional on the dual output.

Standard models are rated to 55°C only. If the power supply is to be operated at 71°C, it must be specified when ordering so selected high temperature components can be included.

Nominal Output Voltage	Adj. Range ±V	Maximum Current Ratings (Amps) 40°C	55°C	Optional 71°C[4]	Case Size [2]	Model Number (Add −1 for OVP) [1]	Price [3] 10-24 pcs. (See note 1 for OVP)
5	0.25	5.0	4.2	3.2	R2	TR201	$109
+12	0.5	1.0	0.85	.65			
−12	0.5	1.0	0.85	.65			
5	0.25	5.0	4.2	3.2	R2	TR202	$109
+15	0.5	0.85	0.72	.55			
−15	0.5	0.85	0.72	.55			
5	0.25	10.0	8.4	6.4	R3	TR301	$129
+12	0.5	1.0	0.85	.65			
−12	0.5	1.0	0.85	.65			
5	0.25	10.0	8.4	6.4	R3	TR302	$129
+15	0.5	0.85	0.72	.55			
−15	0.5	0.85	0.72	.55			

[1] Overvoltage protection on the 5 Volt output is built-in. To specify OVP on the dual output, add −1 to the part number. Price addition: $10

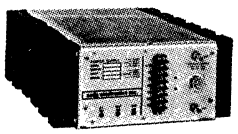
[2] Covers available as an option. To specify, add −2 to the part number. Price addition: $4 for case size 2; $6 for case size 3.

[3] 1-4 pcs: Add $25 Request written quote for
5-9 pcs: Add $15 quantities over 24.

[4] Add $6 to unit price and −3 to the model number

HCM SERIES HIGH CURRENT POWER SUPPLIES

5 to 28 volts, up to 100 amps



Introducing the new ACDC line of 10 High Current power supply models. Ratings from 25 amp @ 28 volts, to 100 amp @ 5 volts. Two case sizes and current ratings for each of five output voltages: 5, 12, 15, 24 and 28 volts. Overvoltage protection available. Excellent for multi-input applications. Immediate delivery from stock on 5 volt models.

Nominal Output Voltage	Adj. range ±V	Maximum Current Rating (Amps) 40°C	55°C	71°C	Case size	Model Number (Add -1 for OVP)	Price (See note [1] for OVP)
5 [2]	.25	65	50	40	1	HCM5N65	$245
		100	80	65	2	HCM5N100	315
12	.50	35	28	22	1	HCM12N35	245
		53	42.5	34.5	2	HCM12N53	315
15	.50	29	23	19	1	HCM15N29	245
		44	35	28.5	2	HCM15N44	315
24	1.0	19	15	12	1	HCM24N19	245
		29	23	19	2	HCM24N29	315
28	1.0	16	13	10	1	HCM28N16	245
		25	20	16	2	HCM28N25	315

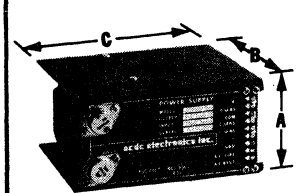
[1] Add $35 for overvoltage protection on case size 1.

Add $45 for overvoltage protection on case size 2.

[2] In stock at ACDC (others available in 4 weeks)

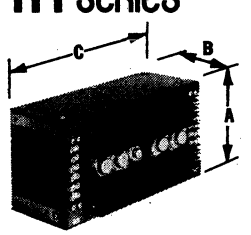
dimensions

OEM SERIES



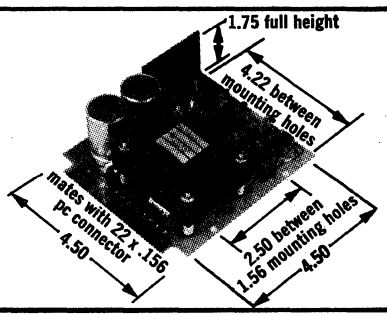
Case Size	A	B	C	Weight Approx (lbs)
R1	3 3/16	4 13/16	6 1/4	4 1/2
R2	3 3/16	4 13/16	10	7 1/2
R3	4 13/16	4 13/16	10	12
R4	4 13/16	6 5/8	12	20
R5	4 13/16	7 1/4	16	29

TR SERIES



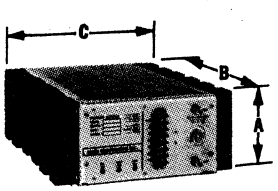
Case Size	A	B	C	Weight Approx (lbs)
R2	3 3/16	4 13/16	10	7 1/2
R3	4 13/16	4 13/16	10	12

CD SERIES



Single output: 1 lb. 5 oz.
Dual output: 1 lb. 7 oz.

HCM SERIES



Case Size	A	B	C	Weight Approx (lbs)
1	4 13/16	11	15 1/4	56
2	4 31/32	15 1/4	18	82

OFF-THE-SHELF DELIVERY

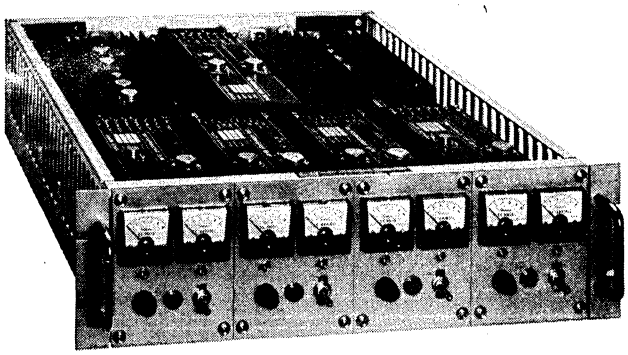
ACDC ELECTRONICS INC., Oceanside Industrial Center, Oceanside, California 92054, (714) 757-1880, TWX: 910-1471

acdc electronics inc.

standard rack adapters

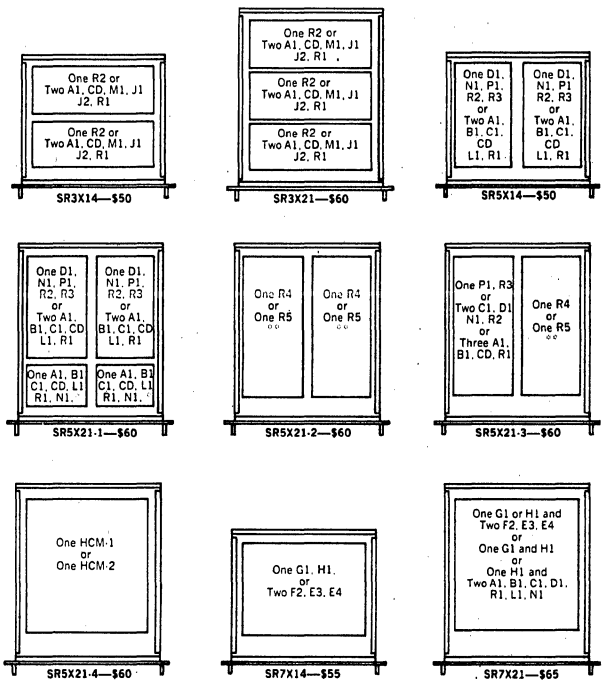
ACDC now offers the SR Series rack adapters with standardized configurations to speed delivery. Nine different combinations of size and capacity are available without engineering design charge. The rack adapters and accessories like our power supplies are guaranteed forever.

All rack adapters are constructed from 14 gauge steel. Panels and bottom chassis are welded together and finished with clear cad plating. All holes for mounting power supply modules, front panels, barrier strips and shunts are provided.



It's Easy to rack mount ACDC Power Supply Modules:

STEP 1
Determine case sizes of power supply modules to be mounted from ACDC catalog. Select the standard rack adapter configurations that fit your application.



* D1 case size can be installed in the two front spaces of SR5X21-1 if P1 case size is not installed in either of the two back spaces

** When installing either a case size R4 or R5 specify module adapter. ADP-4 for case R4 and ADP-5 for case R5

STEP 2
Select the front panel.
Options range from blank front to metered control panels.

Switch panels contain a line switch, red pilot light and fuse holder. The 3½" metered panels provide in addition a 1½" volt meter and ammeter. The 5¼" and 7" metered panels are furthered equipped with 2 selector switches designed to monitor 2 outputs.

	3½" Rack		5¼" Rack		7" Rack	
Full panel blank	RP3XF	$ 9.00	RP5XF	$ 9.00	RP7XF	$ 9.50
¾ panel blank	RP3X3	8.00	RP5X3	8.00	RP7X3	8.50
½ panel blank	RP3X2	6.50	RP5X2	6.50	RP7X2	7.00
¼ panel blank	RP3X1	5.00	RP5X1	5.00	RP7X1	5.50
Switch Panel	RP3X1 P	18.00	RP5X1 P	18.00	RP7X1 P	18.00
Metered Panel	RP3X1 M	45.00	RP5X1 M	45.00	RP7X1 M	45.00

STEP 3
Determine the number of Barrier Strips required to terminate the power supply modules. Select meter shunts and chassis slides if required. All applications where a single ammeter monitors two outputs (one dual or two single) requires two shunts. A shunt is required if power supply being monitored has a current rating of 10 amps or more.

Barrier Strip — 8 terminals	RH8	$ 1.90
Current Shunt (Specify)	RT (Amps)	15.00
Chassis Slides for 14"	RS1X14	48.00/pair
Chassis Slides for 21"	RS1X21	52.00/pair

It's that simple

Rack Adapters can be shipped as a kit or factory assembled and wired.

Kit Form: No holes to drill. Assemble power supply modules, front panel, barrier strips, and slides. All you need is a screwdriver, wrench, and hardware.

Factory Assembled: All items are assembled by factory personnel ready to wire.

Factory Wired: Rack Adapter is completely wired and tested.

Price for factory assembled rack adapter is $5.00 per module installed.

Price for factory wired rack adapter is $25 per module installed and $12 per metered panel installed.

Price for factory assembling and wiring is for 1-9 rack adapters. Contact factory for larger quantities.

customized rack adapters

ACDC Rack Adapters can be constructed to fit your special requirements, some examples of our "customer tailored rack adapters" are:

Front panels finished to match your equipment
Perforated Metal top covers
Connector, special switches, volt adjust pot, etc. installed on front or rear panels
Titling or Trademarks silkscreened on front panels
Oversized front panels to fit space in your cabinet
Bottom Chassis to fit our power supply modules and your equipment

Send us your requirements, we'll be pleased to quote a price for a power supply system that offers you exactly what you want.

ACDC ELECTRONICS INC., Oceanside Industrial Center, Oceanside, California 92054, (714) 757-1880. TWX: 910-1471

acdc electronics inc.

general specifications

	OEM	CD CARD TYPE	TR TRIPLE OUTPUT	HCM HIGH CURRENT
Output	4 to 32 volts ±12 and ±15 volts up to 36 amps	4 to 32 volts ±12 and ±15 volts up to 1.5 amps	5, ±12 volts 5, ±15 volts up to 10 amps	5 to 28 volts up to 100 amps
Input	105-125VAC, 47-63Hz (usable also to 400Hz — consult acdc for derating). 10-250VAC input is available		105-125 VAC or 210-250 VAC; 47-63Hz (must be specified)	105-125 VAC or 210-250 VAC; 47-63 Hz
Regulation	0.1% +5mV NL-FL. ±0.1% ±5mV for ±10% input variation.			
Ripple	2mV RMS and 20mV P-P max.			
Temperature Stability	Typical 10mV for eight hour period after initial warmup.			
Transient Response	Output voltage returns to within regulation limits within 50μsec in response to a 50% step change in load current.			
Remote Sensing	Terminals are provided to maintain regulation at the load, compensating for the DC voltage drop in the load cable.			
Remote Voltage Adjustment	Remote voltage adjustment is provided. Consult factory.			
Ambient Temperature	Operating: See tables for output rating vs. temperature. Storage: —55°C to +85°C.			
Overload Protection	All models are inherently protected against overload and short circuits of any duration. No fuses or reset buttons are used — automatic recovery is electronically accomplished.			
Overvoltage Protection (Optional)	Any model can be furnished with overvoltage protection which "crowbars" the output in the event of a rise in the output voltage of 10% or 2 volts (whichever is greater). On dual outputs, overvoltage protection "crowbars" both voltages to near zero in the event of a rise of one or both of the voltages of 20% or 4 volts (whichever is greater). (Fixed on CD series.)			
Connector	Barrier strip termination	Power supply mates with standard PC edge card connector (22x.156x1/16" thick). Barrier strip available as option.	Barrier strip termination	Barrier strip and Stud terminals
Output Impedance	DC — 1KHz 0.001 R_L or 0.005 ohm max. 1-100KHz 0.005 R_L or 0.5 ohm max. (whichever is greater). R_L = rated load.			DC - 1 KHz .003 ohm max. 1K - 100 KHz .15 ohm max.
Temperature Coefficient	0.02%/°C max.			

OEM SERIES

Our new OEM series features the low price and compatible construction to meet the needs of today's OEM manufacturers — large and small. With 0.1% regulation, excellent stability, overload protection, and designed to fit anywhere, the OEM specifications tell the story. Take a good look — then order and get off-the-shelf delivery!

OEM SINGLE OUTPUT

Nominal output voltage [1]	Adj. range ±V	Maximum current rating (amps) 40°C	55°C	71°C	Case size [5]	Model Number (Add -1 for OVP)	Price [3] 10-24 pcs (See note [4] for OVP)
4	.25	6.0	5.1	3.9	R1	OEM4N6	$ 57.00
		11	9.3	7.1	R2	OEM4N11	69.50
		18	15.3	11.7	R3	OEM4N18	105.00
		26	22.1	16.9	R4	OEM4N26	149.00
		36	30.6	23.3	R5	OEM4N36	184.00
[2]5	**.25**	**5.7**	**4.8**	**3.7**	**R1**	**OEM5N5.7**	**57.00**
		10	**8.5**	**6.5**	**R2**	**OEM5N10**	**69.50**
		17	**14.5**	**11.0**	**R3**	**OEM5N17**	**105.00**
		25	**21.2**	**16.3**	**R4**	**OEM5N25**	**149.00**
		35	**29.8**	**22.8**	**R5**	**OEM5N35**	**184.00**
6	.25	5.2	4.4	3.4	R1	OEM6N5.2	57.00
		9.5	8.1	6.2	R2	OEM6N9.5	69.50
		15	12.7	9.7	R3	OEM6N15	105.00
		22	18.7	14.3	R4	OEM6N22	149.00
		30.7	26.1	20.0	R5	OEM6N30.7	184.00
8	.25	4.2	3.6	2.7	R1	OEM8N4.2	57.00
		7.5	6.4	4.9	R2	OEM8N7.5	69.50
		12	10.2	7.8	R3	OEM8N12	105.00
		17.5	14.9	14.3	R4	OEM8N17.5	149.00
		24.5	20.8	15.9	R5	OEM8N24.5	184.00
10	.5	3.5	3.0	2.3	R1	OEM10N3.5	57.00
		6.5	5.5	4.2	R2	OEM10N6.5	69.50
		10.2	8.6	6.6	R3	OEM10N10.2	105.00
		14.9	12.7	9.7	R4	OEM10N14.9	149.00
		21.0	17.9	13.6	R5	OEM10N21	184.00
[2]12	**.5**	**3.2**	**2.7**	**2.1**	**R1**	**OEM12N3.2**	**56.00**
		5.8	**4.9**	**3.8**	**R2**	**OEM12N5.8**	**67.00**
		9.5	**8.1**	**6.2**	**R3**	**OEM12N9.5**	**99.00**
		13.0	**11.1**	**8.5**	**R4**	**OEM12N13**	**149.00**
		18.5	**15.7**	**12.0**	**R5**	**OEM12N18.5**	**184.00**
14	.5	2.8	2.4	1.8	R1	OEM14N2.8	56.00
		5.2	4.4	3.4	R2	OEM14N5.2	67.00
		8.7	7.4	5.6	R3	OEM14N8.7	99.00
		12.0	10.2	7.8	R4	OEM14N12	149.00
		16.7	14.2	10.9	R5	OEM14N16.7	184.00
[2]15	**.5**	**2.7**	**2.3**	**1.7**	**R1**	**OEM15N2.7**	**56.00**
		5.0	**4.2**	**3.2**	**R2**	**OEM15N5**	**67.00**
		8.2	**7.0**	**5.3**	**R3**	**OEM15N8.2**	**99.00**
		11.2	**9.5**	**7.3**	**R4**	**OEM15N11.2**	**149.00**
		15.2	**13.4**	**10.3**	**R5**	**OEM15N15.8**	**184.00**
16	.5	2.6	2.2	1.7	R1	OEM16N2.6	56.00
		4.7	4.0	3.0	R2	OEM16N4.7	67.00
		7.7	6.5	5.0	R3	OEM16N7.7	99.00
		10.8	9.2	7.0	R4	OEM16N10.8	149.00
		15.0	12.8	9.8	R5	OEM16N15	184.00
18	.5	2.3	1.9	1.5	R1	OEM18N2.3	56.00
		4.2	3.6	2.7	R2	OEM18N4.2	67.00
		6.9	5.9	4.5	R3	OEM18N6.9	99.00
		9.6	8.2	6.2	R4	OEM18N9.6	149.00
		13.5	11.5	8.8	R5	OEM18N13.5	184.00

OFF-THE-SHELF DELIVERY

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acdc electronics inc.

SINGLE AND DUAL OUTPUT POWER SUPPLY MODULES
4 to 32 volts, up to 36 amps & ±12 or ±15 volts, up to 2.7 amps

OEM SINGLE OUTPUT

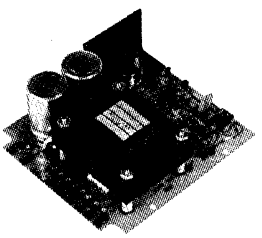
Nominal output voltage [1]	Adj. range ±V	Maximum current rating (amps) 40°C	55°C	71°C	Case size [5]	Model Number (Add −1 for OVP)	Price [3] 10-24 pcs (See note [4] for OVP)
20	1	2.1	1.8	1.4	R1	OEM20N2.1	56.00
		3.8	3.2	2.5	R2	OEM20N3.8	67.00
		6.2	5.3	4.0	R3	OEM20N6.2	99.00
		8.7	7.4	5.7	R4	OEM20N8.7	149.00
		12.2	10.4	7.9	R5	OEM20N12.2	184.00
22	1	1.9	1.6	1.2	R1	OEM22N1.9	56.00
		3.6	3.1	2.3	R2	OEM22N3.6	67.00
		5.9	5.0	3.8	R3	OEM22N5.9	99.00
		8.1	6.9	5.3	R4	OEM22N8.1	149.00
		11.4	9.7	7.4	R5	OEM22N11.4	184.00
[2] 24	1	**1.8**	**1.5**	**1.2**	**R1**	**OEM24N1.8**	**56.00**
		3.3	**2.8**	**2.1**	**R2**	**OEM24N3.3**	**67.00**
		5.4	**4.6**	**3.5**	**R3**	**OEM24N5.4**	**99.00**
		7.5	**6.4**	**4.9**	**R4**	**OEM24N7.5**	**149.00**
		10.6	**9.0**	**6.9**	**R5**	**OEM24N10.6**	**184.00**
26	1	1.7	1.4	1.1	R1	OEM26N1.7	56.00
		3.1	2.6	2.0	R2	OEM26N3.1	67.00
		5.0	4.2	3.2	R3	OEM26N5.0	99.00
		7.1	6.1	4.6	R4	OEM26N7.1	149.00
		10.0	8.5	6.5	R5	OEM26N10.0	184.00
[2] 28	1	**1.6**	**1.4**	**1.0**	**R1**	**OEM28N1.6**	**56.00**
		2.9	**2.5**	**1.9**	**R2**	**OEM28N2.9**	**67.00**
		4.7	**4.0**	**3.1**	**R3**	**OEM28N4.7**	**99.00**
		6.7	**5.7**	**4.4**	**R4**	**OEM28N6.7**	**149.00**
		9.3	**7.9**	**6.1**	**R5**	**OEM28N9.3**	**184.00**
30	1	1.5	1.3	1.0	R1	OEM30N1.5	56.00
		2.7	2.3	1.8	R2	OEM30N2.7	67.00
		4.5	3.8	2.9	R3	OEM30N4.5	99.00
		6.3	5.4	4.1	R4	OEM30N6.3	149.00
		8.8	7.5	5.7	R5	OEM30N8.8	184.00
32	1	1.4	1.2	0.9	R1	OEM32N1.4	56.00
		2.5	2.1	1.6	R2	OEM32N2.5	67.00
		4.3	3.6	2.8	R3	OEM32N4.3	99.00
		5.7	4.9	3.7	R4	OEM32N5.7	149.00
		8.1	6.9	5.3	R5	OEM32N8.1	184.00

OEM DUAL OUTPUT

Nominal output voltage	Adj. range ±V	Maximum current rating 40°C	55°C	71°C	Case size	Model Number add -1 for OVP	Price [3] 10-24 pcs (See note [4] for OVP)
±12	.5	1.5	1.3	1.0	R1	OEM12D1.5	$81.00
		2.7	2.3	1.8	R2	OEM12D2.7	89.00
±15	.5	1.3	1.1	0.8	R1	OEM15D1.3	81.00
		2.4	2.0	1.6	R2	OEM15D2.4	89.00

[1] Contact ACDC for any voltage not listed
[2] In stock at ACDC (others available in 4 weeks)
[3] 1-4 pcs: Add $25
5-9 pcs: Add $15 Request written quote for quantities over 24.
[4] Add $10 for Overvoltage protection on R1, R2, R3 cases.
Add $14 for Overvoltage protection on R4, R5 cases.
[5] Covers available as an option. Add −2 to the part number and add $4.00 for case R1 or R2, and $6.00 for case R3, R4, or R5.

CD SERIES SINGLE AND DUAL OUTPUT CARD TYPE POWER SUPPLIES
4 to 32 volts, up to 1.5 amps ±12 or ±15 volts, up to 0.42 amps



Designed for versatile mounting inside your equipment, the compact size of the CD series lets you put your power supply right where it's needed. This latest addition to the growing line of ACDC power modules has all of the performance features you need — stability, regulation, floating output.

Off-the-shelf delivery, and at the lowest prices, too!

CD SINGLE OUTPUT

VOLTS [1]	Max Current Rating 40°C	55°C	71°C	Model Number (Add -1 for OVP)	Price [3] 10-24 pcs
4	1.5	1.3	1.0	CD4N1.5	Any Model $28.50
[2] 5	**1.5**	**1.3**	**1.0**	**CD5N1.5**	
6	1.4	1.2	.9	CD6N1.4	
8	1.1	.94	.72	CD8N1.1	
10	.95	.81	.62	CD10N.95	
[2] 12	**.85**	**.72**	**.55**	**CD12N.85**	
14	.77	.65	.50	CD14N.77	
[2] 15	**.74**	**.63**	**.48**	**CD15N.74**	
16	.70	.60	.46	CD16N.70	
18	.64	.55	.42	CD18N.64	
20	.58	.50	.38	CD20N.58	
22	.54	.46	.35	CD22N.54	
[2] 24	**.51**	**.44**	**.33**	**CD24N.51**	
26	.48	.41	.31	CD26N.48	
[2] 28	**.45**	**.38**	**.29**	**CD28N.45**	
30	.42	.36	.27	CD30N.42	
32	.40	.34	.26	CD32N.40	

CD DUAL OUTPUT

VOLTS [1]	Max Current Rating 40°C	55°C	71°C	Model No add -1 for OVP	Price [3] 10-24 pcs
±12 [2]	.42	.36	.27	CD12D.42	$37.50
±15 [2]	.37	.32	.24	CD15D.37	$37.50

[1] Factory fixed to within 1%
[2] In stock at ACDC (others available in 4 weeks)
[3] 1-4 Pieces: Add $15.00 5-9 Pieces: Add $10.00
Request written quote for quantities over 24.
Options Barrier Strip $2.00
Overvoltage protection $4.00
Voltage Adj. (Pot) $2.00

OFF-THE-SHELF DELIVERY **OFF-THE-SHELF DELIVERY**

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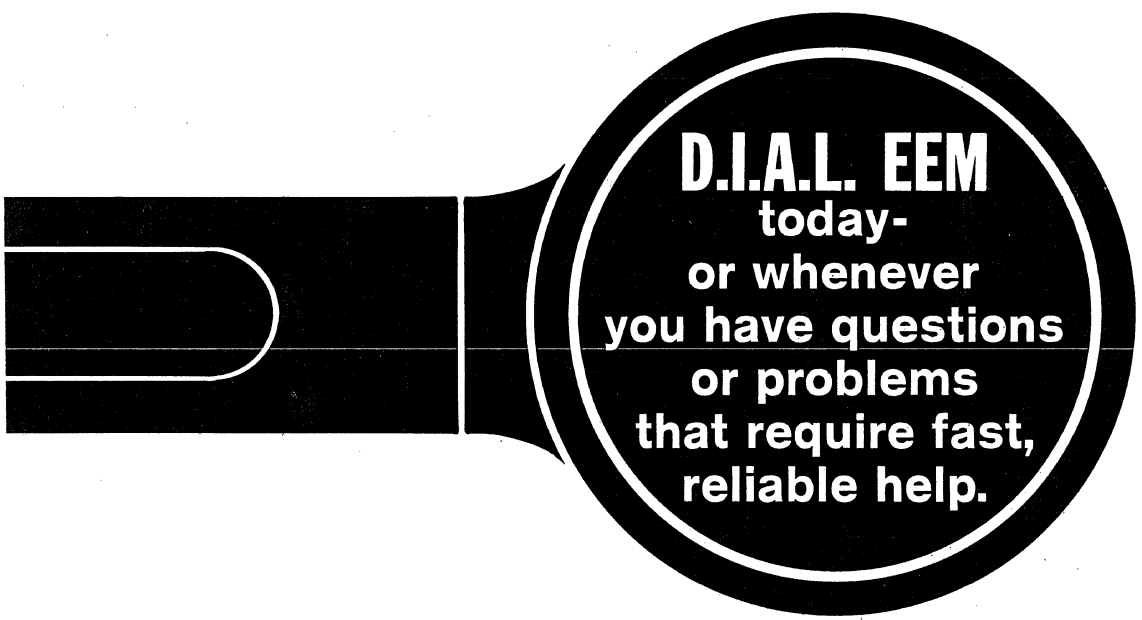

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Solid State Frequency Changers Inverters-Uninterruptible Power Systems

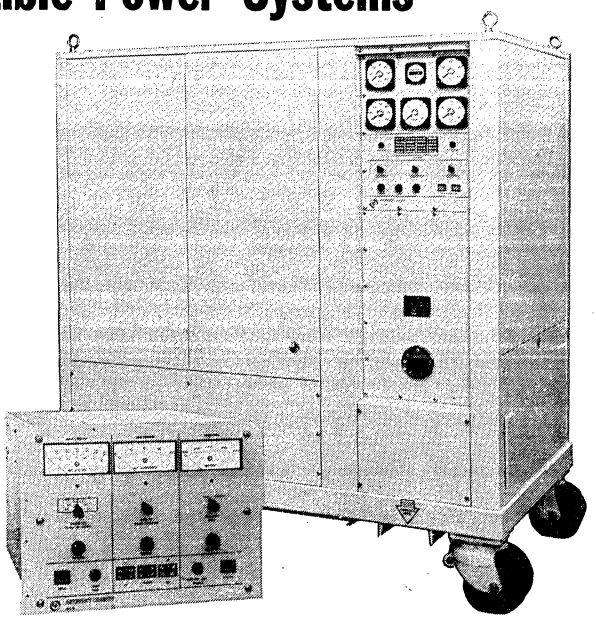
A•L•S has achieved major innovations in power conversion techniques and power systems control. These accomplishments enable A•L•S to offer, at competitive prices, frequency changers, inverters and uninterruptible power systems embodying the best characteristics of both solid state and rotating machine equipments without the performance and reliability limitations of either.

The SMG Series General Purpose Frequency Changers are available in 50, 60, or 400 Hz output and will accept 45 to 450 Hz input. There are ten standard models available from 5 to 375 KVA. Single phase output systems to 50 KVA are also available.

In addition to their superior performance, the SMG Series offer many truly unique features, the most important of which are listed below.

EXCLUSIVE FEATURES

- Unity power factor rated. Will handle continuous full rated load from .5 leading to .5 lagging power factor.
- Reserve capacity to handle surge loads. Will start and run one horsepower of motor load per KVA of rating.
- Convenient, reliable parallel operation. Any number of units may be paralleled to increase capacity.
- Status lamps indicate specific cause and power circuits deactivate in the event of abnormal line voltage, sustained overload, excessive temperature or output voltage.
- Very low open loop output impedance. Less than 5% transient voltage excursion for 50% step load change.
- Operates with any input phase rotation. No need to worry about expensive blow-ups each time the input source location is changed.
- Integral KVA meter and switch monitor each phase or total load KVA. Accuracy, ±2% regardless of load unbalances.
- Cannot be damaged by progressively applied or stepped overloads, or by input line transients.
- High input power factor and low line distortion. Does not control output by phase firing SCR's in the rectifier section.
- Plug-in modules can be easily replaced and are designed so that a component failure in one module will not produce a consequent failure of any other module.
- Switchboard instrumentation. 4½" square, 250° instruments are used exclusively on all units 50 KVA and above.



Model SMG-5. 5 KVA, 400 Hz Output.

Model SMG-150. 150 KVA, 400 Hz Output.

SPECIFICATIONS

INPUT

Voltage: Available in all standard, domestic and foreign nominal voltages ±10% or per customer specifications. Frequency 45 to 450 Hz.

OUTPUT

Voltage: Available in all standard, domestic and foreign voltages or per customer specifications. Output adustment is ±10% from nominal or optionally 0 to 110%. Regulation is ±0.5% for the combined effects of line, load and temperature.

Waveform: 2% THD at full load. 1% available optionally.

Current: Adjustable current limit from 75 to 125% of ratings or optionally from 0 to 125%. Manual current limit override allows over 200% of ratings for motor starting. Regulation is ±0.5% for the combined effect of line, load and temperature.

Power Factor: Full rated power from 0.5 capacitive to 0.5 inductive.

Phase Displacement: 120° ± < 1° for balanced loads. Load may be 100% unbalanced. Line-to-line voltage will remain within ±1% from the average for load unbalances of 50%.

Incidental Modulation: 0.025% peak FM and 0.025% to 1.0% peak AM depending on input power frequency and phase unbalance.

Response Time: 1 cycle of output.

Recovery Time: 4 cycles of output.

Frequency: 50, 60 and 400 Hz adustable ±5% are standard. Stability is ±0.1% constant environment, ±0.5% from cold start. Quartz time base with ±0.001% stability is available optionally.

Instrumentation: All indications are accurate to ±2% of full scale. Provided are input/output voltmeter(s), ammeter(s), KVA meter, dial and pointer hertzmeter and running time meter.

Status Lamps: Depending on model, 6 to 20 lamps indicate system operating status.

Protection: Combination of circuit breakers, fuses, sensing circuitry, air switches, thermostats and contactors positively protect the unit from fault loads, improper input voltages and consequential power train damage.

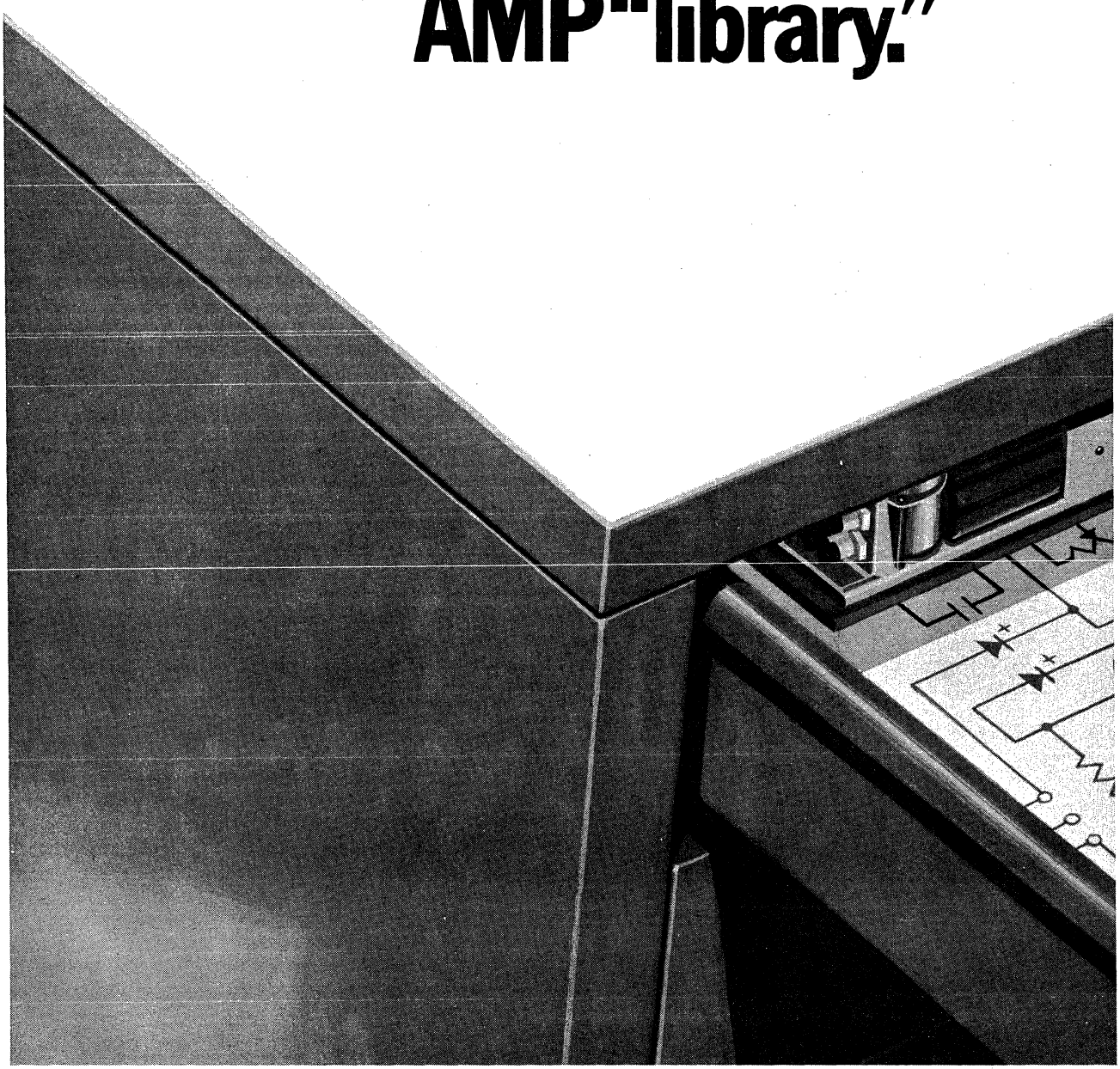
Environment: 0-50°C continuous, full ratings.

EMI

Shielded and filtered. Meets most EMI requirements. Optional filters for the most stringent requirements can be provided.

Looking for a custom power supply?

Consult the AMP "library."



You'll find over 1000 custom designs—up to 0 to 60 KV, and 2 KW. The result of proven performance in 20 years' experience in power supply design. In high-, low- or combination-voltage configurations.

For CRT's, lasers, scan converters, klystrons, photomultipliers, X-ray, vac-ion pumps, image intensifiers, orthicons, silicon image tubes, TWT's and low voltage systems.

Limited room? We'll design a power supply to fit. With more output per cubic inch than probably any other supply you can lay your hands on. And we'll work with you from start to finish—using specs you write or helping you write them.

Whatever you decide, you can be sure of one thing. You'll wind up with a good power supply that fits the space available...at a reasonable cost and in a reasonably short period of time.

For more information, call 717 367-1105 or write AMP Capitron Division, Elizabethtown, Pa. 17022.

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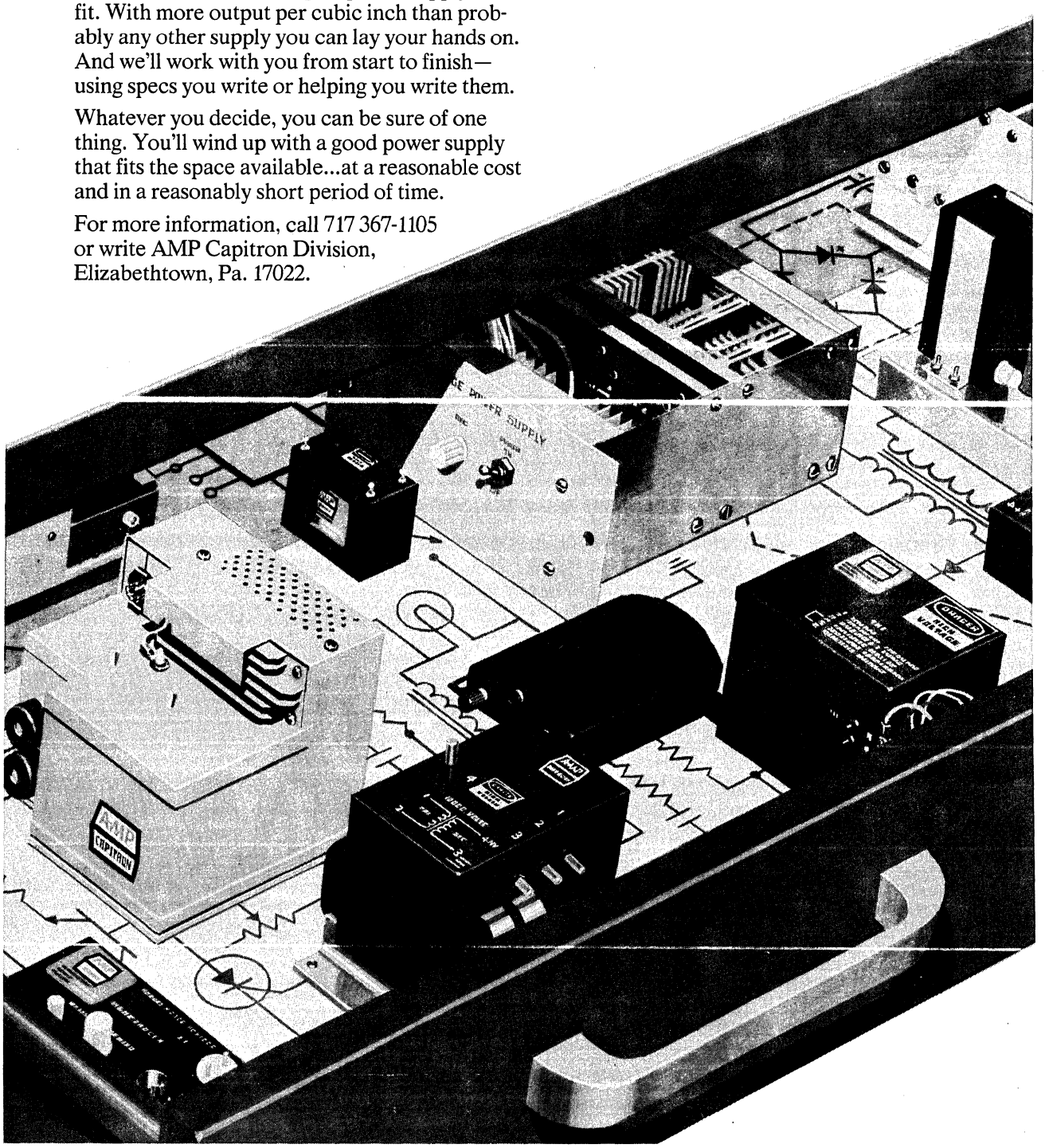


ATR ELECTRONICS, INC.

INVERTERS, VIBRATORS, "A" ELIMINATORS, ETC.

Tel. (612) 222-3791 • 300 East Fourth St., St. Paul, Minnesota 55101

DC TO AC UNIVERSAL INVERTERS

New, universal inverters for operating 110-v., 60 cycle AC equipment from DC voltages in autos, buses, trucks, boats, trains, planes and DC districts. Designed especially for standard 110-volt AC tape recorders, TV sets, radios, PA systems, electric razors, test equipment, etc. Units are carefully engineered and ruggedly constructed to provide long life operation. All feature complete RF interference suppression and exceptional frequency stability. Have operating efficiency in excess of 75%. Four-point voltage regulator corrects output voltage for minimum and maximum loads, and also helps compensate for input voltages lower or higher than normal. Inverters are recommended for use with loads having power factors in excess of 70%. Built-in toggle switch selects most efficient operation for use with TV sets or tape recorders. Inverters are not recommended for use with large motor driven appliances such as refrigerators, washing machines, etc. All have On-Off switches. Housed in attractive brown hammerloid metal cabinet with convenient leather carrying strap. Sizes: Standard Model RSF, 8½x9⅞x5¼"; Heavy-Duty Model RHG, 6⅞x11¼x 8½"; Extra-Heavy-Duty Model HSJ, 6½x12⅞x8½". With battery clips for instant connection to power source. Models with "P" suffix equipped with adapter cord for use in auto cigarette lighter receptacles. *Recommended for 24 volt battery operation. **Before ordering, check wattage of equipment with which inverter will be used.**

Stock No.	Mfr's Type	DC Input Volts	AC Output 60 Cycles (volts)	Output Watt. Int.	Output Watt. Cont.	Shipping Wt. (Lbs.)	Net Price
	6U-RSF	6	110	100	80	22	**$96.25**
	6U-RSF-P	6	110	100	80	22	**96.25**
	6U-RHG	6	110	150	125	27	**125.20**
	6U-HSJ	6	110	175	150	37	**159.50**
	12U-RSF	12	110	150	125	22	**72.98**
	12U-RSF-P	12	110	150	125	22	**72.98**
	12U-RHG	12	110	200	175	27	**94.45**
	12U-HSJ	12	110	250	225	37	**125.74**
	*28U-RSF	28	110	125	100	22	**96.25**
	*28U-RHG	28	110	175	150	27	**113.85**
	*28U-HSJ	28	110	250	200	37	**148.50**
	32U-RSF	32	110	150	100	22	**96.25**
	32U-RHG	32	110	200	180	30	**113.85**
	32U-HSJ	32	110	325	225	37	**148.50**
	50U-RSF	50	110	150	100	22	**96.25**
	50U-RHG	50	110	225	200	27	**125.00**
	110U-RSF	110	110	250	150	22	**76.45**
	110AU-RHG	110	110	325	250	27	**98.95**
	110BU-RHG	110	110	450	350	30	**125.20**
	110U-HSJ	110	110	600	400	37	**142.45**
	220U-RSF	220	110	250	150	22	**87.63**
	220U-RHG	220	110	325	250	27	**125.20**
	220U-HSJ	220	110	500	300	37	**148.50**

PORTABLE PLUG-IN TYPE INVERTERS

Specially Designed for Operating Standard AC Dictating Machines, Record Players, Incandescent Lamps, Electric Razors, Electronic Test Equipment, and other Small Electrical and Electronic Devices from DC Voltages in Automobiles, Buses, Trucks, Boats, Planes, Trains, and DC Districts.

Lightweight inverters for operating 110 v. AC equipment from DC voltage sources. Feature excellent frequency stability and high efficiency. 6 and 12-volt units plug into cigarette lighter receptacle of any vehicle; others are equipped with standard 2-prong plugs. All are designed especially for use with dictating machines; record players, electric razors, test equipment, etc. Not recommended for large tape recorders and motor driven appliances such as refrigerators, washing machines, etc. Brown Hammerloid case with leather carrying strap. Sizes: DME, 5¼x4¾x2¾"; RME and RMF, 8⅜x8x 3¾". *Recommended for 24-volt operation. **Check wattage rating of equipment before ordering. RMF/RME Model Inverters equipped with voltage regulator.**

Stock No.	Mfr's Type	DC Input Volts	AC Output 60 Cycles (volts)	Output Watt. Int.	Output Watt. Cont.	Shipping Wt. (Lbs.)	Net Price
	6-DME[1]	6	110	40	30	5	**$31.35**
	6C-DME[1]	6/12	110	40	30	5	**35.75**
	6-RMF[2]	6	110	80	60	12	**58.47**
	6C-RMF[2]	6/12	110	80	60	12	**65.95**
	12-DME[1]	12	110	50	40	5	**25.18**
	12T-RME-12[2,3]	12	110	125	110	14	**52.24**
	*28-RME[2]	28	110	100	80	12	**65.95**
	32-RME[2]	32	110	100	80	12	**65.95**
	110-RME[2]	110	110	150	100	12	**63.25**
	220-RME	220	110	150	100	12	**65.95**

[1] These Inverters primarily recommended for Edison VP dictating machines. May also be used with Model 200 Soundscriber (with engine of car not running).

[2] Primarily recommended for Dictaphone's Time Master, DeJur Stenorette, and Gray Audograph dictating machines or other similar types. Also recommended for use with Norelco tape recorder Model EL-3516 and Geloso Model G 255-S Tape Recorder.

[3] **This Inverter specially designed and recommended also for use with portable TV set.**

SOLID STATE INVERTERS

Specially Designed to Provide 117 Volt 60 Cycle AC Power for the Operation of Tape Recorders, VTR Equipment, Public Address Systems, TV Sets, Ham Gear, Small Portable Tools and Appliances, Test Instruments, Closed Circuit TV, Scientific Laboratory and Hospital Equipment, Small AC-DC Universal Motors, Fluorescent and Incandescent Lamps from 12 Volt DC Storage Battery Power in Automobiles, Buses, Trucks, Campers, Mobile Homes, Boats, and Aircraft.

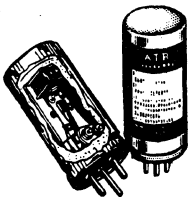
ATR SOLID STATE Inverters are Universal Type Inverters recommended for the applications as listed above plus hundreds more! These Inverters are very well filtered and feature quick starting, frequency stability with varying load and input voltage, rugged heavy-duty construction, reverse polarity protection, and built-in power factor corrector utilizing a simple toggle switch. With ATR Inverters, the need for special equipment is eliminated. They are designed for quiet, long-life operation at high efficiency and maximum reliability. All models indicated here are equipped with heavy duty power transistors and plug-in frequency reed for automatic frequency control. These Inverters also come equipped with four-point voltage regulators which make possible the correct output voltage for minimum to maximum loads and also help compensate for input voltages which are lower or higher than normal. The operating efficiency is approximately 80%. To figure approximate current consumption from storage battery, divide the rated input wattage of the load being operated by the storage battery voltage, and further divide this answer by .80 which will give the approximate current consumption from the battery based on the actual load being operated. These Inverters are recommended primarily for use with loads having power factors in excess of 70%. Inverters come complete with battery cables ready for operation.

Type	DC Input Volts	AC Output 60 Cycles (volts)	Output Wattage Int.	Output Wattage Cont.	Net Price
12U-S2A	12	117	300	275	**$139.50**
*12U-S2A-P	12	117	300	275	**139.50**
12U-S4G	12	117	500	450	**228.25**
12U-S6M	12	117	650	600	**249.75**

"-P" model is equipped with cigarette lighter cord set to plug into dash receptacle. Caution — Do not load beyond 150 watts due to possible damage to cigarette receptacle wiring.

All ATR Inverters are housed in attractively finished brown-hammerloid metal cabinets and are complete with battery cables ready for operation.

For Inverters having larger or smaller output capacities, or for operation on other DC input voltages from 6 volts to 220 volts, please consult available ATR Inverter catalog sheets.



VIBRATORS

For All Auto Radio Sets Since 1954 Use One of the ATR Vibrators Listed Below.

ATR Vibrators Feature:

Ceramic Stack Spacers with Two-Bolt Stack construction. Instant Starting — as a result of highly efficient magnetic circuit with formed base for more uniform operation on both high and low voltages.

Large Oversize Tungsten Contacts having Full Wiping Action — for greater reliability and longer life.

Perforated Reed of Highest Quality Swedish Spring Steel.

Highest Precision Construction and Workmanship — practically all parts used are held to within a tolerance of 0.0005 of inch.

Value Plus — as readily evidenced by the Larger Contacts, Ceramic Spacers and Precision Construction and Workmanship. Available in TEN-PAK.

ATR No. 1400 (Bulk), 4-Prong, 6-Volt For All 6-Volt Sets Since 1954.

ATR No. 1843 (Bulk), 3-Prong, 12-Volt For All 12-Volt General Motors Since 1954.

ATR No. 1843 also used in following automobiles: 1956 Ford (Philco), Lincoln (Bendix), and Mercury (Bendix); 1956 Chrysler (Philco); 1955-57 Packard; 1956-57 Plymouth (Philco); 1956 Studebaker (Philco) and 1957 Mercury (Philco).

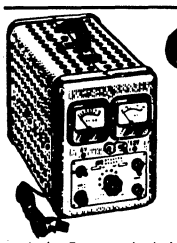
ATR No. 1840 (Bulk), 4-Prong, 12-Volt For 12-Volt Cars other than GM Since 1954.

SHAV-PAKS

Every man should have this lightweight ATR Inverter in his car for that "Keep Clean-Shaved Look." Will operate standard AC Electric Shavers from your CAR or Boat. Complete with 3 ft. cord set. Plugs into cigarette lighter receptacle. Fuse protected, rugged construction, and attractively housed in grey hammerloid-finish steel case. Size: 4x2⅝x2¾". Ship. wt., 2½ lbs.

Model 6-SPB (6 volt) ..... Net **$19.97**

Model 12-SPB (12 volt) ..... Net **16.45**



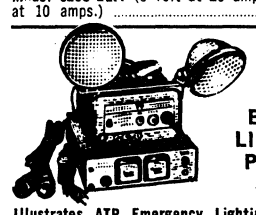
"A" BATTERY ELIMINATOR

For Demonstrating and Testing Transistor or Vibrator - Type Auto Radios. Designed for testing DC Electrical Apparatus on regular 110 volt AC lines — equipped with full-wave dry disc-type rectifier, assuring noiseless, interference - free operation. Fully Automatic and Fool-Proof; has voltmeter, ammeter, and 8-position voltage control. Fuse protected and housed in heavy gauge brown hammerloid-finish metal case. 6 ft. cord set included. Size: Model 610C-ELIF, 6½x9⅛x8½", ship. wt., 22 lbs.; Model 620C-ELIT, 6½x12⅞x8½", ship. wt., 33 lbs.

Ideal as a Power Supply for Model Railroad Trains, Radio Sets, Electro Plating Outfits, and other 6 or 12 Volt, DC Equipment. May also be used as a Battery Charger.

Model 610C-ELIF (6 volt at 10 amps. or 12 volt at 6 amps.) ..... Net **$75.00**

Model 620C-ELIT (6 volt at 20 amps. or 12 volt at 10 amps.) ..... Net **99.75**



EMERGENCY LIGHTING AND POWER UNIT

Illustrates ATR Emergency Lighting and Power Unit, Model ETS complete with lamps.

Completely Automatic Standby-Power Units Specially Designed to Permit the Instantaneous Continued Operation of Critical Lighting Equipment, PA Systems, Amplifiers, Intercom Systems, Burglar Alarms, Fire Alarms, Synchronous Electric Clocks, Electric Time and Recording Clocks, Incubators, Gas Valves, Telephone and Test Equipment, and Similar Critical Devices in the Event of 115 Volt AC-Commercial Power Line Failure. For Use: In Hospitals, Banks, Hotels, Theatres, Factories, Office Buildings, Schools, Homes and Other Areas of Operation.

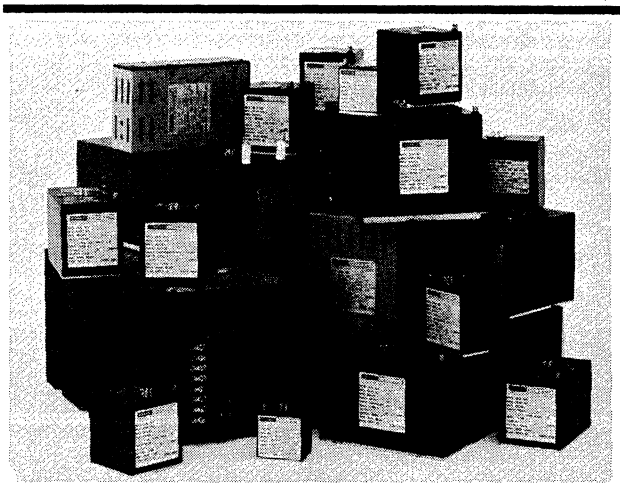
Type	*Storage Battery Input (volts)	AC Output 60 Cycles (volts)	Output Wattage Int.	Output Wattage Cont.	Net With Lamps
661-ETM	6	110	80	60	**$231.75**
662-ETS	6	110	100	80	**253.50**
663-ETH	6	110	150	125	**275.50**
1232-ETS	12	110	150	125	**247.50**
1233-ETH	12	110	200	175	**267.00**
1234-ETJ	12	110	250	225	**287.25**

For Units Without Lamps Deduct **$37.50** Net.

ALL ATR INVERTERS LISTED ABOVE ARE FREQUENCY STABLE AND HAVE AUTOMATIC FREQUENCY CONTROL

abbott Power Supply Modules

The Next 13 Pages List 1070 Regulated Modules with Specifications and Prices



The most complete line of small size MIL-Spec and OEM type power modules available in the industry is fully described in the following 13 pages. The Abbott line of power modules includes output voltages from 3 volts to 740 volts DC, output current from 2 milliamperes to 20 amperes and output power from 1 watt to 300 watts. Sizes, weights, regulations and environments are shown for the various input and output powers. Abbott is proud to continue its policy of introducing new products to meet the growing demands of our customers by listing four new lines of power modules this year: the Model "LC" series of OEM 60 Hz to DC low cost units; the Model "RN" series of 60 Hz to DC industrial units; the Model "VN" series of high-efficiency 60 Hz to DC switching regulated units (the first standard line of hermetically sealed, hi-efficiency units available from any manufacturer); and the Model "KN", "LN", and "PN" series of DC to 60 Hz Sine Wave inverters (the lowest cost units available anywhere). Look through the next 13 pages and you may find the power module you want is a standard Abbott model.

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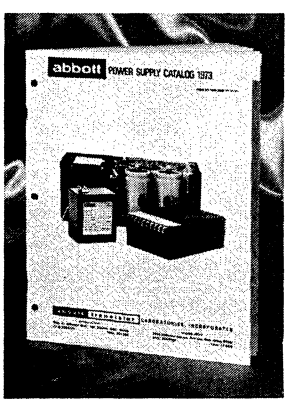
NEXT 13 PAGES

60 HERTZ to:	DC, Low Cost; LC's	Vol.1•582
	DC, Industrial; RN's	Vol.1•583
	DC, Hi-performing compacts; Z's	Vol.1•584
	DC, Hi-efficiency; VN's	Vol.1•585
400 HERTZ to:	DC, Hi-performance; W's	Vol.1•586
	DC, Dual output; WW's	Vol.1•587
	DC, Hi-temp; U's	Vol.1•588
DC to:	DC, Hi-temp; B's	Vol.1•589
	DC, Hi-performance; C's	Vol.1•590
	DC, Dual output; CC's	Vol.1•591
	Sine Wave; KN/LN/PN/S's	Vol.1•592
Size Charts for All Units		Vol.1•593



See Abbott's 1973 catalog for complete information on all our products plus additional items such as:

- Quality Control System
- Thermal Data
- Input Currents
- Overvoltage Protectors
- Input Line Filters
- Operating Hints
- Reliability & MTBF
- EMI/RFI
- MIL Spec Environments

To receive your free copy of this comprehensive 56 page Power Supply Catalog, simply call or write Abbott.

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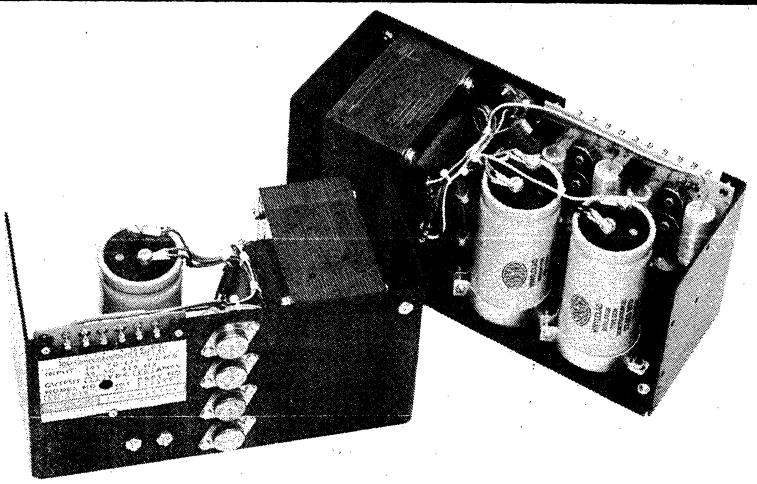
abbott 60 ~ to DC Low Cost

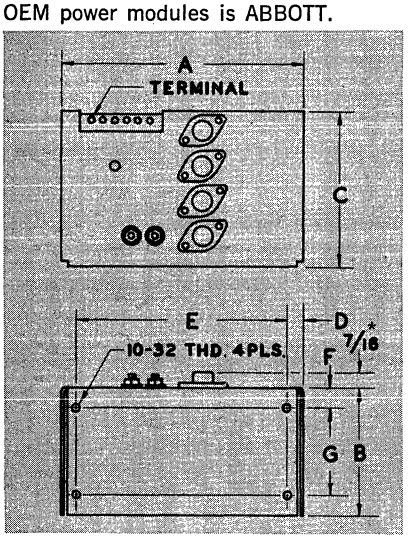


features

- 1 Day Stock Delivery
- Single and Dual Outputs
- 0.1% Regulation
- +50°C Ambient Operation
- 47-420 Hz Input Frequency

DELIVERY FROM STOCK

These reliable Abbott power modules are designed to meet the needs of OEM engineers. For their intended application, these units are not only rated high in overall quality, but also priced relatively low. Thus, they provide more quality per dollar compared to similar items on the market. Your best buy in OEM power modules is ABBOTT.



Size	A	B	C	D	E	F	G
L1	7½	3 1/16	3⅝	½	6½	⅝	1 13/16
L2	8½	4	4¾	½	7½	⅝	2¾
L3	9¼	4	4¾	½	8¼	⅝	2¾
L4	9½	3 1/16	3⅝	½	8½	⅝	1 13/16
L5	10	4	4¾	½	9	⅝	2¾
L6	10¾	4	4¾	½	9¾	⅝	2¾

specifications

INPUT VOLTAGE RANGE: 103 to 127 VRMS.

INPUT FREQUENCY: 47 to 420 Hertz, 1 Phase.

LINE REGULATION: 0.1% or 10 mV (whichever is greater), for input change of 103 to 127 VAC.

LOAD REGULATION: 0.1% or 10 mV, whichever is greater), from no load to full load.

RIPPLE: 10 mV rms; 30 mV peak-to-peak.

OUTPUT VOLTAGE ADJUSTMENT RANGE: Voltage is continuously adjustable between the limits shown on the table by means of a screwdriver adjustment potentiometer.

ISOLATION VOLTAGE: 300 VDC between output terminals and chassis ground.

INSULATION RESISTANCE: 50 megohms between output terminals and chassis ground when measured at 50 VDC.

POLARITY: Inputs and outputs are isolated, either positive or negative side may be grounded.

TEMPERATURE: Operating: 0°C to +50°C ambient without derating, forced air or heat-sinking. Storage: −55°C to 85°C.

TEMPERATURE COEFFICIENT: 0.08% per degree Centigrade.

ALTITUDE: 10,000 feet above sea level.

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration. The output voltage automatically restores to normal when the overload is removed within approx. 25 msec.

INPUT TRANSIENT PROTECTION: 180 VAC for 0.1 sec.

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 75 microseconds after a 50% step change in load current. Maximum overshoot/undershoot is 5% of nominal output voltage.

TURN ON/TURN OFF OVERSHOOT: The output voltage overshoot during "turn on" or "turn off" will not exceed 1% of the output voltage.

REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra "sensing" leads. The resulting circuit action compensates for a DC voltage drop up to 0.5 volts in the load leads.

OVER VOLTAGE PROTECTION: Additional circuitry will reduce the output voltage to approximately 1 VDC within 25 μsec typ., if the output voltage rises 10% or 2 VDC (whichever is greater) above nominal. Available as an optional feature by adding "-1" to the model number and $8 ($16) for dual output units) to the 1-24 piece price.

OUTPUT IMPEDANCE: DC to 1K Hz — .008 R_L ohms or .03 ohms, whichever is greater.
1K Hz to 10K Hz — .008 R_L or .08 ohms, whichever is greater.
10K Hz to 100K Hz — .015 R_L or .30 ohms, whichever is greater.
R_L = rated load resistance.

RELIABILITY: The Mean Time between failure (MTBF) per MIL-HDBK-217A under worst case operating conditions is in excess of 100,000 hours per single output units and in excess of 70,000 hours per dual output units. For example: LC12T10 - 114,268 hours (MTBF); LC28T1 - 158,290 hours (MTBF); LLC12T5 - 75,593.

SINGLE OUTPUT

Output Voltage Range	Output Curr. (Amps)	Size (See Dwg)	Wt. (Lbs.)	Model Number	Price 1-24 Pieces
4.5 - 5.5	6.0	L1	5.5	LC5T6	$72.00
	10.0	L3	12.5	LC5T10	81.00
11.5 - 12.5	2.5	L1	5.5	LC12T2.5	72.00
	5.0	L2	8.7	LC12T5	81.00
	10.0	L3	12.5	LC12T10	99.00
14.5 - 15.5	2.0	L1	5.5	LC15T2	72.00
	4.0	L2	8.7	LC15T4	81.00
	8.0	L3	12.5	LC15T8	99.00
23 - 25	1.2	L1	5.5	LC24T1.2	72.00
	2.5	L2	8.7	LC24T2.5	81.00
	5.0	L3	12.5	LC24T5	99.00
27 - 29	1.0	L1	5.5	LC28T1	72.00
	2.1	L2	8.7	LC28T2.1	81.00
	4.3	L3	12.5	LC28T4.3	99.00

DUAL OUTPUT

Output Voltage Range	Output Curr. (Amps)	Size (See Dwg)	Wt. (Lbs.)	Model Number	Price 1-24 Pieces
±11.5 - ±12.5	1.2	L4	6.0	LLC12T1.2	$99.00
	2.5	L5	9.2	LLC12T2.5	110.00
	5.0	L6	13.5	LLC12T5	135.00
±14.5 - ±15.5	1.0	L4	6.0	LLC15T1	99.00
	2.0	L5	9.2	LLC15T2	110.00
	4.0	L6	13.5	LLC15T4	135.00

Dual Output Units:

1. Both outputs are isolated and non-tracking so each output can be used as a completely separate power supply.
2. The output current listed is for each output voltage.

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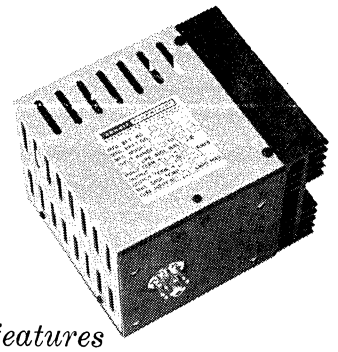
abbott 60 ~ to DC Industrial



features

- −4 to +160°F ambient
- 5 to 37 VDC
- 0.15 to 20 amps
- 0.1% regulation
- Stock to 10 day delivery

specifications

INPUT VOLTAGE RANGE: 105-125 VRMS

INPUT FREQUENCY RANGE: 50-420 Hertz, 1 phase

LINE REGULATION: 0.1% or 10 mv (whichever is greater) for input change of 105-125 VRMS

LOAD REGULATION: 0.1% or 10 mv (whichever is greater) for change from no load to full load

RIPPLE: 0.02% or 5 mv RMS (whichever is greater)

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in table by means of an externally accessible screwdriver adjustment potentiometer

ADJUSTMENT RESOLUTION: 30 mv max.

POLARITY: Inputs and outputs are isolated; either positive or negative side may be grounded

TEMPERATURE: Operating: −4°F (−20°C) to +160°F (+71°C) without derating, forced air, or heatsinking. Storage: −67°F to +185°F

TEMPERATURE COEFFICIENT: 0.03% per degree Centigrade

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration. The output voltage automatically restores to normal when the overload is removed.

INPUT TRANSIENT PROTECTION: 180 VAC for 0.1 sec in accordance with MIL-STD-704A, figure 3, limit 1

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 75 microseconds after a 50% step change in load current

TURN ON/TURN OFF OVERSHOOT: The output voltage overshoot during "turn on" or "turn off" will not exceed 0.1% of the output voltage, or 20 mv, whichever is greater

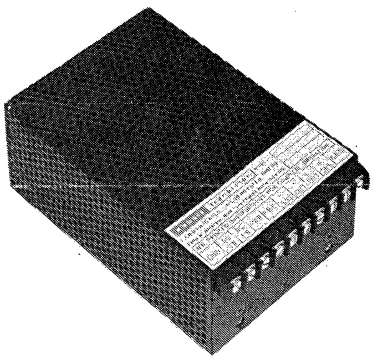
REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra "sensing" leads. The resulting circuit action compensates for a DC voltage drop up to 0.5 volts in the load leads.

OVER VOLTAGE PROTECTION, 230 VAC OPERATION, AND REMOTE VOLTAGE ADJUSTMENT: Available as optional features.

Output Voltage Range	Output Curr. (Amps)	Size*	Wt. (Lbs.)	Model Number	Price 1-4 pcs.
4.5-5.5	0.15	AA	3.0	RN5S0.15	$ 66
	0.3	AA	3.0	RN5S0.3	69
	0.6	BB	6.0	RN5S0.6	86
	1.2	BB	6.0	**RN5S1.2**	89
	2.5	CC	8.0	**RN5S2.5**	104
	5.0	DD	13.0	**RN5S5**	121
	10	FF	22.0	**RN5S10**	179
	15	GG	28.0	RN5T15	219
	20	JJ	33.0	RN5T20	249
5.5-6.5	0.15	AA	3.0	RN6S0.15	66
	0.3	AA	3.0	RN6S0.3	69
	0.6	BB	6.0	RN6S0.6	86
	1.2	BB	6.0	**RN6S1.2**	89
	2.5	CC	8.0	**RN6S2.5**	104
	5.0	DD	13.0	RN6S5	121
	10	FF	22.0	RN6S10	179
	15	GG	28.0	RN6T15	219
	20	JJ	33.0	RN6T20	249
6.5-7.5	0.15	AA	3.0	RN7S0.15	66
	0.3	AA	3.0	RN7S0.3	69
	0.6	BB	6.0	RN7S0.6	86
	1.2	BB	6.0	RN7S1.2	89
	2.5	CC	8.0	RN7S2.5	104
	5.0	DD	13.0	RN7S5	121
	10	FF	22.0	RN7S10	179
	15	GG	28.0	RN7T15	219
	20	JJ	33.0	RN7T20	249
7.5-8.5	0.15	AA	3.0	RN8S0.15	66
	0.3	AA	3.0	RN8S0.3	69
	0.6	BB	6.0	RN8S0.6	86
	1.2	BB	6.0	RN8S1.2	89
	2.5	CC	8.0	RN8S2.5	104
	5.0	DD	13.0	RN8S5	121
	10	FF	22.0	RN8S10	179
	15	GG	28.0	RN8T15	219
	20	JJ	33.0	RN8T20	249
8.5-9.5	0.15	AA	3.0	RN9S0.15	66
	0.3	AA	3.0	RN9S0.3	69
	0.6	BB	6.0	RN9S0.6	86
	1.2	BB	6.0	RN9S1.2	89
	2.5	CC	8.0	RN9S2.5	104
	5.0	DD	13.0	RN9S5	121
	10	FF	22.0	RN9S10	179
	15	HH	31.0	RN9T15	239
	20	JJ	33.0	RN9T20	249
9.5-10.5	0.15	AA	3.0	RN10S0.15	66
	0.3	AA	3.0	RN10S0.3	69
	0.6	BB	6.0	RN10S0.6	86
	1.2	BB	6.0	RN10S1.2	89
	2.5	CC	8.0	RN10S2.5	104
	5.0	DD	13.0	RN10S5	121
	10	FF	22.0	RN10S10	179
	15	HH	31.0	RN10T15	239
	20	JJ	33.0	RN10T20	249
10.5-11.5	0.15	AA	3.0	RN11S0.15	$ 66
	0.3	AA	3.0	RN11S0.3	69
	0.6	BB	6.0	RN11S0.6	86
	1.2	BB	6.0	RN11S1.2	89
	2.5	CC	8.0	RN11E2.5	104
	5.0	DD	13.0	RN11S5	121
	10	FF	22.0	RN11S10	179
	15	HH	31.0	RN11T15	239
	20	JJ	33.0	RN11T20	249
11-13	0.15	AA	3.0	RN12S0.15	66
	0.3	AA	3.0	**RN12S0.3**	69
	0.6	BB	6.0	RN12S0.6	86
	1.2	BB	6.0	**RN12S1.2**	89
	2.5	CC	8.0	RN12S2.5	104
	5.0	DD	13.0	RN12S5	121
	10	GG	22.0	RN12S10	179
	15	HH	31.0	RN12T15	239
	20	JJ	33.0	RN12T20	249
13-15	0.15	AA	3.0	RN14S0.15	66
	0.3	AA	3.0	RN14S0.3	69
	0.6	BB	6.0	RN14S0.6	86
	1.2	BB	6.0	**RN14S1.2**	89
	2.5	CC	8.0	**RN14S2.5**	104
	5.0	DD	13.0	**RN14S5**	121
	10	GG	28.0	RN14T10	219
	15	HH	31.0	RN14T15	239
15-17	0.15	AA	3.0	RN16S0.15	66
	0.3	AA	3.0	RN16S0.3	69
	0.6	BB	6.0	RN16S0.6	86
	1.2	BB	6.0	RN16S1.2	89
	2.5	CC	8.0	RN16S2.5	104
	5.0	DD	13.0	RN16S5	121
	10	GG	28.0	RN16T10	219
	15	HH	31.0	RN16T15	239
17-19	0.15	AA	3.0	RN18S0.15	66
	0.3	AA	3.0	RN18S0.3	69
	0.6	BB	6.0	RN18S0.6	86
	1.2	BB	6.0	RN18S1.2	89
	2.5	CC	8.0	RN18S2.5	104
	5.0	DD	13.0	RN18S5	121
	10	GG	28.0	RN18T10	219
19-21	0.15	AA	3.0	RN20S0.15	66
	0.3	AA	3.0	RN20S0.3	69
	0.6	BB	6.0	RN20S0.6	86
	1.2	BB	6.0	RN20S1.2	89
	2.5	CC	8.0	RN20S2.5	104
	5.0	DD	13.0	RN20S5	121
	10	GG	28.0	RN20T10	219
21-23	0.15	AA	3.0	RN22S0.15	66
	0.3	AA	3.0	RN22S0.3	69
	0.6	BB	6.0	RN22S0.6	86
	1.2	BB	6.0	RN22S1.2	$ 89
	2.5	CC	8.0	RN22S2.5	104
	5.0	EE	13.0	RN22S5	139
	10	GG	28.0	RN22T10	219
23-25	0.15	AA	3.0	RN24S0.15	66
	0.3	AA	3.0	**RN24S0.3**	69
	0.6	BB	6.0	RN24S0.6	86
	1.2	BB	6.0	RN24S1.2	89
	2.5	CC	8.0	RN24S2.5	104
	5.0	EE	13.0	**RN24S5**	139
	10	GG	28.0	RN24T10	219
25-27	0.15	AA	3.0	RN26S0.15	69
	0.3	BB	6.0	RN26S0.3	86
	0.6	BB	6.0	RN26S0.6	89
	1.2	CC	8.0	RN26S1.2	104
	2.5	DD	13.0	RN26S2.5	121
	5.0	EE	20.0	RN26S5	139
27-29	0.15	AA	3.0	RN28S0.15	69
	0.3	BB	6.0	RN28S0.3	86
	0.6	BB	6.0	**RN28S0.6**	89
	1.2	CC	8.0	**RN28S1.2**	104
	2.5	DD	13.0	RN28S2.5	121
	5.0	EE	20.0	**RN28S5**	139
29-31	0.15	AA	3.0	RN30S0.15	69
	0.3	BB	6.0	RN30S0.3	86
	0.6	BB	6.0	RN30S0.6	89
	1.2	CC	8.0	RN30S1.2	104
	2.5	DD	13.0	RN30S2.5	121
	5.0	EE	20.0	RN30S5	139
31-33	0.15	AA	3.0	RN32S0.15	69
	0.3	BB	6.0	RN32S0.3	86
	0.6	BB	6.0	RN32S0.6	89
	1.2	CC	8.0	RN32S1.2	104
	2.5	DD	13.0	RN32S2.5	121
	5.0	EE	20.0	RN32S5	139
33-35	0.15	AA	3.0	RN34S0.15	69
	0.3	BB	6.0	RN34S0.3	86
	0.6	BB	6.0	RN34S0.6	89
	1.2	CC	8.0	RN34S1.2	104
	2.5	DD	13.0	RN34S2.5	121
	5.0	EE	20.0	RN34S5	139
35-37	0.15	AA	3.0	RN36S0.15	69
	0.3	BB	6.0	RN36S0.3	86
	0.6	BB	6.0	RN36S0.6	89
	1.2	CC	8.0	RN36S1.2	104
	2.5	DD	13.0	RN36S2.5	121
	5.0	EE	20.0	RN36S5	139

*See page Vol.1•593 for size charts.

abbott 60 ⏦ to DC Hi-Performing Compacts



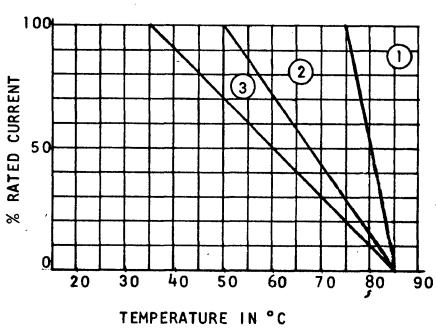
features

- Compact
- Input Frequency Range 47-440 Hz
- Input Voltage Range 100-132 vac
- Hi-Reliability
- +80°C Operation
- Parallel Operation
- Delivery is stock to 10 days.

Output Voltage Range (vdc)	Rated Output Current* (amps)	Model No.	Price 1-4 pcs.
2.7 - 3.3	10	**Z3T10**	229
3.7 - 4.3	10	**Z4T10**	229
4.7 - 5.3	10	**Z5T10**	229
5.7 - 6.3	9	**Z6T9**	229
6.0 - 6.6	9	**Z6.3T9**	229
9.5 - 10.5	6	**Z10T6**	229
11.5 - 12.5	6	**Z12T6**	229
14.5 - 15.5	4	**Z15T4**	229
17.5 - 18.5	3.5	**Z18T3.5**	229
19 - 21	3	**Z20T3**	229
21 - 23	3	**Z22T3**	229
23 - 25	2.5	**Z24T2.5**	229
27 - 29	2.5	**Z28T2.5**	229
29 - 31	2.5	**Z30T2.5**	229

*See Current vs Temperature Curves below.

CURRENT VS TEMPERATURE CURVES



specifications

INPUT VOLTAGE RANGE: 100 to 132 VRMS

INPUT FREQUENCY RANGE: 47 to 440 Hz, 1 phase

OUTPUT VOLTAGE AND CURRENT: See specific models listed in table

LINE REGULATION: 0.04% or 5 mv (whichever is greater) for input change of 100 to 132 VRMS with load constant

LOAD REGULATION: 0.1% or 20 mv (whichever is greater) for change from no load to full load with line constant

RIPPLE: 0.02% or 5 mv RMS (whichever is greater); 50 mv peak-to-peak maximum, measured with scope having 25 MHz bandwidth

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in table by means of an externally accessible screwdriver adjustment potentiometer

ADJUSTMENT RESOLUTION:

Nom. Output Voltage	Resolution
3-16 vdc	35 mv
18-30 vdc	60 mv

ISOLATION VOLTAGE: 500 vdc input to output and input to case — 200 vdc output to case

INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 vdc

TEMPERATURE RANGE: Operating: −20°C to +80°C (see curves below)
Storage: −55°C to +85°C

TEMPERATURE COEFFICIENT: 0.03% per degree centigrade maximum — 0.01% per degree centrigrade typical

SHORT CIRCUIT PROTECTION: Each unit is completely protected against a short circuit of any duration. The output voltage automatically restores to normal when the short is removed

INPUT TRANSIENT PROTECTION: 180 vac for 0.1 second

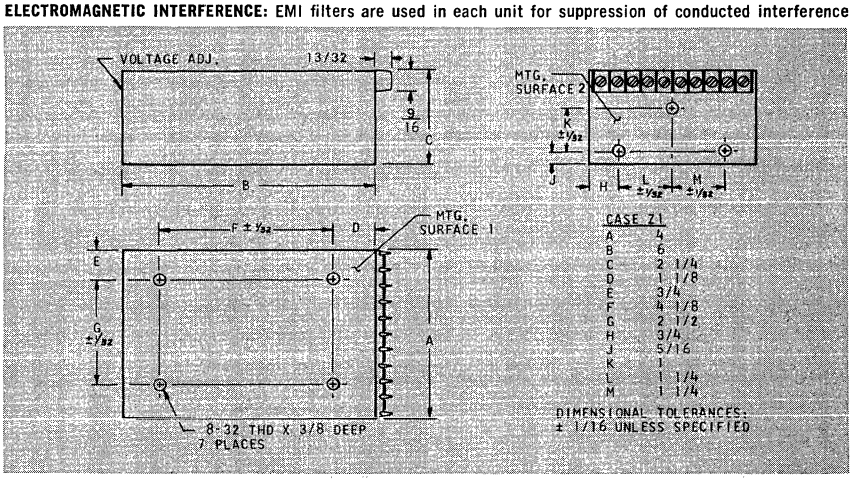
OVERVOLTAGE PROTECTION: Internal circuitry will reduce the output voltage to approximately 1 vdc within 15 microseconds if the output voltage rises 10% or 2 vdc (whichever is greater) above nominal. Available as an optional feature by adding "−1" to the model number and $10.00 to the 1-4 piece price

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 200 microseconds in response to a step change of 50% in load current. Typical over/undershoot is less than 10% of output voltage

PARALLEL OPERATION: Any two identical units may be connected in parallel. Output should be derated to 90% of rated current

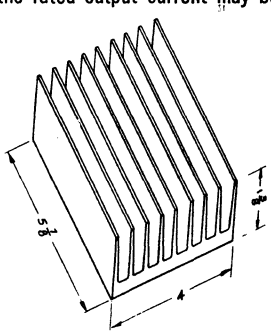
WEIGHT: 3.0 pounds maximum

ELECTROMAGNETIC INTERFERENCE: EMI filters are used in each unit for suppression of conducted interference



OUTPUT CURRENT VS TEMPERATURE

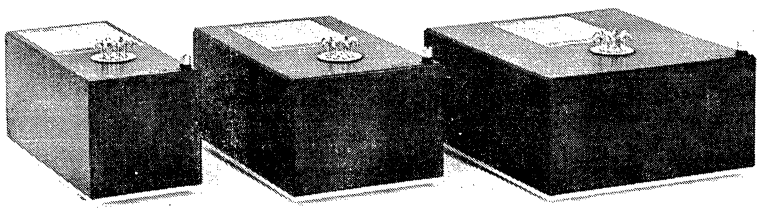
1) CONDUCTION COOLING — Mounting Surface 1 should be attached to a heat sink plate or chassis. The percentage of rated output current that may be drawn from any "Z" model at various mounting surface temperatures is indicated by Curve ①. Thus, 100% of the rated output current may be drawn at a **mounting surface temperature** of 75°C.



2) CONVECTION COOLING — A thermal finned radiator, Model TRZ1, may be attached to Mounting Surface 1. Using Mounting Surface 2, install the unit with fins in a vertical position. Curve ② indicates the percentage of rated output current that may be drawn from any "Z" model in this configuration at various **ambient temperatures.** Thus, 100% of the rated current may be drawn at 50°C **ambient temperature.** Model TRZ1, shown at right, adds 1⅜" to Dimension "C." Price is $4.00 each for 1 to 4 pieces.

3) RADIATION COOLING — Units may be installed on Mounting Surface 2 with **no** additional **heat sinking.** The percentage of rated current that may be drawn from any "Z" model at various ambient temperatures is indicated by Curve ③. The ambient temperature should be measured within ¼ inch of Mounting Surface 1 in still air. Thus 100% of the rated current may be drawn at 35°C **ambient temperature.**

abbott 60 ⏦ to DC Hi-Efficiency



features

- Hi-Efficiency (64 to 77%)
- Low EMI
- Compact
- +160°F Operation
- Hi-Reliability
- Hermetically Sealed

specifications

INPUT VOLTAGE RANGE: 115 VRMS, ±10%

INPUT FREQUENCY RANGE: 47 to 440 Hz, 1 Phase

EFFICIENCY: Typical efficiency ranges from 64 to 77%

OUTPUT VOLTAGE AND CURRENT: See specific models listed in tables

LINE REGULATION: 0.4% or 50 mv (whichever is greater) for input change of 103.5 to 126.5 VRMS with load constant

LOAD REGULATION: 0.4% or 50 mv (whichever is greater) from no load to full load with line constant

RIPPLE AND NOISE (PARD): 0.2% plus 125 mv peak-to-peak from +25°C to +71°C. At 0°C peak-to-peak ripple increases to 0.4% plus 200 mv maximum. Measurements made with a scope having a 25MHz bandwidth

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the table by means of an externally accessible screwdriver adjustment potentiometer

ADJUSTMENT RESOLUTION:	**Nominal Output Voltage**	**Resolution**
	3-16 VDC	35 millivolts
	18-50 VDC	60 millivolts

ISOLATION VOLTAGE: 500 VDC input to output and input to case, 100 output to case

INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 VDC

POLARITY: Inputs and outputs are isolated, either positive or negative side may be grounded

TEMPERATURE RANGE: Operating: 0°C (32°F) to +71°C (+160°F) baseplate temperature. Storage: −55°C (−65°F) to +85°C (+185°F)

TEMPERATURE COEFFICIENT: 0.03% per degree centigrade maximum

ENVIRONMENT: Hermetically sealed and encapsulated to meet severe environmental requirements, including:
Vibration: MIL-STD-810B, Method 514, Procedure I, Curve H (±10g's) and Procedure XII. Also MIL-STD-167B, Type I
Shock: MIL-STD-810B, Method 516, Procedure II (75g's) crash safety
Humidity: MIL-STD-810B, Method 507, Procedure I
Saltspray: MIL-STD-983E, Paragraph 4.4.12
Saltfog: MIL-STD-810B, Method 509, Procedue I

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration

INPUT TRANSIENT PROTECTION: Unit will withstand 180 VAC for 0.1 second in accordance with MIL-STD-704A, Figure 3, Limit 1

OVERVOLTAGE PROTECTION: Available as separate modules. Consult nearest office for complete information

REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra "Sensing" leads. The resulting circuit action compensates for a DC voltage drop up to 0.3 volts in the load leads

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 7 msec. after a 50% step change in load current. Maximum over/undershoot is less than 0.8 VDC or 3% of the output voltage, whichever is greater

OUTPUT IMPEDANCE: DC to 1 KHz: .04 R_L or 0.1 ohm, whichever is greater. 1 KHz to 10 KHz: .06 R_L or 0.15 ohms, whichever is greater. 10 KHz to 100 KHz: .08 R_L or 0.4 ohms, whichever is greater.
R_L = Rated Load

ELECTROMAGNETIC INTERFERENCE: EMI filters are used in each unit for suppression of conducted interference

RELIABILITY: The Mean Time Betwen Failure (MTBF) per MIL-HDBK-217A under worst conditions of full rated output current, 126.5 VDC input voltage, and 40°C baseplate temperature was calculated to be 60,000 hours

Output Voltage Range	Output Current (Amps)	Size*	Weight (Lbs)	Model Number	Price 1-4 pcs
4.7-5.3	5.0	11F	2.8	VN25D-5A	$230
	10.0	12C	4.0	VN50D-5A	245
	20.0	14E	5.4	VN100D-5A	265
5.3-5.9	4.5	11F	2.8	VN25D-5.6A	230
	9.0	12C	4.0	VN50D-5.6A	245
	18.0	14E	5.4	VN100D-5.6A	265
5.9-6.6	4.0	11F	2.8	VN25D-6.3A	230
	8.0	12C	4.0	VN50D-6.3A	245
	16.0	14E	5.4	VN100D-6.3A	265
6.6-7.4	3.6	11F	2.8	VN25D-7.0A	230
	7.2	12C	4.0	VN50D-7.0A	245
	14.4	14E	5.4	VN100D-7.0A	265
7.4-8.3	3.2	11F	2.8	VN25D-7.9A	230
	6.4	12C	4.0	VN50D-7.9A	245
	12.8	14E	5.4	VN100D-7.9A	265
8.3-9.3	2.8	11F	2.8	VN25D-8.8A	230
	5.7	12C	4.0	VN50D-8.8A	245
	11.4	14E	5.4	VN100D-8.8A	265
9.3-10.4	2.5	11F	2.8	VN25D-9.9A	230
	5.1	12C	4.0	VN50D-9.9A	245
	10.2	14E	5.4	VN100D-9.9A	265
10.4-11.6	2.3	11F	2.8	VN25D-11A	$230
	4.6	12C	4.0	VN50D-11A	245
	9.2	14E	5.4	VN100D-11A	265
11.6-13.0	2.0	11F	2.8	VN25D-12.3A	230
	4.1	12C	4.0	VN50D-12.3A	245
	8.2	14E	5.4	VN100D-12.3A	265
13.0-14.8	1.8	11F	2.8	VN25D-13.8A	230
	3.6	12C	4.0	VN50D-13.8A	245
	7.2	14E	5.4	VN100D-13.8A	265
14.8-16.6	1.6	11F	2.8	VN25D-15.7A	230
	3.2	12C	4.0	VN50D-15.7A	245
	6.4	14E	5.4	VN100D-15.7A	265
16.6-18.6	1.4	11F	2.8	VN25D-17.6A	230
	2.8	12C	4.0	VN50D-17.6A	245
	5.6	14E	5.4	VN100D-17.6A	265
18.6-20.8	1.2	11F	2.8	VN25D-19.7A	230
	2.5	12C	4.0	VN50D-19.7A	245
	5.0	14E	5.4	VN100D-19.7A	265
20.8-23.3	1.1	11F	2.8	VN25D-22A	230
	2.3	12C	4.0	VN50D-22A	245
	4.6	14E	5.4	VN100D-22A	265
23.3-26.1	1.0	11F	2.8	VN25D-24.7A	$230
	2.0	12C	4.0	VN50D-24.7A	245
	4.0	14E	5.4	VN100D-24.7A	265
26.1-29.2	0.9	11F	2.8	VN25D-27.6A	230
	1.8	12C	4.0	VN50D-27.6A	245
	3.6	14E	5.4	VN100D-27.6A	265
29.2-32.6	0.8	11F	2.8	VN25D-31A	230
	1.6	12C	4.0	VN50D-31A	245
	3.2	14E	5.4	VN100D-31A	265
32.6-36.5	0.7	11F	2.8	VN25D-34.6A	230
	1.4	12C	4.0	VN50D-34.6A	245
	2.8	14E	5.4	VN100D-34.6A	265
36.5-40.9	0.6	11F	2.8	VN25D-38.7A	230
	1.3	12C	4.0	VN50D-38.7A	245
	2.6	14E	5.4	VN100D-38.7A	265
40.9-45.8	0.5	11F	2.8	VN25D-43.3A	230
	1.1	12C	4.0	VN50D-43.3A	245
	2.2	14E	5.4	VN100D-43.3A	265
45.8-50.0	0.5	11F	2.8	VN25D-47.9A	230
	1.0	12C	4.0	VN50D-47.9A	245
	2.0	14E	5.4	VN100D-47.9A	265

*See page Vol.1•593 for size charts

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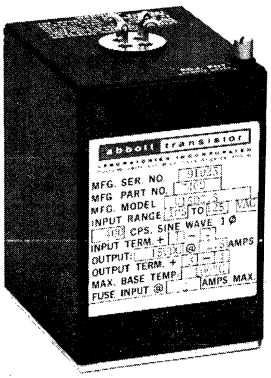
abbott 400 ⏦ to DC Hi-Performance



features

- Low Peak-to-Peak Ripple
- RFI/EMI to MIL-STD-461
- Small
- Hermetically Sealed
- +100°C Operation
- 0.1% Regulation

DELIVERY FROM STOCK

MODELS IN BOLD TYPE NORMALLY IN STOCK

specifications

INPUT VOLTAGE RANGE: 105 to 125 VRMS

INPUT FREQUENCY RANGE: 380 to 420 Hertz, 1 phase

INPUT POWER: Per MIL-STD-704A for category B equipment

OUTPUT VOLTAGE AND CURRENT: See specific models listed in table

LINE REGULATION: 0.1% or 10 mv (whichever is greater) for input change of 105 to 125 VRMS with load constant

LOAD REGULATION: 0.1% or 20 mv (whichever is greater) for change from no load to full load with line constant

RIPPLE: 0.02% or 5 mv RMS (whichever is greater) 25 mv peak-to-peak maximum, measured with scope having 25 MHz bandwidth

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the table by means of an externally accesible screwdriver adjustment potentiometer

ADJUSTMENT RESOLUTION:

Nom. Output Voltage	Resolution
5 - 16 vdc	35 mv
18 - 50 vdc	60 mv
55 - 95 vdc	90 mv

ISOLATION VOLTAGE: 750 vdc input to output and input to case • 200 vdc output to case

INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 vdc

POLARITY: Inputs and outputs are isolated, either positive or negative side may be grounded.

TEMPERATURE RANGE: Operating: −55° to +100°C maximum at center of mounting base
Storage: −55°C to +125°C

TEMPERATURE COEFFICIENT: 0.03% per degree centigrade maximum

ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-STD-810B and MIL-E-5400K, Class 2, including: altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, salt spray, fungus, explosion, etc.

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration. The output voltage automatically restores to normal when the overload is removed

INPUT TRANSIENT PROTECTION: MIL-STD-704A Figure 3, Limit 1 (180 VAC for 0.1 seconds)

OVER VOLTAGE PROTECTION: Over voltage protection modules are available for these units. Please consult the factory.

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 100 microseconds after 50% step change in load current

OUTPUT IMPEDANCE:
DC to 1K Hz — 0.004 R_L or 0.04 ohm max.
1K Hz to 10K Hz — 0.015 R_L or 0.15 ohm max.
10K Hz to 100K Hz — 0.030 R_L or 0.50 ohm max.
R_L = Rated Load

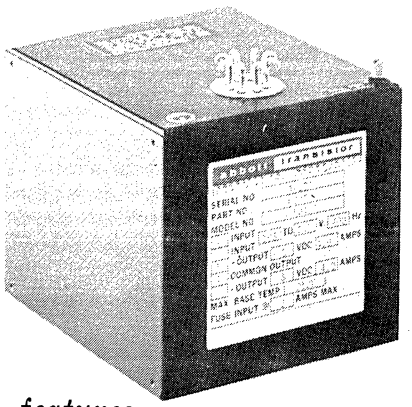
ELECTROMAGNETIC INTERFERENCE: Built to meet the requirements of MIL-STD-461 for generation of and susceptability to radiated and conducted interference

RELIABILITY: The Mean Time Between Failure (MTBF) per MIL-HDBK-217 under worst case operating conditions of full rated output current, 125 vac input voltage, and +100°C base plate temperature, ranges from 47,393 hours for Model W95D0.3 to 56,148 hours for Model W5D10.

Output Voltage Range	Output Curr. (Amps)	Size*	Wt. (Lbs.)	Model Number	Price 1 pc.	Price 2-4 pcs.
4.5-5.5	2.5	2E	1.9	**W5D2.5**	$285	$260
	5.0	4D	2.7	**W5D5.0**	320	295
	10.0	10B	5.1	**W5D10**	385	350
	15.0	14C	8.9	W5D15	430	395
	20.0	14C	8.9	W5D20	465	425
5.5-6.5	2.5	2E	1.9	**W6D2.5**	285	260
	5.0	4D	2.7	**W6D5.0**	320	295
	10.0	10B	5.1	**W6D10**	385	350
	15.0	14C	8.9	W6D15	430	395
	20.0	14C	8.9	W6D20	465	425
6.5-7.5	2.5	2E	1.9	**W7D2.5**	285	260
	5.0	4D	2.7	**W7D5.0**	320	295
	10.0	10B	5.1	**W7D10**	385	350
	15.0	14C	8.9	W7D15	430	395
	20.0	14C	8.9	W7D20	465	425
7.5-8.5	2.5	2E	1.9	**W8D2.5**	285	260
	5.0	4D	2.7	**W8D5.0**	320	295
	10.0	10B	5.1	**W8D10**	385	350
	15.0	14C	8.9	W8D15	430	395
	20.0	14C	8.9	W8D20	465	425
8.5-9.5	2.5	2E	1.9	**W9D2.5**	295	270
	5.0	4D	2.7	**W9D5.0**	340	310
	10.0	10B	5.1	**W9D10**	405	370
	15.0	14C	8.9	W9D15	460	420
	20.0	14C	8.9	W9D20	495	450
9.5-10.5	2.5	2E	1.9	**W10D2.5**	295	270
	5.0	4D	2.7	**W10D5.0**	340	310
	10.0	10B	5.1	**W10D10**	405	370
	15.0	14C	8.9	W10D15	460	420
	20.0	14C	8.9	W10D20	495	450
10.5-11.5	2.5	2E	1.9	**W11D2.5**	295	270
	5.0	4D	2.7	**W11D5.0**	340	310
	10.0	10B	5.1	**W11D10**	405	370
	15.0	14C	8.9	W11D15	460	420
	20.0	14C	8.9	W11D20	495	450
11-13	2.5	2E	1.9	**W12D2.5**	$295	$270
	5.0	4D	2.7	**W12D5.0**	340	310
	10.0	10B	5.1	**W12D10**	405	370
	15.0	14C	8.9	W12D15	460	420
	20.0	14C	8.9	W12D20	495	450
13-15	1.2	2E	1.9	**W14D1.2**	285	260
	2.5	4D	2.7	**W14D2.5**	320	295
	5.0	10B	5.1	**W14D5.0**	385	350
	10.0	14C	8.9	W14D10	430	395
	15.0	14C	8.9	W14D15	465	425
14-16	1.2	2E	1.9	**W15D1.2**	285	260
	2.5	4D	2.7	**W15D2.5**	320	295
	5.0	10B	5.1	**W15D5.0**	385	350
	10.0	14C	8.9	W15D10	430	395
	15.0	14C	8.9	W15D15	465	425
15-17	1.2	2E	1.9	**W16D1.2**	$285	$260
	2.5	4D	2.7	**W16D2.5**	320	295
	5.0	10B	5.1	**W16D5.0**	385	350
	10.0	14C	8.9	W16D10	430	395
	15.0	14C	8.9	W16D15	465	425
17-19	1.2	2E	1.9	**W18D1.2**	285	260
	2.5	4D	2.7	**W18D2.5**	320	295
	5.0	10B	5.1	**W18D5.0**	385	350
	10.0	14C	8.9	W18D10	430	395
19-21	1.2	2E	1.9	**W20D1.2**	290	265
	2.5	4D	2.7	**W20D2.5**	340	310
	5.0	10B	5.1	**W20D5.0**	405	370
	10.0	14C	8.9	W20D10	460	420
21-23	1.2	2E	1.9	**W22D1.2**	290	265
	2.5	4D	2.7	**W22D2.5**	340	310
	5.0	10B	5.1	**W22D5.0**	405	370
	10.0	14C	8.9	W22D10	460	420
23-25	1.2	2E	1.9	**W24D1.2**	290	265
	2.5	4D	2.7	**W24D2.5**	340	310
	5.0	10B	5.1	**W24D5.0**	405	370
	10.0	14C	8.9	W24D10	460	420
25-27	1.2	2E	1.9	**W26D1.2**	$290	$265
	2.5	4D	2.7	**W26D2.5**	340	310
	5.0	10B	5.1	**W26D5.0**	405	370
	10.0	14C	8.9	W26D10	460	420
27-29	1.2	2E	1.9	**W28D1.2**	290	265
	2.5	4D	2.7	**W28D2.5**	340	310
	5.0	10B	5.1	**W28D5.0**	405	370
	10.0	14C	8.9	W28D10	460	420
29-31	0.6	2E	1.9	**W30D0.6**	280	255
	1.2	4D	2.7	**W30D1.2**	335	305
	2.5	10B	5.1	**W30D2.5**	400	365
	5.0	14C	8.9	W30D5.0	430	395
	10.0	14C	8.9	W30D10	465	425
31-33	0.6	2E	1.9	W32D0.6	280	255
	1.2	4D	2.7	W32D1.2	335	305
	2.5	10B	5.1	W32D2.5	400	365
	5.0	14C	8.9	W32D5.0	430	395
33-35	0.6	2E	1.9	W34D0.6	280	255
	1.2	4D	2.7	W34D1.2	335	305
	2.5	10B	5.1	W34D2.5	400	365
	5.0	14C	8.9	W34D5.0	430	395
35-37	0.6	2E	1.9	W36D0.6	280	255
	1.2	4D	2.7	W36D1.2	335	305
	2.5	10B	5.1	W36D2.5	400	365
	5.0	14C	8.9	W36D5.0	430	395
37-39	0.6	2E	1.9	W38D0.6	$280	$255
	1.2	4D	2.7	W38D1.2	335	305
	2.5	10B	5.1	W38D2.5	400	365
	5.0	14C	8.9	W38D5.0	430	395
39-41	0.6	2E	1.9	W40D0.6	280	255
	1.2	4D	2.7	W40D1.2	335	305
	2.5	10B	5.1	W40D2.5	400	365
	5.0	14C	8.9	W40D5.0	430	395
41-43	0.6	2E	1.9	W42D0.6	280	255
	1.2	4D	2.7	W42D1.2	335	305
	2.5	10B	5.1	W42D2.5	400	365
	5.0	14C	8.9	W42D5.0	430	395
43-45	0.6	2E	1.9	W44D0.6	295	270
	1.2	4D	2.7	W44D1.2	350	320
	2.5	10B	5.1	W44D2.5	420	385
	5.0	14C	8.9	W44D5.0	460	420
45-47	0.6	2E	1.9	W46D0.6	295	270
	1.2	4D	2.7	W46D1.2	350	320
	2.5	10B	5.1	W46D2.5	420	385
	5.0	14C	8.9	W46D5.0	460	420
47-49	0.6	2E	1.9	W48D0.6	295	270
	1.2	4D	2.7	W48D1.2	350	320
	2.5	10B	5.1	W48D2.5	420	385
	5.0	14C	8.9	W48D5.0	460	420
49-51	0.6	2E	1.9	W50D0.6	295	270
	1.2	4D	2.7	W50D1.2	350	320
	2.5	10B	5.1	W50D2.5	420	385
	5.0	14C	8.9	W50D5.0	460	420
50-60	0.3	2E	1.9	W55D0.3	285	260
	0.6	4D	2.7	W55D0.6	335	305
	1.2	10B	5.1	W55D1.2	400	365
60-70	0.3	2E	1.9	W65D0.3	285	260
	0.6	4D	2.7	W65D0.6	335	305
	1.2	10B	5.1	W65D1.2	400	365
70-80	0.3	2E	1.9	W75D0.3	295	270
	0.6	4D	2.7	W75D0.6	350	320
	1.2	10B	5.1	W75D1.2	420	385
80-90	0.3	2E	1.9	W85D0.3	295	270
	0.6	4D	2.7	W85D0.6	350	320
	1.2	10B	5.1	W85D1.2	420	385
90-100	0.3	2E	1.9	W95D0.3	295	270
	0.6	4D	2.7	W95D0.6	350	320
	1.2	10B	5.1	W95D1.2	420	385

*See page Vol.1•593 for size charts

abbott 400 ~ to DC Dual Output



features

- 1% Tracking Accuracy
- 0.2% Regulation
- Low Peak-To-Peak Ripple
- RFI/EMI to MIL-STD-461
- Hermetically Sealed
- +100°C Operation

specifications

INPUT VOLTAGE RANGE: 105 to 125 VRMS
INPUT FREQUENCY RANGE: 380 to 420 Hertz, 1 phase
INPUT POWER: Per MIL-STD-704A for category B equipment
LINE REGULATION: 0.2% or 10 mv (whichever is greater) for input change of 105 to 125 VRMS
LOAD REGULATION: 0.2% or 20 mv (whichever is greater) for change from no load to full load
RIPPLE: 0.02% or 5 mv RMS (whichever is greater) 25 mv peak-to-peak max. each output (25 MHz bandwidth)
TRACKING ACCURACY: The negative output will track the positive output to within 1.0% or 100 mv (whichever is greater) for all rated conditions of input voltage, output current, operating temperature, and output voltage adjustment.
OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the table by means of an externally accessible screwdriver adjustment potentiometer.
ADJUSTMENT RESOLUTION: 25 mv for outputs up to ±4.5 vdc; 35 mv for outputs ±5.0 thru ±15 vdc; 60 mv for outputs ±16 vdc and above
ISOLATION VOLTAGE: 750 vdc input to output and input to case: 200 vdc output to case
INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 vdc
TEMPERATURE RANGE: Operating: −55°C to +100°C maximum at center of mounting base
Storage: −55°C to +125°C
TEMPERATURE COEFFICIENT: 0.03% per degree centigrade maximum
ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-STD-810B and MIL-E-5400K, Class 2, including: altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, salt spray, fungus, explosion, etc.
SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration. The output voltage automatically restores to normal when the overload is removed.
INPUT TRANSIENT PROTECTION: In accordance with MIL-STD-704A, Figure 3, Limit 1 (180 vac for 0.1 seconds)
OVERVOLTAGE PROTECTION: Overvoltage protection modules are available for use with these units. Please consult the factory.
LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 200 microseconds after a 50% step change in load current.
ELECTROMAGNETIC INTERFERENCE: Built to meet the requirements of MIL-STD-461 for generation of and susceptability to radiated and conducted interference.
RELIABILITY: The Mean Time Between Failure (MTBF) per MIL-HDBK-217 under worst case operating conditions of full rated output current, 125 vac input voltage, and +100°C base plate temperature, ranges from 48,450 hours for Model WW30D4.0 to 67,385 hours for Model WW3D0.3.

OUTPUT IMPEDANCE:

	RATED OUTPUT CURRENT (Amps)				
	0.3A	0.5A	1.0A	2.0A	4.0A
DC-1 KHz	0.2Ω	0.15Ω	0.1Ω	0.08Ω	0.04Ω
1 KHz-10 KHz	0.5Ω	0.4Ω	0.3Ω	0.2Ω	0.1Ω
10 KHz-100 KHz	0.5Ω	0.5Ω	0.5Ω	0.5Ω	0.3Ω

Output Voltage Range	Output Current (Amps)*	Size†	Wt (Lbs.)	Model Number	Price 1 pc.	Price 2-4 pcs.
±2.75-±3.25	0.3	8B	1.9	WW3D0.3	$300	$270
	0.5	9C	2.2	WW3D0.5	335	300
	1.0	9C	2.2	WW3D1.0	365	325
	2.0	9D	3.1	WW3D2.0	395	355
	4.0	11D	5.5	WW3D4.0	430	385
±3.25-±3.75	0.3	8B	1.9	WW3.5D0.3	300	270
	0.5	9C	2.2	WW3.5D0.5	335	300
	1.0	9C	2.2	WW3.5D1.0	365	325
	2.0	9D	3.1	WW3.5D2.0	395	355
	4.0	11D	5.5	WW3.5D4.0	430	385
±3.75-±4.25	0.3	8B	1.9	WW4D0.3	300	270
	0.5	9C	2.2	WW4D0.5	335	300
	1.0	9C	2.2	WW4D1.0	365	325
	2.0	9D	3.1	WW4D2.0	395	355
	4.0	11D	5.5	WW4D4.0	430	385
±4.25-±4.75	0.3	8B	1.9	WW4.5D0.3	300	270
	0.5	9C	2.2	WW4.5D0.5	335	300
	1.0	9C	2.2	WW4.5D1.0	365	325
	2.0	9D	3.1	WW4.5D2.0	395	355
	4.0	11D	5.5	WW4.5D4.0	430	385
±4.5-±5.5	0.3	8B	1.9	WW5D0.3	300	270
	0.5	9C	2.2	WW5D0.5	335	300
	1.0	9C	2.2	WW5D1.0	365	325
	2.0	9D	3.1	WW5D2.0	395	355
	4.0	11D	5.5	WW5D4.0	430	385
±5.5-±6.5	0.3	8B	1.9	WW6D0.3	300	270
	0.5	9C	2.2	WW6D0.5	335	300
	1.0	9C	2.2	WW6D1.0	365	325
	2.0	9D	3.1	WW6D2.0	395	355
	4.0	11D	5.5	WW6D4.0	430	385
±6.5-±7.5	0.3	8B	1.9	WW7D0.3	300	270
	0.5	9C	2.2	WW7D0.5	335	300
	1.0	9C	2.2	WW7D1.0	365	325
	2.0	9D	3.1	WW7D2.0	395	355
	4.0	11D	5.5	WW7D4.0	430	385
±7.5-±8.5	0.3	8B	1.9	WW8D0.3	305	275
	0.5	9C	2.2	WW8D0.5	340	305
	1.0	9C	2.2	WW8D1.0	375	335
	2.0	9D	3.1	WW8D2.0	410	365
	4.0	11D	5.5	WW8D4.0	455	410
±8.5-±9.5	0.3	8B	1.9	WW9D0.3	$305	$275
	0.5	9C	2.2	WW9D0.5	340	305
	1.0	9C	2.2	WW9D1.0	375	335
	2.0	9D	3.1	WW9D2.0	410	365
	4.0	11D	5.5	WW9D4.0	455	410
±9.5-±10.5	0.3	8B	1.9	WW10D0.3	305	275
	0.5	9C	2.2	WW10D0.5	340	305
	1.0	9C	2.2	WW10D1.0	375	335
	2.0	9D	3.1	WW10D2.0	410	365
	4.0	11D	5.5	WW10D4.0	455	410
±10.5-±11.5	0.3	8B	1.9	WW11D0.3	305	275
	0.5	9C	2.2	WW11D0.5	340	305
	1.0	9C	2.2	WW11D1.0	375	335
	2.0	9D	3.1	WW11D2.0	410	365
	4.0	11D	5.5	WW11D4.0	455	410
±11-±13	0.3	8B	1.9	WW12D0.3	315	280
	0.5	9C	2.2	WW12D0.5	345	310
	1.0	9C	2.2	WW12D1.0	385	345
	2.0	9D	3.1	**WW12D2.0**	430	385
	4.0	11D	5.5	**WW12D4.0**	480	430
±13-±15	0.3	8B	1.9	WW14D0.3	315	280
	0.5	9C	2.2	WW14D0.5	345	310
	1.0	9C	2.2	WW14D1.0	385	345
	2.0	9D	3.1	WW14D2.0	430	385
	4.0	11D	5.5	WW14D4.0	535	480
±14-±16	0.3	8B	1.9	**WW15D0.3**	315	280
	0.5	9C	2.2	**WW15D0.5**	345	310
	1.0	9C	2.2	**WW15D1.0**	385	345
	2.0	9D	3.1	**WW15D2.0**	430	385
	4.0	11D	5.5	**WW15D4.0**	535	480
±15-±17	0.3	9C	2.2	WW16D0.3	315	280
	0.5	9C	2.2	WW16D0.5	345	310
	1.0	9D	3.1	WW16D1.0	385	345
	2.0	11D	5.5	WW16D2.0	460	410
	4.0	14C	8.0	WW16D4.0	535	480
±17-±19	0.3	9C	2.2	WW18D0.3	$330	$295
	0.5	9C	2.2	WW18D0.5	360	320
	1.0	9D	3.1	WW18D1.0	405	365
	2.0	11D	5.5	WW18D2.0	460	410
	4.0	14C	8.0	WW18D4.0	535	480
±19-±21	0.3	9C	2.2	WW20D0.3	330	295
	0.5	9C	2.2	WW20D0.5	360	320
	1.0	9D	3.1	WW20D1.0	405	365
	2.0	11D	5.5	WW20D2.0	490	440
	4.0	14C	8.0	WW20D4.0	585	525
±21-±23	0.3	9C	2.2	WW22D0.3	330	295
	0.5	9C	2.2	WW22D0.5	360	320
	1.0	9D	3.1	WW22D1.0	405	365
	2.0	11D	5.5	WW22D2.0	490	440
	4.0	14C	8.0	WW22D4.0	585	525
±23-±25	0.3	9C	2.2	WW24D0.3	340	305
	0.5	9C	2.2	WW24D0.5	375	335
	1.0	9D	3.1	WW24D1.0	430	385
	2.0	11D	5.5	WW24D2.0	500	450
	4.0	14C	8.0	WW24D4.0	585	525
±25-±27	0.3	9C	2.2	WW26D0.3	340	305
	0.5	9C	2.2	WW26D0.5	375	335
	1.0	9D	3.1	WW26D1.0	430	385
	2.0	11D	5.5	WW26D2.0	525	470
	4.0	14C	8.0	WW26D4.0	605	545
±27-±29	0.3	9C	2.2	WW28D0.3	340	305
	0.5	9C	2.2	WW28D0.5	375	335
	1.0	9D	3.1	WW28D1.0	430	385
	2.0	11D	5.5	WW28D2.0	525	470
	4.0	14C	8.0	WW28D4.0	605	545
±29-±31	0.3	9C	2.2	WW30D0.3	340	305
	0.5	9C	2.2	WW30D0.5	375	335
	1.0	9D	3.1	WW30D1.0	430	385
	2.0	11D	5.5	WW30D2.0	545	490
	4.0	14C	8.0	WW30D4.0	630	565

†Each Output

*See page Vol.1•593 for size charts

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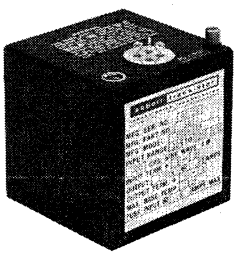
abbott 400 ⏦ to DC (Reg.) Hi-Temp.



POWER MODULES

features

- Hi-temp. +212°F.
- 5 to 740 volts
- Hermetically sealed
- Compact, low cost
- Low ripple
- For aerospace application

specifications

INPUT VOLTAGE RANGE: 105 to 125 volts AC
INPUT FREQUENCY RANGE: 380 to 420 Hertz, 1 phase
INPUT TRANSIENT PROTECTION: In accordance with MIL-STD-704A, Figure 3, Limit 1 (180 VAC for 0.1 sec.)
LINE REGULATION: ±0.2% for 105-125 VAC input, with load constant
COMBINED LINE AND LOAD REGULATION: ±0.5% for 105-125 VAC input and load variation of ½ to full load
RIPPLE: 0.2% RMS
SHORT CIRCUIT PROTECTION: Protected against short circuit conditions of any duration
VOLTAGE ADJUSTMENT RANGE: 12% by screwdriver adjustment
TEMPERATURE: +212°F (+100°C) Maximum at mounting base using adequate heat sink −65°F (−54°C) minimum at mounting base
RELIABILIIY: 70,000 hourse MTBF typical per MIL-HDBK-217 under worst case operating conditions
ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-STD-810B and MIL-E-5400K, Class 2, including: altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.
ISOLATION: Inputs, outputs, and case are isolated so that either a plus or minus output voltage polarity can be obtained
OUTPUT VOLTAGE AND CURRENT: See specific models listed

Output Voltage Range	Output Current (Amps)	Size*	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
4.7-5.3	0.400	2C	0.8	U02DS-5A	$212	$193
	1.0	3A	1.7	U05DS-5A	217	198
	2.0	3	1.8	U1DS-5A	234	213
	4.0	5	2.0	U2DS-5A	247	225
	6.0	6	2.3	U3DS-5A	261	237
	10.0	11	5.5	U5DS-5A	326	296
5.3-5.9	0.357	2C	0.8	U02DS-5.6A	212	193
	0.9	3A	1.7	U05DS-5.6A	217	198
	1.8	3	1.8	U1DS-5.6A	234	213
	3.6	5	2.0	U2DS-5.6A	247	225
	5.4	6	2.3	U3DS-5.6A	261	237
	8.91	11	5.5	U5DS-5.6A	326	296
5.9-6.6	0.318	2C	0.8	U02DS-6.3A	212	193
	0.8	3A	1.7	U05DS-6.3A	217	198
	1.6	3	1.8	U1DS-6.3A	234	213
	3.2	5	2.0	U2DS-6.3A	247	225
	4.8	6	2.3	U3DS-6.3A	261	237
	7.92	11	5.5	U5DS-6.3A	319	290
6.6-7.4	0.286	2C	0.8	U02DS-7A	212	193
	0.7	3A	1.7	U05DS-7A	217	198
	1.4	3	1.8	U1DS-7A	234	213
	2.8	5	2.0	U2DS-7A	247	225
	4.2	6	2.3	U3DS-7A	261	237
	7.15	11	5.5	U5DS-7A	319	290
7.4-8.3	0.253	2C	0.8	U02DS-7.9A	204	186
	0.63	3A	1.7	U05DS-7.9A	211	192
	1.26	3	1.8	U1DS-7.9A	229	208
	2.52	5	2.0	U2DS-7.9A	241	219
	3.78	6	2.3	U3DS-7.9A	261	237
	6.32	7	3.0	U5DS-7.9A	319	290
8.3-9.3	0.227	2C	0.8	U02DS-8.8A	204	186
	0.57	3A	1.7	U05DS-8.8A	211	192
	1.14	3	1.8	U1DS-8.8A	229	208
	2.28	5	2.0	U2DS-8.8A	241	219
	3.42	6	2.3	U3DS-8.8A	261	237
	5.68	7	3.0	U5DS-8.8A	319	290
9.3-10.4	0.202	2C	0.8	U02DS-9.9A	204	186
	0.50	3A	1.7	U05DS-9.9A	211	192
	1.00	3	1.8	U1DS-9.9A	229	208
	2.00	5	2.0	U2DS-9.9A	241	219
	3.00	6	2.3	U3DS-9.9A	255	232
	5.05	7	3.0	U5DS-9.9A	319	290
	10.10	11	5.5	U10DS-9.9A	383	349
10.4-11.6	0.182	2C	0.8	U02DS-11A	204	186
	0.45	3A	1.7	U05DS-11A	211	192
	0.91	3	1.8	U1DS-11A	229	208
	1.82	5	2.0	U2DS-11A	241	219
	2.73	6	2.3	U3DS-11A	255	232
	4.55	7	3.0	U5DS-11A	319	290
	9.10	11	5.5	U10DS-11A	383	349
11.6-13.0	0.163	2C	0.8	U02DS-12.3A	204	186
	0.40	3A	1.7	U05DS-12.3A	211	192
	0.81	3	1.8	U1DS-12.3A	229	208
	1.62	5	2.0	U2DS-12.3A	241	219
	2.43	6	2.3	U3DS-12.3A	255	232
	4.06	7	3.0	U5DS-12.3A	313	285
	8.12	11	5.5	U10DS-12.3A	371	338
	13.83	14	14.5	U17DS-12.3A	436	397
13.0-14.8	0.145	2C	0.8	U02DS-13.8A	$199	$181
	0.36	3A	1.7	U05DS-13.8A	204	186
	0.72	3	1.8	U1DS-13.8A	222	202
	1.44	5	2.0	U2DS-13.8A	234	213
	2.16	6	2.3	U3DS-13.8A	247	225
	3.62	7	3.0	U5DS-13.8A	313	285
	7.24	11	5.5	U10DS-13.8A	371	338
	12.31	14	14.5	U17DS-13.8A	436	397
14.8-16.6	0.127	2C	0.8	U02DS-15.7A	199	181
	0.32	3A	1.7	U05DS-15.7A	204	186
	0.64	3	1.8	U1DS-15.7A	222	202
	1.28	5	2.0	U2DS-15.7A	234	213
	1.92	6	2.3	U3DS-15.7A	247	225
	3.18	7	3.0	U5DS-15.7A	313	285
	6.36	11	5.5	U10DS-15.7A	359	327
	10.81	14	14.5	U17DS-15.7A	424	386
16.6-18.6	0.114	2C	0.8	U02DS-17.6A	199	181
	0.28	3A	1.7	U05DS-17.6A	204	186
	0.57	3	1.8	U1DS-17.6A	222	202
	1.14	5	2.0	U2DS-17.6A	234	213
	1.71	6	2.3	U3DS-17.6A	247	225
	2.84	7	3.0	U5DS-17.6A	313	285
	5.68	11	5.5	U10DS-17.6A	359	327
	9.65	14	14.5	U17DS-17.6A	424	386
18.6-20.8	0.101	2C	0.8	U02DS-19.7A	199	181
	0.255	3A	1.7	U05DS-19.7A	204	186
	0.510	3	1.8	U1DS-19.7A	222	202
	1.02	5	2.0	U2DS-19.7A	234	213
	1.53	6	2.3	U3DS-19.7A	247	225
	2.54	7	3.0	U5DS-19.7A	307	279
	5.08	11	5.5	U10DS-19.7A	359	327
	8.62	14	14.5	U17DS-19.7A	424	386
20.8-23.3	0.098	2C	0.8	U02DS-22A	193	176
	0.230	3A	1.7	U05DS-22A	199	181
	0.460	3	1.8	U1DS-22A	214	195
	0.920	5	2.0	U2DS-22A	229	208
	1.38	6	2.3	U3DS-22A	241	219
	2.27	7	3.0	U5DS-22A	307	279
	4.54	11	5.5	U10DS-22A	353	321
	7.72	14	14.5	U17DS-22A	413	376
23.3-26.1	0.081	2C	0.8	U02DS-24.7A	193	176
	0.205	3A	1.7	U05DS-24.7A	199	181
	0.410	3	1.8	U1DS-24.7A	214	195
	0.820	5	2.0	U2DS-24.7A	229	208
	1.23	6	2.3	U3DS-24.7A	241	219
	2.02	7	3.0	U5DS-24.7A	307	279
	4.04	11	5.5	U10DS-24.7A	353	321
	6.88	14	14.5	U17DS-24.7A	413	376
26.1-29.2	0.073	2C	0.8	U02DS-27.6A	193	176
	0.180	3A	1.7	U05DS-27.6A	199	181
	0.360	3	1.8	U1DS-27.6A	214	195
	0.720	5	2.0	U2DS-27.6A	229	208
	1.08	6	2.3	U3DS-27.6A	241	219
	1.81	7	3.0	U5DS-27.6A	307	279
	3.62	11	5.5	U10DS-27.6A	342	311
	6.16	14	14.5	U17DS-27.6A	401	365
29.2-32.6	0.065	2C	0.8	U02DS-31A	$193	$176
	0.160	3A	1.7	U05DS-31A	199	181
	0.320	3	1.8	U1DS-31A	214	195
	0.640	5	2.0	U2DS-31A	229	208
	0.960	6	2.3	U3DS-31A	241	219
	1.61	7	3.0	U5DS-31A	307	279
	3.22	11	5.5	U10DS-31A	359	327
	5.48	14	14.5	U17DS-31A	424	386
32.6-36.5	0.058	2C	0.8	U02DS-34.6A	193	176
	0.145	3A	1.7	U05DS-34.6A	199	181
	0.290	3	1.8	U1DS-34.6A	214	195
	0.580	5	2.0	U2DS-34.6A	229	208
	0.870	6	2.3	U3DS-34.6A	241	219
	1.44	7	3.0	U5DS-34.6A	307	279
	2.88	11	5.5	U10DS-34.6A	383	349
	4.91	14	14.5	U17DS-34.6A	444	404
36.5-40.9	0.052	2C	0.8	U02DS-38.7A	193	176
	0.130	3A	1.7	U05DS-38.7A	199	181
	0.260	3	1.8	U1DS-38.7A	214	195
	0.520	5	2.0	U2DS-38.7A	229	208
	0.780	6	2.3	U3DS-38.7A	247	225
	1.29	7	3.0	U5DS-38.7A	313	285
	2.58	11	5.5	U10DS-38.7A	409	372
	4.39	14	14.5	U17DS-38.7A	469	427
40.9-45.8	0.046	2C	0.8	U02DS-43.3A	193	176
	0.115	3A	1.7	U05DS-43.3A	199	181
	0.230	3	1.8	U1DS-43.3A	214	195
	0.460	5	2.0	U2DS-43.3A	229	208
	0.690	6	2.3	U3DS-43.3A	247	225
	1.15	7	3.0	U5DS-43.3A	313	285
	2.30	11	5.5	U10DS-43.3A	427	389
	3.92	14	14.5	U17DS-43.3A	491	447
45.8-51.4	0.041	2C	0.8	U02DS-48.6A	199	181
	0.103	3A	1.7	U05DS-48.6A	204	186
	0.206	3	1.8	U1DS-48.6A	222	202
	0.412	5	2.0	U2DS-48.6A	234	213
	0.618	6	2.3	U3DS-48.6A	255	232
	1.03	7	3.0	U5DS-48.6A	319	290
	2.06	11	5.5	U10DS-48.6A	452	411
	3.49	14	14.5	U17DS-48.6A	512	466
51.4-59.0	0.036	2C	0.8	U02DS-55.2A	217	198
	0.091	3A	1.7	U05DS-55.2A	223	203
	0.182	3	1.8	U1DS-55.2A	241	219
	0.364	5	2.0	U2DS-55.2A	255	232
	0.546	6	2.3	U3DS-55.2A	267	243
	0.905	7	3.0	U5DS-55.2A	326	296
	1.81	11	5.5	U10DS-55.2A	452	411
	3.07	14	14.5	U17DS-55.2A	512	466
59.0-740.0	174 other standard models are available available with output voltages between 59.0 and 740.0 Vdc at output power ratings of 2, 5, 10, 20, 30, 50, 100 or 170 watts. For complete information, please consult one of the offices listed below.					

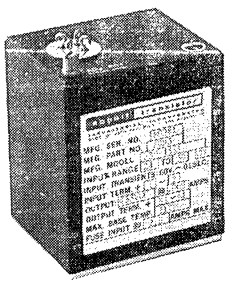
*See page Vol.1•593 for size charts

abbott transistor LABORATORIES, INCORPORATED

general offices
5200 W. Jefferson Blvd., Los Angeles, Calif. 90016
(213) 936-8185 Telex: 69-1398

eastern office
1224 Anderson Avenue, Fort Lee, New Jersey 07024
(201) 224-6900 Telex: 13-5332

abbott 28 VDC to DC (Reg.) Hi-Temp.



POWER MODULES

features

- Hi-temp. +212°F.
- 5 to 740 volts
- Hermetically sealed
- Short circuit protection
- Input spike protection

specifications

Input Voltage Range
24 to 30 volts DC

Line Regulation
±0.2% for input 24 to 30 VDC

Voltage Regulation
±1.5% for input 24 to 30 VDC and from ½ load to full load on Model B's
±2.5% for input 24 to 30 VDC and from ½ load to full load on Model BL's

Ripple
0.5 RMS — Model B's
1.0% RMS — Model BL's

Voltage Adjustment Range
12% by screwdriver adjustment

Input Transient Protection
In accordance with MIL-STD-704A, Limit 1, Category B (80 volts for 0.1 sec.)

Reliability
120,000 hours MTBF typical per MIL-HDBK-217 under worst case operating conditions

Environment
+212°F max. at mounting base using adequate heat sink
−65°F min. at mounting surface
Altitude: To vacuum (true hermetic seal). Vibration, shock, sand, dust, humidity, salt-spray, fungus, sunshine, rain, and explosion to MIL-STD-810B and MIL-E-5400K, Class 2

Output Voltage and Current
See specific models listed
(Outputs and inputs are isolated)

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
4.7-5.3	0.400	1B	0.5	BL02D-5A	$218	$197
	1.0	1A	0.9	BL05D-5A	231	208
	2.0	1	1.0	BL1D-5A	253	230
	4.0	2	1.1	BL2D-5A	279	254
	6.0	4	1.3	BL3D-5A	299	272
	10.0	6A	2.5	BL5D-5A	344	313
5.3-5.9	0.357	1B	0.5	BL02D-5.6A	212	191
	0.9	1A	0.9	BL05D-5.6A	225	203
	1.8	1	1.0	BL1D-5.6A	247	225
	3.6	2	1.1	BL2D-5.6A	267	243
	5.4	4	1.3	BL3D-5.6A	293	266
	8.91	6A	2.5	BL5D-5.6A	339	308
5.9-6.6	0.318	1B	0.5	BL02D-6.3A	212	191
	0.8	1A	0.9	BL05D-6.3A	225	203
	1.6	1	1.0	BL1D-6.3A	247	225
	3.2	2	1.1	BL2D-6.3A	267	243
	4.8	4	1.3	BL3D-6.3A	293	266
	7.92	6	1.9	BL5D-6.3A	339	308
6.6-7.4	0.286	1B	0.5	BL02D-7A	212	191
	0.7	1A	0.9	BL05D-7A	225	203
	1.4	1	1.0	BL1D-7A	247	225
	2.8	2	1.1	BL2D-7A	267	243
	4.2	4	1.3	BL3D-7A	286	260
	7.15	6	1.9	BL5D-7A	331	301
7.4-8.3	0.253	1B	0.5	BL02D-7.9A	212	191
	0.63	1A	0.9	B05D-7.9A	225	203
	1.26	1	1.0	BL1D-7.9A	247	225
	2.52	2	1.1	BL2D-7.9A	267	243
	3.78	4	1.3	BL3D-7.9A	286	260
	6.32	6	1.9	BL5D-7.9A	331	301
8.3-9.3	0.227	1B	0.5	BL02D-8.8A	212	191
	0.57	1A	0.9	B05D-8.8A	225	203
	1.14	1	1.0	BL1D-8.8A	240	218
	2.28	2	1.1	BL2D-8.8A	260	236
	3.42	4	1.3	BL3D-8.8A	279	254
	5.68	6	1.9	BL5D-8.8A	324	295
9.3-10.4	0.202	1B	0.5	B02D-9.9A	206	186
	0.50	1A	0.9	B05D-9.9A	218	197
	1.00	1	1.0	BL1D-9.9A	240	218
	2.00	2	1.1	BL2D-9.9A	253	230
	3.00	4	1.3	BL3D-9.9A	273	248
	5.05	6	1.9	BL5D-9.9A	324	295
	10.10	11	3.7	BL10D-9.9A	365	329
10.4-11.6	0.182	1B	0.5	B02D-11A	206	186
	0.45	1A	0.9	B05D-11A	218	197
	0.91	1	1.0	BL1D-11A	234	213
	1.82	2	1.1	BL2D-11A	247	225
	2.73	4	1.3	BL3D-11A	273	248
	4.55	6	1.9	BL5D-11A	319	290
	9.10	11	3.7	BL10D-11A	362	326
11.6-13.0	0.163	1B	0.5	B02D-12.3A	206	186
	0.40	1A	0.9	B05D-12.3A	218	197
	0.81	1	1.0	BL1D-12.3A	234	213
	1.62	2	1.1	BL2D-12.3A	253	230
	2.43	4	1.3	BL3D-12.3A	273	248
	4.06	6	1.9	BL5D-12.3A	311	283
	8.12	11	3.7	BL10D-12.3A	350	315
	13.83	14	10.3	BL17D-12.3A	465	419
13.0-14.8	0.145	1B	0.5	B02D-13.8A	206	186
	0.36	1A	0.9	B05D-13.8A	218	197
	0.72	1	1.0	BL1D-13.8A	234	213
	1.44	2	1.1	BL2D-13.8A	267	243
	2.16	4	1.3	BL3D-13.8A	279	254
	3.62	6	1.9	BL5D-13.8A	305	277
	7.24	11	3.7	BL10D-13.8A	343	309
	12.31	14	10.3	BL17D-13.8A	409	369
14.8-16.6	0.127	1B	0.5	B02D-15.7A	$206	$186
	0.32	1A	0.9	B05D-15.7A	218	197
	0.64	1	1.0	BL1D-15.7A	234	213
	1.28	2	1.1	BL2D-15.7A	267	243
	1.92	4	1.3	BL3D-15.7A	279	254
	3.18	6	1.9	BL5D-15.7A	305	277
	6.36	11	3.7	BL10D-15.7A	337	304
	10.81	14	10.3	BL17D-15.7A	398	359
16.6-18.6	0.114	1B	0.5	B02D-17.6A	200	180
	0.28	1A	0.9	B05D-17.6A	212	191
	0.57	1	1.0	BL1D-17.6A	228	207
	1.14	2	1.1	BL2D-17.6A	260	236
	1.71	4	1.3	BL3D-17.6A	267	243
	2.84	6	1.9	BL5D-17.6A	299	272
	5.68	11	3.7	BL10D-17.6A	331	298
	9.65	14	10.3	BL17D-17.6A	392	353
18.6-20.8	0.101	1B	0.5	B02D-19.7A	200	180
	0.255	1A	0.9	B05D-19.7A	212	191
	0.510	1	1.0	BL1D-19.7A	228	207
	1.02	2	1.1	BL2D-19.7A	260	236
	1.63	4	1.3	BL3D-19.7A	267	243
	2.54	6	1.9	BL5D-19.7A	286	260
	5.08	11	3.7	BL10D-19.7A	331	298
	8.62	14	10.3	BL17D-19.7A	392	353
20.3-23.3	0.091	1B	0.5	B02D-22A	193	174
	0.230	1A	0.9	B05D-22A	206	186
	0.460	1	1.0	BL1D-22A	221	201
	0.920	2	1.1	BL2D-22A	253	230
	1.38	4	1.3	BL3D-22A	260	236
	2.27	6	1.9	BL5D-22A	286	260
	4.54	11	3.7	BL10D-22A	331	298
	7.72	14	10.3	BL17D-22A	392	353
23.3-26.1	0.081	1B	0.5	B02D-24.7A	193	174
	0.205	1A	0.9	B05D-24.7A	206	186
	0.410	1	1.0	BL1D-24.7A	221	201
	0.820	2	1.1	BL2D-24.7A	253	230
	1.23	4	1.3	BL3D-24.7A	260	236
	2.02	6	1.9	BL5D-24.7A	286	260
	4.04	11	3.7	BL10D-24.7A	331	298
	6.88	14	10.3	BL17D-24.7A	392	353
26.1-29.2	0.073	1B	0.5	B02D-27.6A	193	174
	0.180	1A	0.9	B05D-27.6A	206	186
	0.360	1	1.0	BL1D-27.6A	221	201
	0.720	2	1.1	BL2D-27.6A	247	225
	1.08	4	1.3	BL3D-27.6A	260	236
	1.81	6	1.9	BL5D-27.6A	286	260
	3.62	11	3.7	BL10D-27.6A	331	298
	6.16	14	10.3	BL17D-27.6A	392	353
29.2-32.6	0.065	1B	0.5	B02D-31A	193	174
	0.160	1A	0.9	B05D-31A	206	186
	0.320	1	1.0	B1D-31A	221	201
	0.640	2	1.1	B2D-31A	240	218
	0.960	4	1.3	BL3D-31A	260	236
	1.61	6	1.9	BL5D-31A	286	260
	3.22	11	3.7	BL10D-31A	331	298
	5.48	14	10.3	BL17D-31A	392	353
32.6-36.5	0.058	1B	0.5	B02D-34.6A	193	174
	0.145	1A	0.9	B05-34.6A	206	186
	0.290	1	1.0	B1D-34.6A	221	201
	0.580	2	1.1	B2D-34.6A	228	207
	0.870	4	1.3	BL3D-34.6A	260	236
	1.44	6	1.9	BL5D-34.6A	286	260
	2.88	11	3.7	BL10D-34.6A	331	298
	4.91	14	10.3	BL17D-34.6A	392	353
36.5-40.9	0.052	1B	0.5	B02D-38.7A	$193	$174
	0.130	1A	0.9	B05D-38.7A	206	186
	0.260	1	1.0	B1D-38.7A	221	201
	0.520	2	1.1	B2D-38.7A	228	207
	0.780	4	1.3	BL3D-38.7A	260	236
	1.29	6	1.9	BL5D-38.7A	286	260
	2.58	11	3.7	BL10D-38.7A	331	298
	4.39	14	10.3	BL17D-38.7A	392	353
40.9-45.8	0.046	1B	0.5	B02D-43.3A	193	174
	0.155	1A	0.9	B05D-43.3A	206	186
	0.230	1	1.0	B1D-43.3A	221	201
	0.460	2	1.1	B2D-43.3A	228	207
	0.690	4	1.3	BL3D-43.3A	260	236
	1.15	6	1.9	BL5D-43.3A	286	260
	2.30	11	3.7	BL10D-43.3A	331	298
	3.92	14	10.3	BL17D-43.3A	392	353
45.8-51.4	0.041	1B	0.5	B02D-48.6A	193	174
	0.108	1A	0.9	B05D-48.6A	206	186
	0.206	1	1.0	B1D-48.6A	221	201
	0.412	2	1.1	B2D-48.6A	228	207
	0.618	4	1.3	B3D-48.6A	260	236
	1.03	6	1.9	BL5D-48.6A	286	260
	2.06	11	3.7	BL10D-48.6A	331	298
	3.49	14	10.3	BL17D-48.6A	392	353
51.4-59.0	0.036	1B	0.5	B02D-55.2A	193	174
	0.091	1A	0.9	B05D-55.2A	206	186
	0.182	1	1.0	B1D-55.2A	221	201
	0.364	2	1.1	B2D-55.2A	228	207
	0.546	4	1.3	B3D-55.2A	260	236
	0.905	6	1.9	BL5D-55.2A	286	260
	1.81	11	3.7	BL10D-55.2A	331	298
	3.07	14	10.3	BL17D-55.2A	392	353
59.0-66.0	0.032	1B	0.5	B02D-63A	193	174
	0.080	1A	0.9	B05D-63A	206	186
	0.160	1	1.0	B1D-63A	221	201
	0.320	2	1.1	B2D-63A	228	207
	0.480	4	1.3	B3D-63A	260	236
	0.795	6	1.9	BL5D-63A	286	260
	1.59	11	3.7	BL10D-63A	331	298
	2.69	14	10.3	BL17D-63A	392	353
66.0-74.0	0.029	1B	0.5	B02D-70A	193	174
	0.071	1A	0.9	B05D-70A	206	186
	0.143	1	1.0	B1D-70A	221	201
	0.286	2	1.1	B2D-70A	228	207
	0.429	4	1.3	B3D-70A	253	230
	0.715	6	1.9	BL5D-70A	279	254
	1.43	11	3.7	BL10D-70A	331	298
	2.42	14	10.3	BL17D-70A	392	353
74.0-83.0	0.025	1B	0.5	B02D-79A	193	174
	0.063	1A	0.9	B05D-79A	206	186
	0.127	1	1.0	B1D-79A	221	201
	0.254	2	1.1	B2D-79A	228	207
	0.381	4	1.3	B3D-79A	253	230
	0.634	6	1.9	BL5D-79A	267	243
	1.27	11	3.7	BL10D-79A	331	298
	2.15	14	10.3	BL17D-79A	392	353
83.0-740.0	150 other standard models are available with output voltages between 83.0 and 740.0 Vdc at output power ratings of 2, 5, 10, 20, 30, 50, 100 or 170 watts. For complete information, please consult one of the offices listed below.					

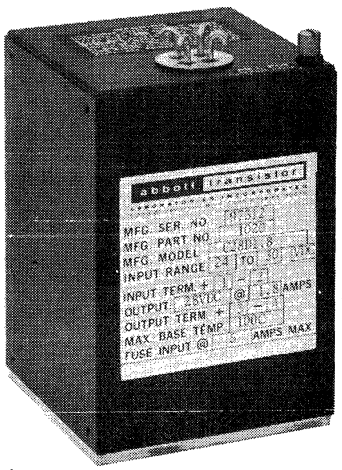
*See page Vol.1•593 for size charts

abbott transistor LABORATORIES, INCORPORATED

general offices
5200 W. Jefferson Blvd., Los Angeles, Calif. 90016
(213) 936-8185 Telex: 69-1398

eastern office
1224 Anderson Avenue, Fort Lee, New Jersey 07024
(201) 224-6900 Telex: 13-5332

abbott 28 VDC to DC Hi-Performance



features

- Low Peak-to-Peak Ripple
- RFI/EMI to MIL-STD-461
- Small
- Hermetically Sealed
- +100°C Operation
- 0.1% Regulation

specifications

INPUT VOLTAGE RANGE: 24 to 30 vdc.

LINE REGULATION: 0.1% or 10 mv (whichever is greater) for input change of 24 to 30 vdc with load constant.

LOAD REGULATION: 0.1% or 20 mv (whichever is greater) for load change of no load to full load with line constant.

RIPPLE: 0.02% or 5 mv RMS (whichever is greater) 50 mv peak-to-peak maximum, measured with scope having a bandwidth of 25 MHz.

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the table by means of an externally accessible screwdriver adjustment potentiometer.

ADJUSTMENT RESOLUTION:

Nominal Output Voltage	Resolution
5 thru 16 vdc	35 mv max.
18 thru 50 vdc	60 mv max.
55 thru 95 vdc	90 mv max.

ISOLATION VOLTAGE: 200 volts DC between input and output, input and case, and output and case.

INSULATION RESISTANCE: 50 megohms minimum at 50 volts DC between input and output, input and case, and output and case.

POLARITY: Inputs and outputs are isolated; either positive or negative side may be grounded.

TEMPERATURE RANGE: Operating: −55°C to +100°C maximum at center of mounting base.
Storage: −55°C to +125°C.

TEMPERATURE COEFFICIENT: 0.03% per degree centigrade maximum.

ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-STD-810B and MIL-E-5400K, Class 2, including altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, salt spray, fungus, explosion, etc.

SHORT CIRCUIT PROTECTION
Each unit is completely protected against an overload or short circuit of any duration. The output voltage automatically restores to normal when the overload is removed.

INPUT TRANSIENT PROTECTION: MIL-STD-704A, Limit 1, Category B (80 volts for 0.1 sec.).

OVER VOLTAGE PROTECTION: Over voltage protection modules are available for use with these units. Please consult the factory.

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 100 microseconds after a 50% step change in load current.

OUTPUT IMPEDANCE:
DC to 1 K Hz — 0.004 R_L or 0.04 ohm max.
1K Hz to 10K Hz — 0.015 R_L or 0.15 ohms max.
10K Hz to 100K Hz — 0.030 R_L or 0.50 ohms max.
R_L = Rated Load.

ELECTROMAGNETIC INTERFERENCE: Built to meet the requirements of MIL-STD-461 for generation of and susceptability to radiated and conducted interference.

RELIABILITY: The mean time between failure (MTFB) per MIL-HDBK-217 under worst case operating conditions of full rated output current, 30 vdc input voltage, and +100°C base plate temperature, ranges from 41,305 hours for Model C5D10 to 55,463 for Model C95D0.25.

*DELIVERY FROM STOCK**

Output Voltage Range	Output Curr. (Amps)	Size†	Wt. (Lbs.)	Model Number	Price 1 pc.	Price 2-4 pcs.
4.5-5.5	2.5	2D	1.2	**C5D2.5**	$291	$265
	5.0	6B	1.7	**C5D5.0**	319	290
	10.0	7A	2.6	**C5D10**	395	359
5.5-6.5	2.5	2D	1.2	**C6D2.5**	291	265
	5.0	6B	1.7	**C6D5.0**	319	290
	10.0	7A	2.6	**C6D10**	395	359
6.5-7.5	2.5	2D	1.2	**C7D2.5**	291	265
	5.0	6B	1.7	**C7D5.0**	319	290
	10.0	7A	2.6	**C7D10**	395	359
7.5-8.5	1.8	2D	1.2	**C8D1.8**	291	265
	3.5	6B	1.7	**C8D3.5**	319	290
	7.5	7A	2.6	**C8D7.5**	395	359
8.5-9.5	1.8	2D	1.2	**C9D1.8**	291	265
	3.5	6B	1.7	**C9D3.5**	319	290
	7.5	7A	2.6	**C9D7.5**	395	359
9.5-10.5	1.8	2D	1.2	**C10D1.8**	291	265
	3.5	6B	1.7	**C10D3.5**	319	290
	7.5	7A	2.6	**C10D7.5**	395	359
0.5-11.5	1.8	2D	1.2	**C11D1.8**	291	265
	3.5	6B	1.7	**C11D3.5**	319	290
	7.5	7A	2.6	**C11D7.5**	395	359
11-13	1.2	2D	1.2	**C12D1.2**	291	265
	2.5	6B	1.7	**C12D2.5**	319	290
	5.0	7A	2.6	**C12D5.0**	395	359
13-15	1.2	2D	1.2	**C14D1.2**	291	265
	2.5	6B	1.7	**C14D2.5**	319	290
	5.0	7A	2.6	**C14D5.0**	395	359
14-16	1.2	2D	1.2	**C15D1.2**	291	265
	2.5	6B	1.7	**C15D2.5**	319	290
	5.0	7A	2.6	**C15D5.0**	395	359
15-17	1.2	2D	1.2	**C16D1.2**	291	265
	2.5	6B	1.7	**C16D2.5**	319	290
	5.0	7A	2.6	**C16D5.0**	395	359
17-19	1.2	2D	1.2	**C18D1.2**	$291	$265
	2.5	6B	1.7	**C18D2.5**	319	290
	5.0	7A	2.6	**C18D5.0**	395	359
19-21	0.8	2D	1.2	**C20D0.8**	291	265
	1.8	6B	1.7	**C20D1.8**	319	290
	3.5	7A	2.6	**C20D3.5**	395	359
21-23	0.8	2D	1.2	**C22D0.8**	291	265
	1.8	6B	1.7	**C22D1.8**	319	290
	3.5	7A	2.6	**C22D3.5**	395	359
23-25	0.8	2D	1.2	**C24D0.8**	291	265
	1.8	6B	1.7	**C24D1.8**	319	290
	3.5	7A	2.6	**C24D3.5**	395	359
25-27	0.8	2D	1.2	**C26D0.8**	291	265
	1.8	6B	1.7	**C26D1.8**	319	290
	3.5	7A	2.6	**C26D3.5**	395	359
27-29	0.8	2D	1.2	**C28D0.8**	291	265
	1.8	6B	1.7	**C28D1.8**	319	290
	3.5	7A	2.6	**C28D3.5**	395	359
29-31	0.6	2D	1.2	**C30D0.6**	291	265
	1.2	6B	1.7	**C30D1.2**	319	290
	2.5	7A	2.6	**C30D2.5**	395	359
31-33	0.6	2D	1.2	C32D0.6	291	265
	1.2	6B	1.7	C32D1.2	319	290
	2.5	7A	2.6	C32D2.5	395	359
33-35	0.6	2D	1.2	C34D0.6	291	265
	1.2	6B	1.7	C34D1.2	319	290
	2.5	7A	2.6	C34D2.5	395	359
35-37	0.6	2D	1.2	C36D0.6	291	265
	1.2	6B	1.7	C36D1.2	319	290
	2.5	7A	2.6	C36D2.5	395	359
37-39	0.6	2D	1.2	C38D0.6	291	265
	1.2	6B	1.7	C38D1.2	319	290
	2.5	7A	2.6	C38D2.5	395	359
39-41	0.5	2D	1.2	C40D0.5	$291	$265
	0.8	6B	1.7	C40D0.8	319	290
	1.8	7A	2.6	C40D1.8	395	359
41-43	0.5	2D	1.2	C42D0.5	291	265
	0.8	6B	1.7	C42D0.8	319	290
	1.8	7A	2.6	C42D1.8	395	359
43-45	0.5	2D	1.2	C44D0.5	291	265
	0.8	6B	1.7	C44D0.8	319	290
	1.8	7A	2.6	C44D1.8	395	359
45-47	0.5	2D	1.2	C46D0.5	291	265
	0.8	6B	1.7	C46D0.8	319	290
	1.8	7A	2.6	C46D1.8	395	359
47-49	0.5	2D	1.2	C48D0.5	291	265
	0.8	6B	1.7	C48D0.8	319	290
	1.8	7A	2.6	C48D1.8	395	359
49-51	0.5	2D	1.2	C50D0.5	291	265
	0.8	6B	1.7	C50D0.8	319	290
	1.8	7A	2.6	C50D1.8	395	359
50-60	0.25	2D	1.2	C55D0.25	277	252
	0.5	6B	1.7	C55D0.5	319	290
	1.0	7A	2.6	C55D1.0	395	359
60-70	0.25	2D	1.2	C65D0.25	277	252
	0.5	6B	1.7	C65D0.5	319	290
	1.0	7A	2.6	C65D1.0	395	359
70-80	0.25	2D	1.2	C75D0.25	277	252
	0.5	6B	1.7	C75D0.5	319	290
	1.0	7A	2.6	C75D1.0	395	359
80-90	0.25	2D	1.2	C85D0.25	277	252
	0.5	6B	1.7	C85D0.5	319	290
	1.0	7A	2.6	C85D1.0	395	359
90-100	0.25	2D	1.2	C95D0.25	277	252
	0.5	6B	1.7	C95D0.5	319	290
	1.0	7A	2.6	C95D1.0	395	359

* All models with output voltages from 5 to 30 VDC are normally available from stock.
† See page Vol.1•593 for size charts

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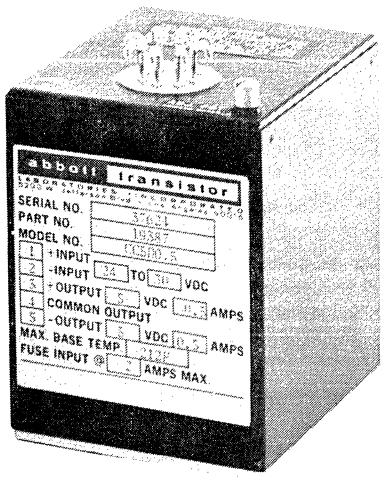
abbott 28 VDC to DC Dual Output



features

- 1% Tracking Accuracy
- 0.2% Regulation
- Low Peak-To-Peak Ripple
- RFI/EMI to MIL-STD-461
- Hermetically Sealed
- +100°C Operation

specifications

INPUT VOLTAGE RANGE: 24 to 30 vdc.

LINE REGULATION: 0.2% or 10 mv (whichever is greater) for input change of 24 to 30 vdc with load constant.

LOAD REGULATION: 0.2% or 20 mv (whichever is greater) for load change of no load to full load with line

RIPPLE: 0.02% or 5 mv RMS (whichever is greater), 50 mv peak-to-peak maximum for each output, measured with scope having bandwidth of 25 MHz.

TRACKING ACCURACY: The negative output will track the positive output to within 1.0% or 100 mv (whichever is greater) for all rated conditions of input voltage, output current, operating temperature, and output voltage adjustment.

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the table by means of an externally accessible screwdriver adjustment potentiometer.

ADJUSTMENT RESOLUTION: 25 mv for outputs up to ±4.5 vdc; 35 mv for outputs ±5.0 to ±15 vdc; 60 mv for outputs ±16 vdc and above.

ISOLATION VOLTAGE: 200 volts DC between input and output, input and case, and output and case.

INSULATION RESISTANCE: 50 megohms minimum at 50 volts DC between input and output, input and case, and output and case.

POLARITY: Inputs and outputs are isolated; either positive or negative side may be grounded.

TEMPERATURE RANGE: Operating: −55°C to +100°C maximum at center of mounting base. Storage: −55°C to +125°C.

TEMPERATURE COEFFICIENT: 0.03% per degree centrigrade maximum.

ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-STD-810B and MIL-E-5400K, Class 2, including altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration. The output voltage automatically restores to normal when the overload is removed.

INPUT TRANSIENT PROTECTION: In accordance with MIL-STD-704A, Figure 9, Limit 1 (80 vdc for 0.1 sec.).

OVERVOLTAGE PROTECTION: Overvoltage protection modules are available for use with these units. Please consult the factory.

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 200 microseconds after a 50% step change in load current.

ELECTROMAGNETIC INTERFERENCE: Built to meet the requirements of MIL-STD-461 for generation of and susceptability to radiated and conducted interference.

RELIABILITY: The mean time between failure (MTBF) per MIL-HDBK-217 under worst case operating conditions of full rated output current, 30 vdc input voltage, and +100°C base plate temperature, range from 20,105 hours for Model CC30D3.5 to 34,710 for Model CC3D3.5.

OUTPUT IMPEDANCE:

	RATED OUTPUT CURRENT (amps)			
	0.5	1.0	2.0	3.5
DC-1 KHz	0.15Ω	0.1Ω	0.08Ω	0.04Ω
1 KHz-10 KHz	0.4Ω	0.3Ω	0.2Ω	0.1Ω
10 KHz-100 KHz	0.5Ω	0.5Ω	0.5Ω	0.3Ω

DELIVERY FROM STOCK*

* Models in bold type are normally in stock.

Output Voltage Range	Output Current (Amps)*	Size†	Wt. (Lbs.)	Model Number	Price 1 pc.	Price 2-4 pcs.
±2.75-±3.25	0.5	10C	2.3	CC3D0.5	$340	$305
	1.0	10C	2.3	CC3D1.0	370	330
	2.0	10D	2.5	CC3D2.0	395	355
	3.5	11E	3.9	CC3D3.5	440	395
±3.25-±3.75	0.5	10C	2.3	CC3.5D0.5	340	305
	1.0	10C	2.3	CC3.5D1.0	370	330
	2.0	10D	2.5	CC3.5D2.0	395	355
	3.5	11E	3.9	CC3.5D3.5	440	395
±3.75-±4.25	0.5	10C	2.3	CC4D0.5	340	305
	1.0	10C	2.3	CC4D1.0	370	330
	2.0	10D	2.5	CC4D2.0	395	355
	3.5	11E	3.9	CC4D3.5	440	395
±4.25-±4.75	0.5	10C	2.3	CC4.5D0.5	340	305
	1.0	10C	2.3	CC4.5D1.0	370	330
	2.0	10D	2.5	CC4.5D2.0	395	355
	3.5	11E	3.9	CC4.5D3.5	440	395
±4.5-±5.5	0.5	10C	2.3	CC5D0.5	340	305
	1.0	10C	2.3	CC5D1.0	370	330
	2.0	10D	2.5	CC5D2.0	395	355
	3.5	11E	3.9	CC5D3.5	440	395
±5.5-±6.5	0.5	10C	2.3	CC6D0.5	345	310
	1.0	10C	2.3	CC6D1.0	375	335
	2.0	10D	2.5	CC6D2.0	410	370
	3.5	11E	3.9	CC6D3.5	465	420
±6.5-±7.5	0.5	10C	2.3	CC7D0.5	345	310
	1.0	10C	2.3	CC7D1.0	375	335
	2.0	10D	2.5	CC7D2.0	410	370
	3.5	11E	3.9	CC7D3.5	465	420
±7.5-±8.5	0.5	10C	2.3	CC8D0.5	345	310
	1.0	10C	2.3	CC8D1.0	375	335
	2.0	10D	2.5	CC8D2.0	410	370
	3.5	11E	3.9	CC8D3.5	465	420
±8.5-±9.5	0.5	10C	2.3	CC9D0.5	$345	$310
	1.0	10C	2.3	CC9D1.0	375	335
	2.0	10D	2.5	CC9D2.0	410	370
	3.5	11E	3.9	CC9D3.5	465	420
±9.5-±10.5	0.5	10C	2.3	CC10D0.5	345	310
	1.0	10C	2.3	CC10D1.0	375	335
	2.0	10D	2.5	CC10D2.0	410	370
	3.5	11E	3.9	CC10D3.5	465	420
±10.5-±11.5	0.5	10C	2.3	CC11D0.5	345	310
	1.0	10C	2.3	CC11D1.0	375	335
	2.0	10D	2.5	CC11D2.0	410	370
	3.5	11E	3.9	CC11D3.5	465	420
±11-±13	0.5	10C	2.3	CC12D0.5	350	315
	1.0	10C	2.3	CC12D1.0	380	340
	2.0	10D	2.5	CC12D2.0	430	385
	3.5	11E	3.9	CC12D3.5	500	450
±13-±15	0.5	10C	2.3	CC14D0.5	350	315
	1.0	10C	2.3	CC14D1.0	380	340
	2.0	10D	2.5	CC14D2.0	430	385
	3.5	11E	3.9	CC14D3.5	500	450
±14-±16	0.5	10C	2.3	**CC15D0.5**	350	315
	1.0	10C	2.3	**CC15D1.0**	380	340
	2.0	10D	2.5	**CC15D2.0**	430	385
	3.5	11E	3.9	CC15D3.5	500	450
±15-±17	0.5	10C	2.3	CC16D0.5	360	320
	1.0	10D	2.5	CC16D1.0	390	350
	2.0	11E	3.9	CC16D2.0	445	400
	3.5	14D	7.9	CC16D3.5	530	475
±17-±19	0.5	10C	2.3	CC18D0.5	$360	$320
	1.0	10D	2.5	CC18D1.0	390	350
	2.0	11E	3.9	CC18D2.0	445	400
	3.5	14D	7.9	CC18D3.5	530	475
±19-±21	0.5	10C	2.3	CC20D0.5	360	320
	1.0	10D	2.5	CC20D1.0	390	350
	2.0	11E	3.9	CC20D2.0	445	400
	3.5	14D	7.9	CC20D3.5	530	475
±21-±23	0.5	10C	2.3	CC22D0.5	365	325
	1.0	10D	2.5	CC22D1.0	400	360
	2.0	11E	3.9	CC22D2.0	465	420
	3.5	14D	7.9	CC22D3.5	545	490
±23-±25	0.5	10C	2.3	CC24D0.5	365	325
	1.0	10D	2.5	CC24D1.0	400	360
	2.0	11E	3.9	CC24D2.0	465	420
	3.5	14D	7.9	CC24D3.5	545	490
±25-±27	0.5	10C	2.3	CC26D0.5	370	330
	1.0	10D	2.5	CC26D1.0	410	370
	2.0	11E	3.9	CC26D2.0	490	440
	3.5	14D	7.9	CC26D3.5	570	515
±27-±29	0.5	10C	2.3	CC28D0.5	370	330
	1.0	10D	2.5	CC28D1.0	410	370
	2.0	11E	3.9	CC28D2.0	490	440
	3.5	14D	7.9	CC28D3.5	570	515
±29-±31	0.5	10C	2.3	CC30D0.5	375	335
	1.0	10D	2.5	CC30D1.0	420	380
	2.0	11E	3.9	CC30D2.0	510	460
	3.5	14D	7.9	CC30D3.5	595	535

† Each Output

*See page Vol.1•593 for size charts

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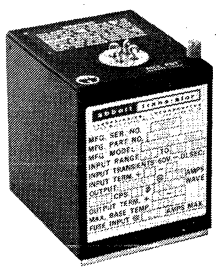
abbott DC to Sine Wave 1 ∅



DC to 400 Hz

POWER MODULES

features

- Close regulation
- 400 or 800 Hertz
- Hermetically sealed
- No moving parts
- Compact

DELIVERY FROM STOCK

specifications

Input Voltage Range: 24 to 30 volts DC

Line Regulation: ±0.5% from ½ to full load.

Frequency Stability: ±1%.

Voltage Adjustment Range: 12% by screwdriver adjustment.

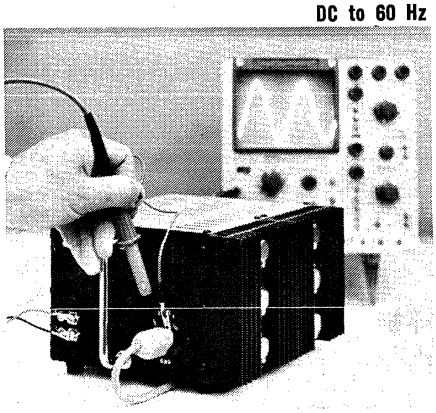
Reliability: 55,000 hours MTBF typical per MIL-HDBK-217 under worst case operation conditions.

Input Transient Protection: In accordance with MIL-STD-704A, Limit 1, Category B (80 volts for 0.1 seconds).

Environment: +212°F max. at mtg base using adequate heat sink. −65°F min. at mtg. surface. Altitude: To vacuum (true hermetic seal). Vibration, shock, sand, dust, humidity, salt spray, fungus, sunshine, rain, and explosion to MIL-E-5272C and MIL-E-5400K.

Output Voltage, Current, and Frequency: See specific models listed (Outputs and inputs are isolated).
Output freqencies up to 1600 Hz are listed in our catalog as standard models. Contact our nearest office for your free copy.

Input Voltage Range	Output Frequency (Hertz)	Output Voltage Range	Output Power (Volt-Amps)	Harmonic Distortion (%)	Size (See pg. 13)	Weight (Lbs.)	Model Number	Price 1 Piece	Price 2-4 Pieces
24-30	400	25.4-28.6	5	2.0	4	1.6	**S05D-27A-400**	$297	$270
			10	2.5	4C	1.7	**S1D-27A-400**	308	280
			20	2.5	4B	2.3	**S2D-27A-400**	319	290
			30	2.5	6A	2.4	**S3D-27A-400**	330	300
			60	3.0	12	4.8	**S6D-27A-400**	436	397
			120	4.0	14	9.1	**S12D-27A-400**	687	625
24-30	400	108-122	5	2.0	4	1.6	**S05D-115A-400**	270	245
			10	2.5	4C	1.7	**S1D-115A-400**	280	255
			20	2.5	4B	2.3	**S2D-115A-400**	291	265
			30	2.5	6A	2.4	**S3D-115A-400**	302	275
			60	3.0	12	4.8	**S6D-115A-400**	410	373
			120	4.0	14	9.1	**S12D-115A-400**	654	595
24-30	800	25.4-28.6	5	2.0	4	1.6	**S05D-27A-800**	325	295
			10	2.5	4C	1.7	**S1D-27A-800**	335	305
			20	2.5	4B	2.3	**S2D-27A-800**	346	315
			30	2.5	6A	2.4	**S3D-27A-800**	357	325
			60	3.0	12	4.8	**S6D-27A-800**	436	397
			120	4.0	14	9.1	**S12D-27A-800**	715	650
24-30	800	108-122	5	2.0	4	1.6	**S05D-115A-800**	297	270
			10	2.5	4C	1.7	**S1D-115A-800**	308	280
			20	2.5	4B	2.3	**S2D-115A-800**	319	290
			30	2.5	6A	2.4	**S3D-115A-800**	330	300
			60	3.0	12	4.8	**S6D-115A-800**	436	397
			120	4.0	14	9.1	**S12D-115A-800**	687	625



DC to 60 Hz

DC TO 60 Hz INVERTERS

features

- 115 VRMS 60 Hz Sine Wave Output
- 12, 24, 28, 36 VDC Inputs
- Low Cost
- High Reliability
- −20°C to +55°C ambient operation
- Reverse Polarity Protection

specifications

INPUT VOLTAGE RANGE: 11 to 15 VDC for KN's; 22 to 30 VDC for PN's; 29 to 38 VDC for LN's

OUTPUT VOLTAGE: 115 VAC ±2% at full load and nominal input voltage

OUTPUT FREQUENCY: 60 Hz ±2 Hz

LINE REGULATION: 3% for specified input voltage range with load constant

LOAD REGULATION: 3% for load change of half load to full load with line constant: 6% for change of no load to full load

WAVE FORM: Sine wave with maximum 5% distortion

LOAD POWER FACTOR: Full rated output VA from unity to 0.7 PF lagging or leading

EFFICIENCY: At full load and nominal input voltage: 40% minimum on KN's; 50% minimum on PN's; 58% minimum on LN's

OPERATING TEMPERATURE RANGE: −4°F to +131°F (−20°C to +55°C) ambient air temperature

INPUT TRANSIENT PROTECTION: 45 VDC for 0.1 second

ALTITUDE: 10,000 feet above sea level

OVERLOAD PROTECTION: Magnetic type circuit breaker

DELIVERY FROM STOCK*

Abbott has designed a new line of quality, low cost D Cto 60 Hz Sine Wave inverters. These units will convert DC battery voltage to regulated 60 Hz power to drive any AC equipment, such as, lamps, compressors, motors, televisions, radios, power tools, appliances, test equipment, etc. Surge current capabilities of these units is up to 3 times rated output power.

Input Voltage Range (VDC)	Output Frequency	Output Power (VA)	Size (See Pg. 13)	Weight (Lbs.)	Model Number	Unit Prices 1-4 pcs.
11-15	60	30	K2	16	KN3T-115-60	$239
		60	F2	18	KN6T-115-60	269
		120	J2	30	KN12T-115-60	299
22-30	60	60	K2	16	PN6T-115-60	239
		120	F2	18	PN12T-115-60	269
		240	J2	30	PN24T-115-60	299
29-38	60	80	K2	16	LN8T-115-60	239
		160	F2	18	LN16T-115-60	269
		320	J2	30	LN32T-115-60	299

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5200 W. Jefferson Blvd., Los Angeles, Calif. 90016
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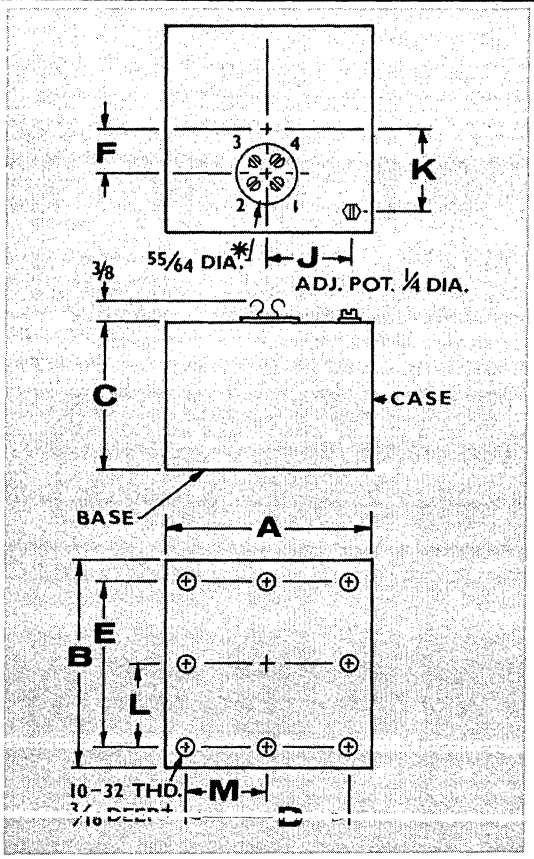
abbott Size Charts

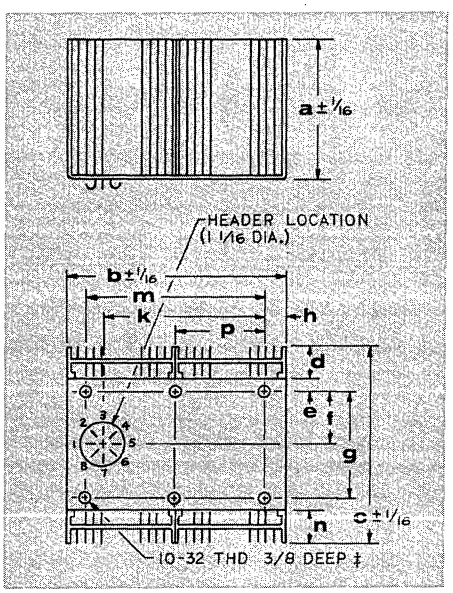


Size	A	B	C	D	E	F	J	K	L	M
1	1½	2¾	3	1.00	2.25	5/16	½	1⅛	—	—
1A	1½	2¾	2¾	1.00	2.25	5/16	½	1⅛	—	—
1B	1½	2	2	1.00	1.50	0	½	¾	—	—
2	1⅞	2¾	3¼	1.37	2.25	¾	11/16	1⅛	—	—
2C	2	2¾	2⅛	1.50	2.25	0	¾	1⅛	—	—
2D	2	3	3½	1.50	2.50	¾	¾	1¼	—	—
2E	2⅛	3¼	3¼	1.62	2.75	⅞	13/16	1⅜	—	—
3	2¾	2¾	3	2.25	2.25	¾	1⅛	1⅛	—	—
3A	2¾	2¾	2¾	2.25	2.25	¾	1⅛	1⅛	—	—
4	2¼	2¾	3¼	1.75	2.25	¾	⅞	1⅛	—	—
4B	2½	3	3¾	2.00	2.50	¾	1	1¼	—	—
4C	2¼	2¾	3½	1.75	2.25	¾	⅞	1⅛	—	—
4D	2½	3½	3½	2.00	3.00	0	1	1½	—	—
5	2¾	2¾	3¼	2.25	2.25	¾	1⅛	1⅛	—	—
6	2¾	3	3¼	2.25	2.50	¾	1⅛	1¼	—	—
6A	2¾	3	4	2.25	2.50	¾	1⅛	1¼	—	—
6B	2¾	3⅛	3⅝	2.25	2.62	¾	1⅛	15/16	—	—
7	2¾	2¾	4	2.25	2.25	¾	1⅛	1⅛	—	—
7A	2⅞	3⅜	4½	2.37	2.87	¾	13/16	17/16	—	—
8B	2⅝	3½	2⅞	2.12	3.00	¾	1 1/16	1½	—	—
9C	2½	4⅜	3⅛	2.00	3.87	1	1	1 15/16	—	—
9D	2⅝	4¾	3⅝	2.12	4.25	1	1 1/16	2⅛	—	—
10B	2⅞	4¼	4⅜	2.37	3.75	1⅜	13/16	1⅞	—	—
10C	3⅜	3⅜	3¾	2.87	2.87	¾	1 7/16	1 7/16	—	—
10D	3½	3½	4	3.00	3.00	¾	1½	1½	—	—
11	3	5½	3¼	2.50	5.00	2⅛	1¼	2½	2.50	—
11D	4	4⅞	3⅞	3.50	4.37	1⅜	1¾	2 5/16	—	—
11E	3¾	4½	4¼	3.25	4.00	¾	1⅝	2	—	—
11F	2¾	6¼	2¾	2.25	5.75	1	1⅛	2⅞	2.87	—
12	3	5½	4	2.50	5.00	2⅛	1¼	2½	2.50	—
12C	3⅞	6¼	2¾	3.37	5.75	1½	1 1/16	2⅞	2.87	—
14	6	6	4	5.50	5.50	2⅜	2¾	2¾	2.75	2.75
14C	5½	5½	3⅝	5.00	5.00	1⅞	2½	2½	2.50	2.50
14D	6	6¼	3⅞	5.50	5.75	1¼	2¾	2⅞	2.87	2.75
14E	5¾	6¼	2¾	5.25	5.75	1¼	2⅝	2⅞	2.87	2.62

* On dual output units (Models CC & WW), special 8 pin header is used. Diameter is 1 1/16 and height is 5/16.

† 6-32 Thd, 3/16 deep on case size 1B.

DIMENSIONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.



‡ 8-32 x ⅜ on case AA; ¼-20 x ⅜ on case GG, HH, & JJ.

Size	A	B	C	D	E	F	G	H	K	M	N	P
AA	6½	4	1⅞	—	¼	1/16	1⅜	½	2⅜	3	—	—
BB	5	4	4½	—	⅜	⅞	3¾	⅜	1⅝	3 1/16	—	—
CC	5	4	5¾	—	⅜	⅞	3 7/16	1	1	2 7/16	1¼	—
DD	5	4	7½	—	⅜	½	4⅜	1	1	2½	2⅛	—
EE	5	8	8¾	—	½	2⅝	5¼	¾	5⅞	6½	2⅛	—
FF	5	8	8¾	1¼	½	2⅝	5¼	¾	5⅞	6½	1¼	—
F2	5	8	8¾	1¼	½	§	5¼¶	¾	§	6½¶	1¼	—
GG	5	12	8	1¼	⅜	§	4¾	1¼	§	9½	1¼	4¾
HH	6½	12	8	1¼	⅜	§	4¾	1¼	§	9½	1¼	4¾
JJ	6½	12	9¾	2⅛	⅜	§	4¾	1¼	§	9½	2⅛	4¾
J2	6½	12	9¾	2⅛	⅜	§	4¾¶	1¼	§	9½¶	2⅛	—
K2	5	8	7½	—	½	§	5¼¶	¾	§	6½¶	1¼	—

§ Terminal strip located on AxC surface.

¶ Dimensions locate rubber feet in lieu of inserts.

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High Voltage Power Supplies and Modules

Telephone: (213) 997-7222

The HV models listed here fill the broadest range of applications and choice of options. In addition, Advanced High Voltage Co. has fully engineered High Voltage Power Supplies and Modules for a long list of specialized applications.

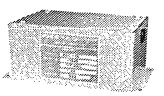
Advanced High Voltage Co. offers technical assistance for selecting and specifying High Voltage Supplies and Modules. Call us. If we cannot supply a unit to your specifications, we will assist you in obtaining a source.

HOW TO ORDER: Specify unit by model number and if applicable, add option number(s).

Advanced High Voltage Co. also manufactures the following type of High Voltage Supplies: High efficiency DC to DC converters, 1 to 500 watts, regulated and unregulated. OEM High Voltage Supplies for laser applications, x-ray, ion implantation, CRT displays, photo and microwave tubes, precipitation and electrostatic charge applications, multiple output and programmable supplies. Please contact factory for details.

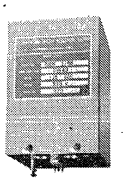
Units are listed by series in order of increasing power output, then by increasing output voltage. Model number code: First letter refers to INPUT. A = 117 VAC, 50 to 400 Hz; D = 28 VDC. Second letter refers to LOAD REGULATION. R = regulated; U = unregulated. See specifications for line regulation. Other letters and numbers designate particular models.

E_{OUT} Nom. kV	I_{OUT} Max. mA	Model No.	Features, Specifications and Options
200V	15.0	ARH 088	Fully regulated AC to DC module, 3 watts. Output adjustable −30% to +10%. Units are shielded and fully serviceable. Remote programming with 5 Kohm pot or approx. 5.6 volts is standard. HV return can be floated to 500 volts against case. Units produce negligible RFI. **Input:** 117 VAC, 50 to 400 Hz. **Ripple:** 0.1% P-P. **Regulation (L/L):** 0.1%. **TC:** 100 ppm. **Operating Temperature:** −10°C to +65°C. **Dimensions:** 5.19″ x 3.25″ x 2.50″. (Flange is 6.0″ x 3.25″.) **Options:** Negative output (−01), improved ripple of 0.005% (−07), improved TC of 25 ppm (−28), other line inputs (−34), other output voltages (−29).
400V	7.5	ARH 098	
600V	5.0	ARH 108	
800V	3.7	ARH 118	
1.1	3.0	ARH 128	
1.5	2.0	ARH 138	
2.0	1.5	ARH 148	
2.5	1.2	ARH 158	
200V	15.0	DRF 325	Miniature, fully regulated DC to DC converter with 0.1% load regulation. Has remote programming capability. 3 watts output. Fully encapsulated, shielded, RFI decoupled, hermetically sealed. **Input:** 28 VDC. **Output Adjustment Range:** −30% to +10%. **Regulation (L/L):** 0.1%. **Ripple:** 0.1% P-P. **TC:** 100 ppm. **Operating Temperature:** −10°C to +65°C. **Dimensions:** 3.0″ x 1.5″ x 0.6″. (Flange length is 3.625″.) **Weight:** 4 oz. **Options:** Negative output (−01), remote program (−05), ±15 volt input (−33). Other options.
400V	7.5	DRF 335	
600V	5.0	DRF 345	
800V	3.7	DRF 355	
1.1	3.0	DRF 365	
1.5	2.0	DRF 375	
2.0	1.5	DRF 385	
2.5	1.2	DRF 395	
3.0	1.0	DRF 405	
4.0	0.8	DRF 415	
5.0	0.6	DRF 425	
200V	15.0	DUG 103	Miniature DC to DC converter similar to DRF series above, but with floating output. Units are line regulated adjustable and/or programmable. Minimum adjustment range is −20% to +10%. Other electrical and mechanical specifications same as DRF series.
400V	7.5	DUG 113	
600V	5.0	DUG 123	
800V	3.7	DUG 133	
1.1	3.0	DUG 143	
1.5	2.0	DUG 153	
2.0	1.5	DUG 163	
2.5	1.2	DUG 173	
3.0	1.0	DUG 183	
4.0	0.8	DUG 193	
5.0	0.6	DUG 203	
200V	30.0	ARM 016	Fully regulated, 6 watt, DC to DC converter with self-contained AC-line to 28 VDC power supply. Units are shielded, serviceable short circuit proof and light weight. Input and output are RFI decoupled. Standard adjustment range is −30% to +10%. Series has wide range of options. **Input:** 117 VAC, 50 to 400 Hz. **Regulation (L/L):** 0.1%, (better with less than 0 to full load changes). **Ripple and Noise:** 0.1% P-P. **Operating Temperature:** −10°C to +65°C. **Size:** 3.04″ x 2.60″ x 4.23″. **Weight:** 32 oz. **Options:** Negative output (−01), wide adjustment range (−04), remote program (−05), improved ripple (−09). Other options.
400V	15.0	ARM 026	
600V	10.0	ARM 036	
800V	7.5	ARM 046	
1.0	6.0	ARM 056	
1.2	5.0	ARM 066	
1.5	4.0	ARM 076	
1.8	3.3	ARM 086	
2.2	2.7	ARM 096	
2.5	2.4	ARM 106	
4.0	0.6	DRC 127	Dual output, MIL-SPEC, DC to DC converter, 6 watts. Unit has voltage monitor point, logic level turn-on, is short circuit proof and magnetically shielded. HV section is hermetically sealed. MTBF is 50,000 hrs. Meets MIL-P-81279, MIL-STD-5400, MIL-STD-704 and MIL-I-6181. **Input:** 28 VDC. **Regulation (L/L):** 0.1%. **Ripple:** 0.1% P-P. **Control Input:** +5 volts. **TC:** 100 ppm. **Operating Temperature:** −55°C to +80°C. **Focus Output:** 350 volts @ 50 μa. **Line Regulation:** 0.1%. **Load Regulation:** 2%. **Ripple:** 0.1%. **TC:** 0.1%/°C. **Dimensions:** 5.05″ x 2.9″ x 2.6″. **Weight:** 32 oz. Many other features and options. Contact factory for detail.
5.0	0.6	DRC 137	
7.5	0.4	DRC 147	
10	0.3	DRC 157	
12	0.2	DRC 167	
15	0.2	DRC 177	
3.0	5.0	ARA 106	Line operated, 15 watt High Voltage Module. Adjustable and/or programmable to zero. Fully serviceable, short circuit proof and shielded. Standard adjustment range is −30% to +10%. **Input:** 117 VAC, 50 to 400 Hz. **Regulation (L/L):** 0.1%. **Ripple:** 0.1% P-P. **TC:** 100 ppm. **Operating Temperature:** −10°C to +65°C. **Dimensions:** 4.66″ x 3.98″ x 3.0″. **Weight:** 3.5 lbs. **Options:** 0 to 110% voltage adjustment (−03), remote program, any voltage, either polarity (−05), negative output (−01), lower ripple figure (−09), higher power output (−19). Many other options.
4.0	4.0	ARA 116	
5.0	3.0	ARA 126	
8.0	2.0	ARA 146	
10	1.5	ARA 156	
12	1.3	ARA 166	
15	1.0	ARA 176	
18	0.8	ARA 186	
22	0.7	ARA 196	

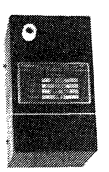


ARH

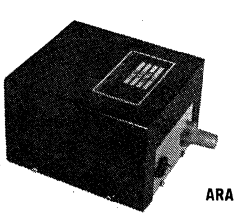
DRF/DUG



ARM



DRC



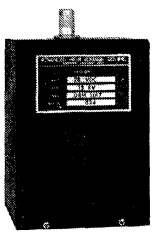
ARA

ADVANCED HIGH VOLTAGE CO., INC.
14532 ARMINTA AVE. • VAN NUYS, CALIF. 91402 • PHONE: (213) 997-7222

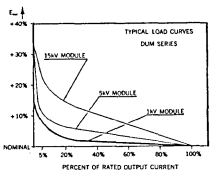
High Voltage Power Supplies and Modules

Advanced High Voltage Co. manufactures many other High Voltage Supplies not listed here. Telephone the factory sales office, (213) 997-7222, for assistance in selecting or specifying.

E_{OUT} Nom. kV	I_{OUT} Max. mA	Model No.	Features, Specifications and Options
800V	18.0	DRM 105	Fully regulated High Voltage Module. 15 watts output. All solid state silicon. Output adjustment +10%, −30%. Short-circuit proof. HV return may be floated to 500 volts from chassis. Magnetically shielded. Serviceable. **Input:** 28 VDC. **Regulation (L/L):** 0.1%. **Ripple:** 0.1% P-P. **TC:** 100 ppm. **Operating Temperature:** −20°C to +65°C. **Options:** Negative output (−01), wider adjustment range (−04), remote program (−05), ripple of 0.005% (−09), wider operating temperature range (−16), 30 watts output power (−19), ±15 volts input (−33). Other options.
1.0	15.0	DRM 115	
1.5	10.0	DRM 125	
2.5	6.0	DRM 135	
3.5	4.0	DRM 145	
5.0	3.0	DRM 155	
7.5	2.0	DRM 165	
10	1.5	DRM 175	
12.5	1.2	DRM 185	
15	1.0	DRM 195	
18	0.8	DRM 205	
22	0.6	DRM 215	
800V	18.0	DUM 044	28 VDC operated High Voltage Modules similar to DRM series above, except HV output is not in the regulation loop. This allows floating HV option with only 30 to 40 pf capacitance to input. More economical than DRM series where the higher internal impedance can be tolerated. (See regulation graph.) Input regulation, ripple and other data per DRM series.
1.0	15.0	DUM 054	
1.5	10.0	DUM 064	
2.5	6.0	DUM 074	
3.5	4.0	DUM 084	
5.0	3.0	DUM 094	
7.5	2.0	DUM 104	
10	1.5	DUM 114	
12.5	1.2	DUM 124	
15	1.0	DUM 134	
18	0.8	DUM 144	
22	0.6	DUM 154	



DRM/DUM

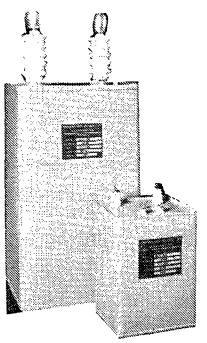


DUM LOAD CURVES

E_{OUT} Nom. kV	I_{OUT} Max. mA	Model No.	DC Output Impedance Megohms	Case Width	Case Depth	Case Height	Terminal Height	Approx. Weight Pounds
				Inches				
1.0	1.5	AUC 017	0.90	3.75	1.75	3.38	0.38	1
1.0	5.0	AUC 015	0.65	3.75	2.25	3.38	0.38	1
1.0	10.0	AUC 011	0.04	3.75	2.25	3.38	0.38	2
2.0	1.5	AUC 027	0.13	3.75	1.75	3.38	0.38	1
2.0	5.0	AUC 025	0.10	3.75	2.25	3.38	0.38	2
2.5	10.0	AUC 031	0.08	3.75	2.25	3.75	0.63	3
5.0	1.5	AUC 037	0.40	3.75	2.25	3.38	0.56	2
5.0	5.0	AUC 035	0.25	3.75	2.25	3.75	0.63	3
5.0	10.0	AUC 041	0.13	3.75	4.56	5.88	1.06	11
10	1.5	AUC 047	1.50	3.75	3.19	4.50	1.06	4
10	5.0	AUC 045	0.50	3.75	4.56	5.88	1.06	8
10	10.0	AUC 051	0.26	3.75	4.56	8.00	1.06	12
15	1.5	AUC 057	1.60	3.75	3.19	5.50	1.69	5
15	5.0	AUC 055	0.50	3.75	4.56	6.13	1.69	11
15	10.0	AUC 061	0.28	4.69	6.00	8.50	1.69	20
20	1.5	AUC 067	1.70	3.75	4.56	5.88	2.25	9
20	5.0	AUC 065	0.86	3.75	4.56	8.00	2.25	12
25	10.0	AUC 071	0.30	5.63	7.38	12.13	3.25	45
30	1.5	AUC 077	2.00	3.75	4.56	7.50	3.25	11
30	5.0	AUC 075	1.00	4.69	6.00	8.50	3.25	22
37.5	10.0	AUC 081	1.30	11.13	14.63	16.25	4.31	124
50	1.5	AUC 087	5.00	4.69	6.00	8.50	4.31	18
50	5.0	AUC 085	1.20	5.63	7.38	12.13	4.31	40
75	1.5	AUC 097	4.70	5.63	7.38	12.13	7.50	45
75	5.0	AUC 095	2.20	11.13	14.63	16.13	7.50	124

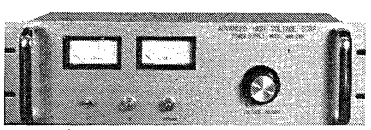
AUC SERIES

Economy High Voltage Module. Output adjustable by varying input voltage. Hermetically sealed. Shielded. **Input:** 117 VAC nom., 50 to 400 Hz. **Ripple at F/L:** 1% rms. **Operating Temperature:** 0 to +85°C.



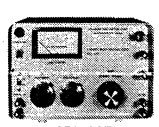
AUC

E_{OUT} Nom. kV	I_{OUT} Max. mA	Output Power Watts	Model No.	Features, Specifications and Options
3	10	30	ARR 269	Rackmounted Supplies for Lab and Systems use. 19" x 5¼" rack. Separate voltage and current meter. Solid state silicon. Output adjustable from 0 to 100% with ten-turn pot. Adjustable current limiting. 30 watt units have disipative regulator, 150 watt units have high efficiency switching regulator. **Input:** 117 VAC, 50 to 400 Hz. **Ripple:** 0.1% P-P. **Regulation (L/L):** 0.1%. Other electrical data same as ARA series. **Options:** Negative output (−01), reversible output (−35), remote program (−05), ripple to 0.005% (−09), regulation to 0.005% (−15), delete meters (−39). Other options.
3	50	150	ARR 260	
5	6	30	ARR 279	
5	30	150	ARR 270	
10	3	30	ARR 289	
10	15	150	ARR 280	
15	2	30	ARR 299	
15	10	150	ARR 290	
20	1.5	30	ARR 309	
20	7.5	150	ARR 310	
30	1.0	30	ARR 319	
30	5.0	150	ARR 320	



ARR

DYNAMIC ELECTRONIC LOAD for testing of High Voltage Sources • Switches between 2 independently adjustable current levels at rates from DC (manual) to 100 kHz • Yields scope display of Regulation, Ripple, Load-Change-Response • Emax: +24 KV, 1 max: 2 mA Model No.: ARL 007. Size: 11"L x 7"H x 8"D.



ARL 007

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The 53 Product Sections categorize related electronic components, equipment, materials, instruments and systems, and fabrication services, enabling you to quickly compare and evaluate similar items.

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Product Section	Volumes 1, 2, 3 Page	1973 Volume 4 Page	Products
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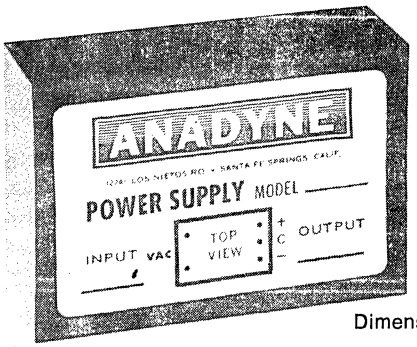
MINIATURE AC/DC POWER SUPPLIES



SERIES 400
Dimensions: 1 x 2 x 3 in.

POWER AT THE RIGHT PRICE. Regulation, ripple, and temperature stability of these supplies are comparable to much larger and more expensive units. In all cases, the specs are consistent with the requirements of most monolithic and discrete-circuit type operational amplifiers.

POWER WITH PROTECTION. All models are protected against sustained overloads and short circuits either to ground or between the two outputs. The 5V (600 Series) is protected against overvoltage. In addition, current limiting prevents excessive heating in case of shorted outputs.

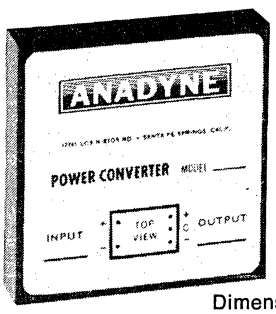
POWER WITHOUT RIPPLE PROBLEMS. The low ripple of these power supplies is far better than most required circuit applications. ANADYNE'S power supplies will operate over a temperature range of 0° to 71°C; however, the output is derated outside the 10° to 55°C range.

SERIES 400

Output Current	0.100 A
Input Voltage	105 to 125 VRMS, 50 to 400 Hz
Dual Output Voltage	+15 VDC and −15 VDC (Also available: ±6, ±10, ±12, ±18, ±24, ±28)
Accuracy (Each Output)	±0.1 VDC
0 to Full Load Regulation	0.02% max.
Line Regulation	±0.005% max.
Ripple	0.5 mv RMS max.
Short Circuit Protection	Either or both outputs to common or together indefinitely
Dimensions	1 x 2 x 3 inches
Weight	Less than 9 ounces

OTHER MODELS AVAILABLE
WRITE FOR BROCHURE 127208

MINIATURE DC/DC POWER CONVERTERS



SERIES 700
Dimensions: 2.0 x 2.0 x 0.4 in.

These ANADYNE 700 Series Power Converters contain an efficient, miniature DC to DC converter and a state-of-the-art precision integrated circuit regulator.

Filtering is included on the inputs as is magnetic shielding, to reduce radiated noise. Audible noise is non-existent since these units operate above 20 KHz.

SERIES 700

Input Voltage ±10%, VDC 5, 6, 10, 12, 15, 26	Dual Output Voltage, VDC ±10, ±12, ±15, ±18, ±20 Single Output Voltage, VDC 20, 24, 30, 36, 40
Accuracy (Each Output	±1%
Temperature Coefficient	.02%/°C max., .01%/°C typical
Warm-up Drift (After 5 Seconds)	±0.1%
0 to Full Load Regulation	.02%
Line Regulation	.02% max. for 10% change
Ripple & Noise	2 mv p-p max. 1 Hz-1 MHz
Output Impedance	1 ohm @ 10 KHz
Operating Temperature (Derate above 55°C)	0°C to +71°C
Input Transients (Conducted Noise)	<25% of nominal input current, peak to peak
Surface Temperature Rise	20°C at full load
Input Isolation	50 megohms
Short Circuit Protection	Either or both outputs to common or together indefinitely

Series 700 Power Supply Designation Chart
Part Number
7XX

Series Number Output ±1%	Input ±10%
	7X1 — 5 V .6 A
70X — ±10 V 70 ma	7X2 — 6 V .5 A
71X — ±12 V 60 ma	7X3 — 10 V .3 A
72X — ±15 V 50 ma	7X4 — 12 V .25 A
73X — ±18 V 40 ma	7X5 — 15 V .2 A
74X — ±20 V 35 ma	7X6 — 26 V .13 A

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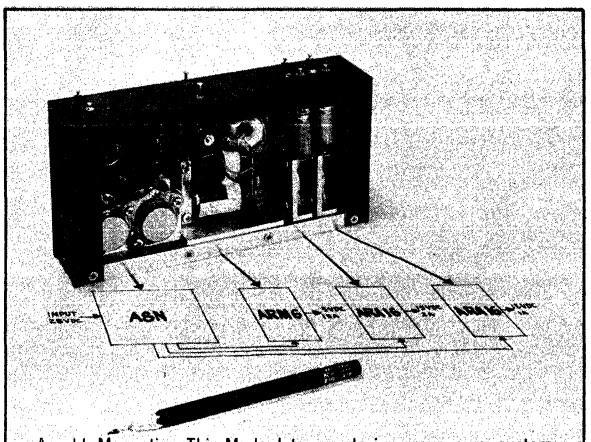

Arnold Magnetics Thin-Mods let you design your own custom power conversion system as you order. No engineering charges . . . no lost design time. And, the complete power supply is provided in a pretested, encapsulated miniature package.

HOW TO SPECIFY AND ORDER

1. **BLOCK DIAGRAM:** Construct your Power Conversion System block diagram in Figure 1.
   A. Use one block for the Driving Module.
   B. Use one block for each output required.
2. **REGULATOR SELECTION:** Select Regulator Modules from Table M1. Enter the following in Table M3 for each output:
   A. Module Part Number
   B. Output voltage (max. adj.) from Table M1 in Volts column
   C. Maximum output current for application in Amps column
   D. Output power in Watts column
   E. Input power (Watts/Efficiency) in Input Power column
3. **DRIVING MODULE SELECTION:** Select Driving Module from Table M2 using prime power source and Total Input Power from Table M3. The Driving Module must be capable of providing more power than the Total Input Power required for the Regulator Modules.
4. **CASE SIZE SELECTION:** Using the sum of all module lengths selected from Table M3, select the shortest case size that will accomodate from Table M4.
5. **PRICING:** Price and Weight for complete power system is the sum of the applicable column from Table M3.
6. **PART NUMBER:** Construct Power Converter Part Number as follows: Driving Module Part Number from Table M2 — Last Letter of Regulator Module Part Number from Table M1 — Operating Voltage (VDC)/ Operating Current (AMPS) — Case Size Letters from Table M4.
   List Regulators in descending order of operating current.
   Enter Power Converter Part Number at "AMC/PN".
   Example: APT-M5/15V-T30/1-A 15/.2-DA
   INPUT: (APT)-105 to 125 VRMS, 50-500 Hz
   OUTPUT:
   1. (ARM 6V) — Delivers 5 VDC @ 15 AMPS, overvoltage protection option (V) at 6±.5V
   2. (ART 30) — Delivers 30 VDC @ 1 AMP
   3. (ARA 16) — Delivers 15 VDC @ .2 AMP

   CASE SIZE: (DA Table M4) 1⅝ × 3⅝ × 10½
7. **DELIVERY:** Normal delivery is 10 days ARO.
8. **HOW TO ORDER:** Order using AMC P/N (defined as above) and base price (1 pc) from Table M3. Price discounts 2-4 pcs .90 x base price, 5-9 pcs .85 x base price, 10-24 pcs .80 x base price. Consult sales representative or factory for higher quantity price discounts and special modules.

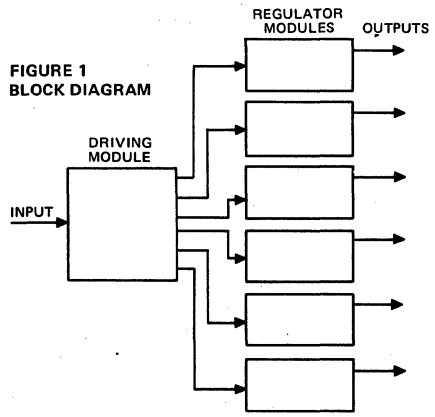

FIGURE 1
BLOCK DIAGRAM

TABLE M1 GENERAL SPECIFICATIONS FOR REGULATOR MODULES

- Magnetic Amplifier Regulator — High Power — High Efficiency ARM and ARQ*
- Switching Regulator — Medium Power — High Efficiency — ART
- Series Regulator — Medium Power — Low Voltage — ARA
- Series Regulator — Medium Power — High Voltage — ARB

Regulated Output Voltage (Adjustable) Min.	Max.	Max. Output (71°C Case Temp.) Current (Amps)	Regulator Power Efficiency (1)	Regulation(2) Line (±10%)	Load (½FL-FL)	Module(3) Part Number	Module Length (inches)	Price (1 pc)
4.2	6	2.0	70%	1.0%	1.0%	ART 6	1.2	$ 142
4.2	6	5.0	60%	0.1%	0.1%	ARA 6	0.6	58
4.2	6	20.0	80%	0.2%	0.2%	ARM 6	2.3	244
4.2	6	100.0	80%	1.0%	1.0%	ARQ 6*	5.2B**	847
11.2	16	1.4	80%	1.0%	1.0%	ART 16	1.2	142
11.2	16	2.5	70%	0.1%	0.1%	ARA 16	0.6	58
11.2	16	9.0	80%	0.2%	0.2%	ARM 16	2.3	244
11.2	16	62.0	84%	0.5%	0.5%	ARQ 16*	5.2B**	847
15	22	7.0	80%	0.2%	0.2%	ARM 22	2.3	244
15	22	45.0	85%	0.5%	0.5%	ARQ 22*	5.2B	847
21	30	1.0	80%	1.0%	1.0%	ART 30	1.2	142
21	30	1.0	70%	0.1%	0.1%	ARA 30	0.6	58
21	30	5.0	80%	0.2%	0.2%	ARM 30	2.3	244
21	30	33.0	85%	0.5%	0.5%	ARQ 30*	5.2B**	847
30	50	0.5	70%	0.1%	0.1%	ARB 50	0.6	72
70	100	0.1	70%	0.1%	0.1%	ARB 100	0.6	72
70	100	2.0	80%	0.2%	0.2%	ARM 100	2.3	244
70	100	10.0	87%	1.0%	1.0%	ARQ 100*	5.2B**	895
112	160	0.06	70%	0.1%	0.1%	ARB 160	0.6	74
140	200	0.05	70%	0.1%	0.1%	ARB 200	0.6	78

Outputs are all isolated

Output Voltage Adjustment Resolution: 0.15% per degree rotation

Short Circuit Protection on all Regulator Modules

Overvoltage Protection Option Available for All Regulator Modules up to 30 VDC, set to 20% above maximum output voltage. Specify "V" after module part number. (add 0.6" to module length for each output with this option). Add $42.00 to module price.

Ripple and Noise (Max.): 0.1% VRMS + 10 MV for ARA & ARB
0.5% VRMS + 10 MV for ART & ARM

Temperature Coefficient: 0.01%/°C for ARA & ARB
0.02%/°C for ART
0.03%/°C for ARM

Weight (Including Case): 4.5 oz. for ARA & ARB & option "V"
10.0 oz. for ART
21.2 oz. for ARM: 88 oz. for ARQ

Operating Case Temperature: –10°C to 71°C

NOTES: (1) Max. Output Voltage and Current, nominal Input
(2) Add 10 MV to Load Regulation and Line Regulation for all models
(3) ARM Regulator Modules may not be used with ATA or ATB Driving Modules.

*Presently in development — consult factory for delivery

**The letter "B" defines case 3⅛"W × 3⅝"H (Mate with "B" Driver only)

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TABLE M2 GENERAL SPECIFICATIONS FOR DRIVING MODULES

- 115 VAC, 50—500 Hz Input (25 KHz Converter)
  - 110 Watts output — APS
  - 200 Watts output — APT
  - *1180 Watts output — APO**
- 115 VDC, 400 Hz Input (Transformer)
  - 50 Watts output — ATA
  - 100 Watts output — ATB
- 28 VDC Input (25 KHz Inverter)
  - 30 Watts output — ADN
  - 60 Watts output — ASM
  - 120 Watts output — ASN
  - *460 Watt output — ASQ**
- 12 VDC Input (25 KHz Inverter)
  - 40 Watts output — ASL
  - 80 Watts, output — ASA
  - *460 Watt output — ASO**
- 48 VDC Input (25 KHz Inverter)
  - 50 Watts output — ASG
  - 90 Watts output — ASJ
  - *460 Watts output — ASF**
- 115 VDC Input (25 KHz Inverter)
  - 110 Watts output — ASH
  - 220 Watts output — ASK
  - *1180 Watts output — ASP**

Input	Output Power (watts)	Module Part Number	Module Length (inches)	Price (1 pc)
105 – 125 VRMS, 47 – 500 Hz	110	APS	4.2	$ 179
105 – 125 VRMS, 47 – 500 Hz	200	APT	4.8	269
105 – 125 VRMS, 47 – 500 Hz	1180	APO*	9.0B**	1170
105 – 125 VRMS, 340 – 500 Hz	50	ATA	3.6	130
105 – 125 VRMS, 340 – 500 Hz	100	ATB	4.2	162
11 – 13 VDC	40	ASL	2.4	115
11 – 13 VDC	80	ASA	2.4	173
11 – 13 VDC	460	ASO*	5.2B**	862
24 – 30 VDC	30	ADN	1.2	145
24 – 30 VDC	60	ASM	2.4	115
24 – 30 VDC	120	ASN	2.4	173
24 – 30 VDC	860	ASP*	5.2B**	862
44 – 52 VDC	50	ASG	2.4	144
44 – 52 VDC	90	ASJ	2.4	222
44 – 52 VDC	460	ASF*	5.2B**	862
105 – 120 VDC	110	ASH	2.4	130
105 – 120 VDC	220	ASK	2.4	196
135 – 165 VDC	1180	ASQ*	5.2B**	1085

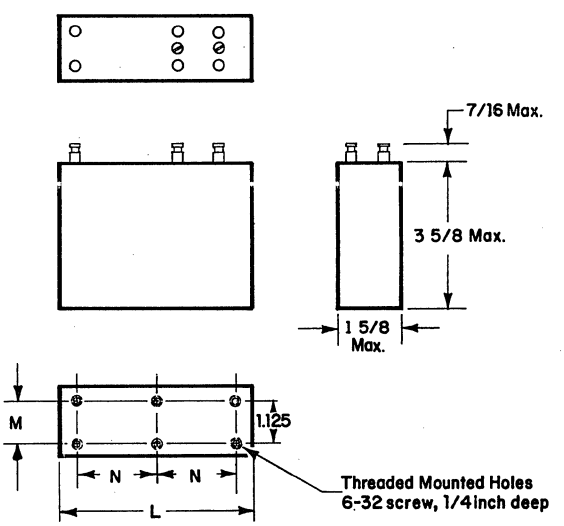
Inputs are isolated from Output and Case
EMI/RFI Filtering (For MIL-6181)
Transient Protected (For MIL-STD-704)
Special Driving Modules available with Modified Output Power and Input Voltages
Weight (Including Case): APS—23 oz., ASL, ASM, ASG, ASH — 18 oz., APT — 26 oz., ASA, ASN, ASJ, ASK — 20 Oz., ATA — 27 oz., ADN — 14 oz., ATB — 29 oz.
Operating Case Temperature — 10°C to +71°C

*Presently in development — consult factory for delivery
**The letter "B" defines case 3⅛"W × 3⅝"H

TABLE M4 MECHANICAL CHARACTERISTICS

	Case Size	Number of Terminals	Total of Module Lengths (inches)	Outside L (Max.) (inches)	N (inches)	Number of Mtg. Holes
	AA		3.2	3 1/2	2.750	4
	BA		4.7	5	4.250	4
	CA		6.7	7	2.750	6
	DA		10.2	10 1/2	4.500	6

Case: Black Anodized Aluminum
Terminals: Turret Style with Teflon Insulation
Mounting Holes: Threaded for 6-32 screw, ¼ inch deep.



AMC P/N _____

TABLE M3 SPECIFICATION WORK FORM

No.	Required Outputs: Volts (1) (Max. adj.)	Amps (Max. Req.)	Watts	Input Power (Watts/Eff.)	Module: Part Number	Length (inches)	Price (3) (1 pc)	Weight (oz.)
1								
2								
3								
4								
5								
6								
			Total Input Power					
			Driving Module (2)					
					Total			

(1) From Table M1 (2) From Table M2, must exceed Total Input Power (3) For quantity discounts see "HOW TO ORDER" on preceding page

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POWER CONVERSION EQUIPMENT

Miniaturized • High Efficiency

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SPECIAL PRODUCTS THRU MODULARIZATION

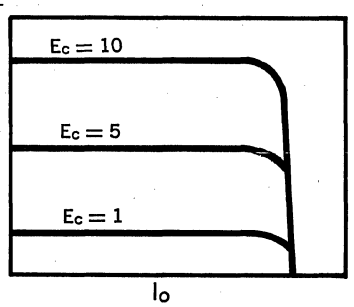
(If your application is experimental, see the free trial provision in the performance guarantee.)

The following new product concepts are based on the application of Arnold Magnetics' modularized power conditioning elements (such as those depicted in the first pages of this presentation).

This method of contributing to your product development is suggested because of its lower cost (due to using stock modules) and proven reliability (the MTBF of a typical module exceeds 100,000 hrs.).

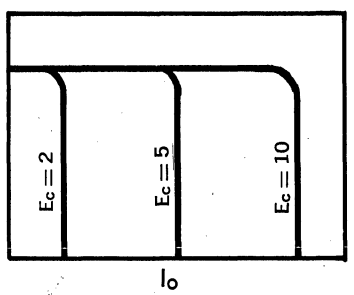
Several modifications to the modules' performance, involving voltage and current control, as a function of analog quantities, make these units as flexible as high power operational amplifiers. Special characteristics such as the following are obtained by adding modification letters to the model number. (Keep in mind these controllers have constant internal dissipation over their entire load line to, and including, short circuit).

Figure 1 — MODIFICATION PE



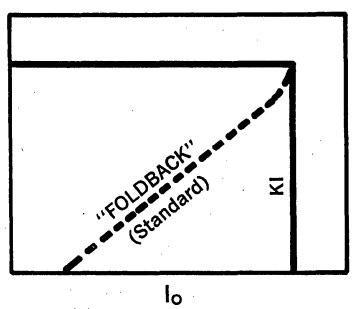
To Order:
1. Add "PE" to Model No.
2. Add $100 to 1 pc. price

Figure 2 — MODIFICATION PI



To Order:
1. Add "PI" to Model No.
2. Add $125 to 1 pc. price

Figure 3 — MODIFICATION KI



To Order:
1. Add "KI to Model No.
2. Add $100 to 1 pc. price

EXAMPLE: Mod APT-ARM100PE will deliver 0-100 VDC @ 2 amps as a function of 0-10V control signal fed to 3K Ohm (min.) input. Response time will be approximately 1 ms, depending on load.

SINE WAVE POWER SOURCES

Bidirectional outputs at frequencies of 1Hz and up (60 & 400 Hz are typical) with harmonic distortion under 5% can be produced at 5VA/in³ (if the system can tolerate zero crossing distortion during load transients affecting power factor).

A typical model is *APO-ARQ-ABD60 with preliminary specs of:

Input: 28V @ 30A
Output: 115V, 60Hz, 6A. (690 W)
Efficiency: 82%
T.H.D. (at PF = 1.0) 5% max.
Size: 4⅞" × 3¼" × 7½"
Weight: 9.3 lbs (74 W/lb)

This unit exhibits constant power per unit weight at lower output frequencies because no low frequency transformer is used. (ie: Regulator feeds load directly). To allow for "reverse" currents required by uncorrected load power factor, the output is "shorted" during load discharge. This results in approximately a 20° "flat spot" in the voltage waveshape at 0.85 power factors. (A "clean" sine wave is obtained by adding a capacitor to correct the power factor). Final specifications on these units are expected in mid 1973.

*Modules listed are enlarged versions of ASN & ARA. Module ABD will become available in mid 1973.

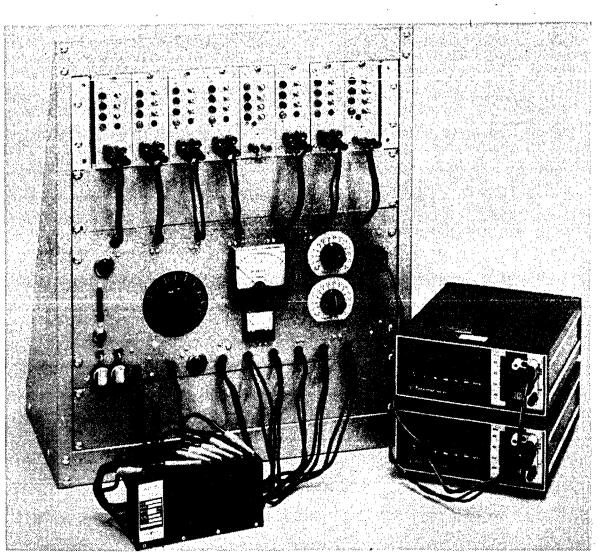
TEST SYSTEMS

Quality assurance and on-line test equipment in "building block" form: Utilizing various modules with standardized rack mounting, interconnection and modified associated products, a quick test set up may be compiled from stock units. The system includes transistorized loads, DVM'S, multipoint selection panels, as well as power sources. Very useful for testing power supplies, servo amps, and digital or analog assemblies.

The system is known as "RIM" (Rack mounted Instrument Modules) and is presently comprised of 12 "RIM Bin" modules. More details of the other functions available will be published in mid 1973.

POWER SOURCES to 200 VDC & 100 amps

ELECTRONIC LOADS to 300 VDC & 20A (each) - certain models available, other instruments to be added continuously.



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SERVO AMPLIFIERS

High power, miniaturized, servo amplifiers are made possible by utilizing these modularized converters with the programmable features such as shown in Figure 1. Response to frequencies near 600 Hz (3db point) is possible with DC motors or torquers with reasonable inductance and load inertia.

HIGH PERFORMANCE DC MOTORS - TORQUERS

Because of the relative ease of controlling high currents with high frequency magnetic amplifiers, the programmable, low voltage modules (such as ARM-4PE) match well with low impedance motor windings (including printed circuit types).

CONSTANT CURRENT SOURCES

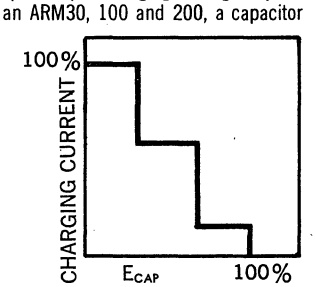
Electro magnets frequently must be controlled so as to regulate their field. Instantaneous output current sensing with gauss meter feedback can be effective in controlling currents in the hundreds of amperes.

As an example, Model APO-ARQ6PI would supply constant, adjustable current to a copper wire load whose temperature rose 100°C. Currents to 100 amps at 5 volts (.05 ohm) are available from this 3" X 5" X 12" unit.

LASER POWER (and other pulsed devices)

Pulsed laser systems frequently require rapid charging of large capacitors. By paralleling the outputs of an ARM30, 100 and 200, a capacitor can be charged at 5, 1.7 and 1.0 amps as its voltage reaches 16, 100, & 200 V respectively. The end voltage will be determined by the voltage at which the ARM-200 is set.

SPECIAL DESIGNS OF THESE UNITS ARE BEING SOUGHT BY ARNOLDS' DEVELOPMENT STAFF.



BATTERY CHARGING

When charging battery systems such as Nickel-Cadmium types, the charging current should be varied as a function of voltage, temperature, cell pressure, or history (of the cells).

Cyclical charging-discharging to "condition" such cells is accomplished by relay shorting of the battery-charging circuit. The charger will operate in the "foldback" current limit mode with little increase in internal dissipation.

A small system such as model APT-ARM30 would provide 5A charging current to a 28V battery. Shorting, "tapering" or other conditioning would be possible.

REDUNDANT OPERATION

For the ultimate in reliability, two or more separate systems can be operated in the current tracking (sharing) mode. In this way, each operates a half load. In the event of failure, the survivor operates at full load. Random and early failures are thereby nearly eliminated. The large dynamic overload range provided by this connection is often useful in enhancing reliability and performance.

LOW FREQUENCY POWER

Low frequency energy (0.1-100Hz) is frequently difficult to generate with reasonable power — size — cost relationships. It is also sometimes difficult to control amplitude near resonance and to provide for the widely varying "power factor". The Arnold programmable units are so insensitive to loading conditions, that experimental use is encouraged. Models ARO are suggested for the higher power systems.*

OTHER APPLICATIONS INCLUDE:

- **SQUIB** firing
- **SOLENOID** control
- **DIGITAL** analog power
- **AIRCRAFT** power source
- **GEOPHYSICAL** (earth-charging, truck mounted)
- **SERVO** power (torpedo-bombs, x-y plotters i.e.: Fast & Small)
- **AMPLIFIERS,** power, DC coupled, to 2 KW, to 1KHz response

HOW TO SPECIFY

1. Pick modules from tables M1 and M2.
2. Enter in table M3 with modifications from Figure 1, 2 or 3.
3. If desired, add the following paragraph to the face of the purchase order:

"The subject item will be experimentally applied by the buyer as a(n)_____

Seller agrees to issue full credit if returned prepaid, within 40 days of the date of shipment."

PERFORMANCE GUARANTEE

In addition to our normal warranty, and to encourage new application effort, Arnold Magnetics will accept selected orders for standard, single output, converters on a 40-day trial basis (ie: undamaged items received FOB our plant within 40 days of date of previous shipment will receive full credit, on demand, without cause).

As a condition of this cost free trial, the buyer agrees to provide Arnold Magnetics with a description of the application, and how it performs, together with the right to publish the information submitted with (or without) identifying the writer, at the writer's option.

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N.Y. STATE CALL COLLECT (516) 294-0990)

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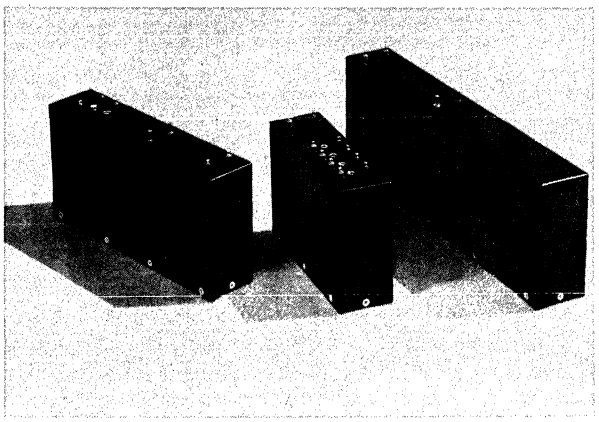
Arnold Magnetics

AC-DC REGULATED CONVERTERS

ARNOLD MAGNETICS

115 VAC 50-500 Hz to single or multiple DC outputs

FEATURES:
- Wide output voltage choice
- Multiple outputs standard
- Short circuit & transient protected
- Miniature size
- Light weight
- Fully encapsulated
- Meets MIL-E-5272C



SPECIFICATIONS:
INPUT: 108 - 130 VRMS, 1Ø 50-500 Hz
OUTPUT: 3 VDC through 2000 VDC, 30 Amps and below up to four outputs
OUTPUT REGULATION AND RIPPLE: See Notes 1 and 2
OPERATING TEMPERATURE: -10° to 71°C at case
COOLING: Primarily cooling by conduction through base plate
ENVIRONMENTAL: Per MIL-E-5272C
EMI/RFI: Filtering in all models

OPTIONS (See Table 1):
A — Remote external voltage adjustment
CT — Center tap output
E — Input voltage alteration
G — Flexible Leads
I — RFI qualified (MIL-1-6181D certification)
S — Short terminals
V — Overvoltage protection

SINGLE OUTPUT MODELS

Output			Case Size (See table II)	Model Number	Price (1 pc)
Voltage (Volts)	Current (Amps)	Notes			
2	5.00	(1) LED	A	PHU-2	$ 242
3	5.00	(1)	A	PHU-3	242
5	0.50	(2) Logic Power	0	PCA-5	98
5	5.00	(1) Logic Power	A	PHU-5	242
5	5.00	(2) Logic Power	CA	PIB-5-M	237
5	12.00	(1) LED Display	CA	PIC-5-M	423
6	5.00	(1) Filament Power	A	PHU-6	242
10	4.00	(1)	A	PHU-10	258
12	3.30	(1) MOS	A	PHU-12	258
12	5.00	(1) High Freq. Mag. Amp.	CA	PIC-12-M	423
15	2.00	(2) OP AMP, Tight Reg.	CA	PIC-15-M	237
15	2.60	(1)	A	PHU-15	258
15	5.00	(1) OP AMP	CA	PIC-15-M	423
18	2.20	(1)	A	PHU-18	258
22	1.80	(1)	A	PHU-22	258
24	1.00	(2) Tight Reg.	CA	PIB-24-M	237
24	1.60	(1) MOS	A	PHU-24	258
24	2.60	(1) High Eff. Mag. Amp.	CA	PIC-24-M	423
28	1.40	(1) MOS	A	PHU-28	258
28	2.60		CA	PIC-28-M	423
30	0.10	(2) Linear Amp.	0	PCA-30	98
30	1.00	(2) Analog Amp. Tight Reg.	CA	PIB-30-M	237
30	1.30	(1)	A	PHU-30	258
30	2.60	(1)	CA	PIC-30-M	423
50	0.80	(1)	A	PHU-50	258
100	0.10	(2) Vacuum Tubes, Tight Reg.	CA	PIB-100-M	251
100	0.40	(1)	A	PHU-100	258
180	0.05	(2) Display, Tight Reg.	CA	PIB-180-M	257
200	0.20	(1) Display	A	PHU-200	258
300	0.13	(1) Vacuum Tubes	A	PHU-300	258
500	0.80	(1)	A	PHU-500	258
750	0.05	(1)	A	PHU-750	258
1000	0.03	(1)	A	PHU-1000	269
1500	0.01	(1)	A	PHU-1500	385
2000	0.01	(1) Laser Power	A	PHU-2000	385

MULTIPLE OUTPUT MODELS

Output			Case Size (See table II)	Model Number	Price (1 pc)
Voltage (Volts)	Current (Amps)	Notes			
15 5	1.00 3.00	(2) Tight Reg.	CA	PIG-15-5-M	$ 295
15 5	1.00 2.50	(1)	A	PHU-15-5	291
15 -15	0.10 0.10	(2) Op Amp	0	PCA-30CT	121
15 -15	1.00 1.00	(2) Op Amp, Tight Reg.	CA	PIG-30-CT -M	295
15 -15	1.30 1.30	(1) Op Amp, Small Size	A	PHU-30-CT	291
-24 15	0.80 1.50	(1) MOS	A	PHU-24-15	291
180 5	0.10 3.00	(1) Display & Logic Power	A	PHU-180-5	291
15 -15 5	0.50 0.50 2.00	(1) Op Amp & Logic Tight Regulation	A	PHU-30CT -5	346
15 -15 5	0.50 0.50 4.00	(2) Op Amp and Logic Tight Regulation	CA	PIL-30CT -5-M	353
-24 15 5	0.50 0.50 3.00	(2) MOS and Logic	CA	PIL-24-15 -5-M	353
180 15 -15	0.03 0.30 0.30	(1) Display & Op Amp	A	PHU-180-30 CT	346
180 15 -15	0.05 0.60 0.60	(2) Display & Op Amp Tight Regulation	CA	PIL-180-30 CT-M	373
750 150 5	0.01 0.10 1.00	(1) Vacuum Tubes and Logic	A	PHU-750 -150-5	358
15 -15 5 - 5	0.30 0.30 1.00 1.00	(1) Op Amp & Logic	A	PHU-30CT -10CT	376
-24 15 -15 5	0.10 0.30 0.30 2.00	(1) MOS, Op Amp and Logic	A	PHU-24-30 CT-5	393
180 15 -15 5	0.03 0.30 0.30 2.00	(1) Display, Op Amp and Logic	A	PHU-180-30 CT-5	393

NOTES:

(1) Load Reg. (½ FL-FL) 2% Max., Line Reg. .3%, adjust ±5% of nominal output, ripple .3% VRMS +10 MV. Options Available: A, CT, E, F, G, I, L, R, S, V.

(2) Load Reg. (½ FL-FL) -1% Max., Line Reg., .1% Max., ripple .1% VRMS +10 MV. Options Available: A, E, F, G, V.

(3) Add 10 MV to Load Regulation and Line Regulation for All Models.

HOW TO ORDER:

(1) Standard models: Use model numbers listed. Add option letters as required per Table 1.

(2) Special models: Use three letter model number followed by voltage (volts)/current (amps). Use standard model of highest voltage for output power rating and price.

EXAMPLE: PHU-5.5V/5 has output of 5.5 VDC at 5 amps with overvoltage protection option. Price in 1 pc. quantity $242.00 plus $42.00 for option. Case Size B.

For other Models see "Design As You Order" pages.

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ARNOLD MAGNETICS

Arnold Magnetics

AC-DC REGULATED POWER SUPPLIES

115 VAC 400 Hz to single or multiple DC outputs

FEATURES:
- Short circuit & transient protected
- Multiple outputs standard
- MIL STD 704 power input
- Small size
- Tight regulation
- EMI/RFI free
- Fully encapsulated

SPECIFICATIONS:
INPUT: 105 - 125 VAC, 1Ø, 380 to 420 Hz
OUTPUT: Up to three outputs. 3 VDC to 200 VDC set to ±2% of nominal voltage
REGULATION:
LINE: ±.1% (105-125 VRMS)
LOAD: ±.1% (1/2 FL-FL)
TEMP. COEFFICIENT: -.015%/°C
RIPPLE: .1% +10 MV Min.
SHORT CIRCUIT PROTECTED
OUTPUTS ARE ISOLATED (Except PCM series)
OPERATING TEMPERATURE: -10°C to +71°C at case.
COOLING: Primary cooling by conduction through base plate.

OPTIONS: (See Table I)
A — Remote external voltage adjustment
E — Input voltage alteration
G — Flexible leads
S — Short terminals
V — Overvoltage protection

SINGLE OUTPUT MODELS

Output Voltage (Volts)	Output Current (Amps)	Notes	Case Size (See table II)	Model Number	Price (1 pc)
3	0.50	Hermetic Case	0	PCM-3	$ 98
5	0.50	Logic Power	0	PCM-5	98
5	5.0	Logic Power	BA	PEN-5	188
6	0.50	Filament Power	0	PCM-6	98
10	0.30	Hermetic Case	0	PCM-10	98
12	0.24	MOS Power	0	PCM-12	98
12	2.0	Linear Amp Power	BA	PEN-12	188
15	0.20	Op Amp Power	0	PCM-15	98
15	2.0	Op Amp Power	BA	PEN 15	188
18	0.20	MOS Power	0	PCM 18	98
22	0.12	22 VDC	0	PCM-22	98
22	1.0	Linear Amp Power	BA	PEN-22	188
24	0.12	MOS Power	0	PCM-24	98
24	1.0	24 VDC	BA	PEN-24	188
28	0.10	Clock Power	0	PCM-28	98
28	1.0	Linear Power Amp	BA	PEN-28	188
50	0.05	Bias Power	0	PCM-50	98
100	0.10	Vacuum Tube Power	BA	PEN-100	202
150	0.06	Vacuum Tube Power	BA	PEN-150	204
200	0.05	Display Power	BA	PEN-200	208

MULTIPLE OUTPUT MODELS

Output Voltage (Volts)	Output Current (Amps)	Notes	Case Size (See table II)	Model Number	Price (1 pc)
12 5	0.05 0.40	Linear Amp and Logic Power	0	PCM-12 -5	$ 121
12 5	1.00 4.00	Linear Amp and Logic Power	CA	PER-12 -5	246
15 5	0.05 0.40	Linear Amp and Logic Power	0	PCM-15 -5	121
15 5	1.00 4.00	Linear Amp and Logic Power	CA	PER-15 -5	246
15 -15	0.10 0.10	Op Amp Power	0	PCM-30CT	121
15 15	1.00 1.00	Op Amp Power	CA	PER-30CT	246
-24 -12	0.05 0.10	MOS Power	0	PCM-24 -12	121
28 5	1.00 4.00	Combination Logic Power	CA	PER-28 -5	246
-28 -14	0.05 0.10	MOS Power	0	PCM-28 -14	121
200 5	0.05 5.00	Display and Logic Power	CA	PER-200 -5	266
15 15 5	0.50 0.50 2.00	Op Amp and Logic Power	CA	PEP-30CT -5	304
15 15 5	1.00 1.00 4.00	Op Amp and Logic Power	CA	PET-30CT -5	304
24 14 5	0.50 0.50 4.00	MOS and Logic Power	CA	PET-24 -14-5	304
200 28 5	0.05 0.50 4.00	Display, Linear Amp and Logic Power	CA	PET-200 -28-5	324

Note: Add 10 MV to Load Regulation and Line Regulation for All Models.

HOW TO ORDER:

(1) Standard models: Use model numbers listed. Add option letters as required per Table 1.

(2) Special models: Use three letter model number followed by voltage (volts) current (amps). Use standard model of highest voltage for output power rating and price.

EXAMPLE: PEN - 6/5 has output of 6 VDC at 5 amps with 1 pc. price of $188.00.

For other Models see "Design As You Order" pages.

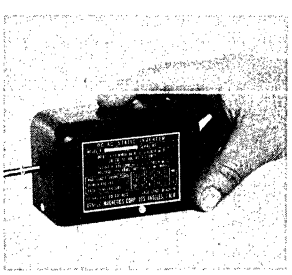
ARNOLD MAGNETICS

Arnold Magnetics

DC-SINE WAVE INVERTERS

28 VDC to 400 Hz Sine Wave output

FEATURES:
- Miniature Size
- Closely Regulated Output Voltage
- Low Harmonic Distortion
- Meets MIL-E-5272 & MIL-STD—704A
- Closely Regulated Output Frequency
- Generates NO RFI-EMI



SPECIFICATIONS:

Input: 24-30 VDC
Output: Voltage: 28 or 115 VRMS, Isolated from case and input. (Other voltages 6-440 VRMS available).
Frequency: 400 Hz (Other frequencies 360 to 10 KHz available).
Wave Shape: Sine Wave with maximum distortion of 6%.
Regulation: Output Voltage: ±.5% line, ±2% load.
Output Frequency: ±.3% line, ±.2% load
Operating Temperature: -10° to +71°C at case)
Cooling: Primarily cooling by conduction thru base plate
Temp. Coefficient: ±.05%/°C.

Output (VRMS)	Output Power (VA)	Case	Model Number	Price 1 pc.
115	50	K	SKB-28-115-400-50	$ 297
115	100	L	SKD-28-115-400-100	527
28	50	K	SKB-28-28-400-50	297
28	100	L	SKD-28-28-400-100	527

HOW TO ORDER:

(1) Standard Units: Use model numbers listed.

(2) Special Units: Specify SKB (50VA), SKD (110VA)—Nominal Input Voltage—Output Voltage—Frequency—Output Power (VA).

EXAMPLE: SKB-26-100-800-40 operates on a nominal 26 VDC input and deliver 100 VRMS at 800 Hz with output power of 40 VA.

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Arnold Magnetics

DC-DC REGULATED CONVERTERS

28 VDC to single or multiple DC outputs

FEATURES
- Wide choice of input voltage
- Polarity reversal protection
- Small size
- EMI/RFI filtering
- High reliability

SPECIFICATIONS: See notes for individual models.

OPTIONS (See Table I):
- A — Remote external voltage adjustment
- CT — Center top output
- E — Input voltage modification
- G — Flexable leads
- V — Overvoltage protection

SINGLE OUTPUT MODELS

Output						Case Size (See Table II)	Model Number	Price (1 pc)
Voltage (VDC)	Current (Amps)	Line Reg. %	Load Reg. %	Ripple[6] (% V RMS)	Notes			
2	0.75	0.3	2.0	0.3	(1) LED Power	M	SMU-002	$ 220
3	0.75	0.3	2.0	0.3	(1)	M	SMU-003	220
3	5.00	0.3	2.0	0.5	(2)	A	SHU-3	214
5	.50	0.3	2.0	0.3	(1) Logic Power	M	SMU-005	209
5	.50	0.1	0.1	0.1	(3) Hermetic Seal	N	PCE-5	121
5	4.00	1.0	1.0	0.1	(4) Sw. Reg.	AA	SEP-5-M	224
5	5.00	0.3	2.0	0.5	(2)	A	SHU-5	220
5	5.00	0.1	0.1	0.1	(3) Logic Power	BA	STB-5-M	173
5	8.00	0.3	2.0	0.5	(2) Small Size	A	SHU-5-WW	255
5	15.00	1.0	1.0	0.1	(3) Logic Power	CA	SLC-5	417
6	0.50	0.3	2.0	0.3	(1) Filament Power	M	SMU-006	209
6	5.00	0.3	2.0	0.5	(2)	A	SHU-6	220
10	0.30	0.3	2.0	0.3	(1) 10 VDC	M	SMU-010	203
10	4.00	0.3	2.0	0.5	(2)	A	SHU-10	220
12	0.25	0.3	2.0	0.3	(1)	M	SMU-012	203
12	0.25	0.1	0.1	0.1	(3)	N	PCE-12	121
12	3.33	0.3	1.50	0.5	(2)	A	SHU-12	220
12	8.00	1.0	1.00	0.1	(3) 12 VDC	CA	SLC-12	417
15	0.20	0.3	2.00	0.3	(1)	M	SMU-015	198
15	0.20	0.1	0.1	0.1	(3) Hermetic Seal	N	PCE-15	121
15	2.00	0.1	0.1	0.1	(3) Tight Reg.	BA	STB-15-M	173
15	2.66	0.3	1.50	0.5	(2) Op Amp	A	SHU-15	220
15	3.00	1.0	1.00	0.1	(4) Sw. Reg.	AA	SEP-15-M	220
15	3.70	1.0	1.00	0.1	(3) Op Amp	CA	SLC-15	417
24	0.12	0.1	0.1	0.1	(3) Tight Reg.	N	PCE-24	121
24	1.66	0.3	1.50	0.5	(2) 24 VDC	A	SHU-24	220
24	4.00	1.0	1.00	0.1	(3) Linear Amp	CA	SLC-24	417
28	0.11	0.3	1.50	0.3	(1)	M	SMU-028	198
28	1.42	0.3	1.50	0.5	(2) Power Amp	A	SHU-28	220
28	3.50	1.0	1.00	0.1	(3)	CA	SLC-28	417
30	0.10	0.1	0.1	0.1	(3) MOS	N	PCE-30	121
30	1.00	0.1	0.1	0.1	(3) Tight Reg.	BA	STB-30-M	173
30	1.34	0.3	1.50	0.5	(2)	A	SHU-30	220
30	3.25	1.0	1.00	0.1	(3) Linear Amp	CA	SLC-30	417
50	0.06	0.3	1.5	0.3	(1)	M	SMU-050	198
50	0.80	0.3	1.5	0.5	(2)	A	SHU-50	220
100	0.03	0.3	1.5	0.3	(1) Vacuum Tubes	M	SMU-100	198
100	0.10	0.1	0.1	0.1	(3)	BA	STB-100-M	187
100	0.40	0.3	1.5	0.5	(2)	A	SHU-100	220
150	0.02	0.3	1.5	0.3	(1)	M	SMU-150	198
150	0.26	0.3	1.5	0.5	(2)	A	SHU-150	220
180	1.05	0.1	0.1	0.1	(3) Display Tubes	BA	STB-180-M	282
250	0.16	0.3	1.5	0.5	(2) Vacuum Tubes	A	SHU-250	220
300	0.01	0.3	1.5	0.3	(1) Photo Diodes	M	SMU-300	209
300	0.13	0.3	1.5	0.5	(2)	A	SHU-300	220
500	0.006	0.3	1.5	0.3	(1) Vacuum Tubes	M	SMU-500	214
500	0.08	0.3	1.5	0.5	(2)	A	SHU-500	236
750	0.004	0.3	1.5	0.3	(1) Klystrons	M	SMU-750	220
750	0.053	0.3	1.5	0.5	(2)	A	SHU-750	236
1000	0.003	0.3	1.5	0.3	(1) Photomultiplier	M	SMU-1	269
1000	0.040	0.3	1.5	0.5	(2)	A	SHU-1000	253
1500	0.002	0.3	1.5	0.3	(1) BWO	M	SMU-1.5	275
1500	0.026	0.3	1.5	0.5	(2)	A	SHU-1500	286
2000	0.0015	0.3	1.5	0.3	(1) TWT	M	SMU-2	286
2000	0.020	0.3	1.5	0.5	(2)	A	SHU-2000	335
2500	0.0012	0.3	2.0	0.3	(1) CRT	M	SMU-2.5	297
2500	0.016	0.3	2.0	0.5	(2) Laser Power	A	SHU-2500	335
3000	0.001	0.3	2.0	0.3	(1) ION Pump	M	SMU-3	320
3000	0.013	0.3	2.0	0.5	(2)	A	SHU-3000	379
3500	0.0008	0.3	2.0	0.3	(1) CRT	M	SMU-3.5	407
3500	0.011	0.3	2.0	0.5	(2)	A	SHU-3500	396
4000	0.0007	0.3	2.0	0.3	(1) Photomultiplier	M	SMU-4	407
4000	0.010	0.3	2.0	0.5	(2)	A	SHU-4000	412
5000	0.0006	0.3	2.0	0.3	(1) CRT	M	SMU-5	462
5000	0.008	0.3	2.0	0.5	(2) Laser Power	A	SHU-5000	429

MULTIPLE OUTPUT MODELS

Output						Case Size (See Table II)	Model Number	Price (1 pc)
Voltage (VDC)	Current (Amps)	Line Reg. %	Load Reg. %	Ripple[6] (% V RMS)	Notes			
15 5	.06 .40	0.1	0.1	0.1	(3) PC Mtg.	N	PCE-15-5	$ 176
15 5	1.00 3.00	1.00	1.00	0.1	(4) Switch Reg. High Efficiency	AA	SEP-15-5-M	282
15 5	1.00 3.00	0.1	0.1	0.1	(3) Tight Reg.	CA	STG-15-5-M	231
15 5	1.00 2.50	0.20	2.00	0.5	(2) Small Size	A	SHU-15-5	269
15 −15	0.12 0.12	0.1	0.1	0.1	(3) Op Amp Power	N	PCE-30CT	176
15 −15	1.00 1.00	0.1	0.1	0.1	(3) Analog Power	CA	STG-30CT-M	231
15 −15	1.00 1.00	0.20	2.00	0.5	(2)	A	SHU-30CT	269
−24 −12	0.04 0.16	0.1	0.1	0.1	(3) PC Mtg.	N	PCE-24-12	176
−28 −12	0.80 1.50	0.20	2.00	0.5	(2) MOS	A	SHU-28-12	269
28 5	0.03 0.40	0.1	0.1	0.1	(3) Hermetic Case	N	PCE-28-5	176
28 5	0.50 2.50	0.1	0.1	0.1	(3) Linear Amp and Logic Power	CA	STG-28-5-M	231
28 5	0.50 2.50	0.20	2.00	0.5	(2) Memory System Power	A	SHU-28-5	269
180 5	 3.00	0.1	0.1	0.1	(3) Display and Logic Power	CA	STG-180-5-M	251
180 5	0.10 3.00	0.20	2.00	0.5	(2) Small Size	A	SHU-180-5	275
15 −15 5	0.50 0.50 2.00	0.20	3.00	0.5	(2) Op Amp and Logic	A	SHU-30CT-5	302
15 −15 5	0.50 0.50 4.00	0.1	0.1	0.1	(3) Tight Regulation Op Amp and Logic	CA	STL-30CT-5-M	289
−24 −14 5	0.50 0.50 3.00	0.1	0.1	0.1	(3) Tight Reg. MOS & Logic	CA	STL-24-14-5-M	289
180 15 −15	0.03 0.30 0.30	0.20	3.00	0.5	(2) Display and Logic	A	SHU-180-30CT	302
180 15 −15	0.05 0.60 0.60	0.1	0.1	0.1	(3) Tight Reg. Display and Op Amp	CA	STL-180-30CT-M	309
180 15 −15 5	0.03 0.30 0.30 2.00	0.20	3.00	0.5	(2) Logic, Display Op Amp Power	A	SHU-180-30CT-5	363

NOTES:

(1) Input 26–30 VDC, Load Reg. (½ FL-FL). Adjust 90% to 105% of nominal output, operating case temp. -55 to +100°C. Options available: A, CT, D, E, F, I, P, S, Z.

(2) Input 26–30 VDC (½ FL-FL), Adjust 40% to 105% of nominal output, operating case temp. -55 to +100°C. Options available: E, CT, E, F, G, I, L, P, R. W, WW.

(3) Input 26–30 VDC, Load Reg. (NL-FL), Overload/short circuit protected operating case temp. -10 to +71°C. Options available: A, E, F, G, I, P, V.

(4) Input 19–32 VDC, Load Reg. (½ FL-FL), common for input and output, operating case temp. -10 to +71°C. Options available: A, E, G, P.

(5) Add 10 MV to Load Regulation and Line Regulation for all models.

(6) Add 10 MV RMS to ripple for all models.

HOW TO ORDER:

(1) Standard models: Use model numbers listed. Add option letters as required per Table 1.

(2) Special models: For SHU converters use three letter model number followed by voltage (volts/current (amps). Use standard model of highest voltage for output power rating and price.

EXAMPLE: SHU-44CT has output of ±22 VDC at 0.80 Amps with a 1 pc. price of $269.00

For other Models see "Design As You Design" pages.

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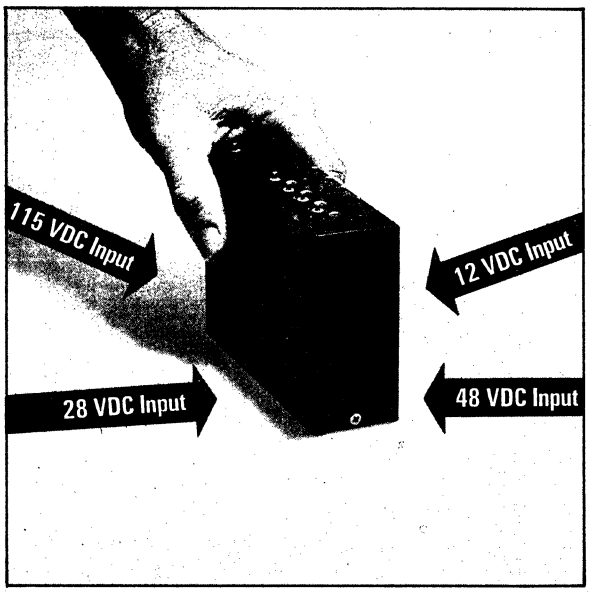
DC-DC REGULATED CONVERTERS

12, 48 or 115 VDC to single or multiple DC outputs



44 TO 52 VDC INPUT
TO DC POWER CONVERTERS

Output								
Voltage (VDC)	Current (Amps)	Line Reg. %	Load Reg. %	Ripple (% V RMS)	Notes	Case Size (See Table II)	Model Number	Price (1 pc)
5	4.00	0.1	0.1	0.1	Logic Power	AA	ASL-A5/4-AA	$ 173
30	0.60	0.1	0.1	0.1		AA	ASL-A30/.6-AA	173
250	0.08	0.2	1.5	0.5	Vacuum Tube	A	SHU-250E(43-52)	255
500	0.04	0.2	1.5	0.5		A	SHU-500E(43-52)	271
1000	0.02	0.2	1.5	0.5	Photomulti.	A	SHU-1000E(43-52)	288
15 −15	1.00 1.00	0.1	0.1	0.1	Op Amp	BA	ASA-A15/1-A15/1-BA	289
5 180	4.00 0.05	0.1	0.1	0.1	Display and Logic	BA	ASA-A5/4-B180/.05-BA	309

105 TO 120 VDC INPUT
TO DC POWER CONVERTERS

Output								
Voltage (VDC)	Current (Amps)	Line[1] Reg. %	Load[1] Reg. %	Ripple[2] (% V RMS)	Notes	Case Size (See Table II)	Model Number	Price (1 pc)
5	5.00	0.1	0.1	0.1	Logic Power	AA	ASH-A5/5-AA	$ 188
5	10.00	1.0	1.0	0.5	Logic Power	BA	ASH-M5/10-BA	374
5	20.00	1.0	1.0	0.5	Logic Power	BA	ASH-M5/20-BA	440
12	2.00	0.1	0.1	0.1		AA	ASH-A5/2-AA	188
12	12.00	1.0	1.0	0.5	12 VDC	BA	ASK-M12/12-BA	440
24	1.00	0.1	0.1	0.1		AA	ASH-A24/1-AA	188
24	3.20	1.0	1.0	0.5	24 VDC	BA	ASH-M24/3.2-BA	379
24	6.00	1.0	1.0	0.5		BA	ASK-M24/6-BA	440
30	1.30	0.3	2.0	0.5		A	SHU-30E(105-120)	255
48	3.00	1.0	1.0	0.5	48 VDC	BA	ASK-M48/3-BA	440
500	0.08	0.3	2.0	0.5	Vacuum Tube	A	SHU-500E (105-120)	271
1000	0.04	0.3	2.0	0.5		A	SHU-1000E (115-120)	288
15 −15	1.00 1.00	0.1	0.1	0.1	Op Amp	BA	ASH-A15/1-A15/1-BA	246
15 −15 5	1.00 1.00 4.00	0.1	0.1	0.1	Op Amp and Logic	BA	ASH-A5/4-A15/1-A15/1-BA	304

11 TO 13 VDC INPUT
TO DC POWER CONVERTERS

Output								
Voltage (VDC)	Current (Amps)	Line Reg. %	Load Reg. %	Ripple (% V RMS)	Notes	Case Size (See Table II)	Model Number	Price (1 pc)
5 5	2.50 5.00	0.3 0.1	2.0 0.1	0.5 0.1	(2) Logic (6)	A BA	SHU-5 EE SGU-5-M	$ 255 173
12 12	1.00 5.00	0.3 0.1	2.0 0.1	0.5 0.1	(2) (6)	A BA	SHU-12 EE SGU-12-M	255 231
15 15	1.00 1.30	0.3 0.1	2.0 0.1	0.5 0.1	(2) Op Amp (6)	A BA	SHU-15 EE SGU-15-M	255 173
30 30	0.50 2.00	0.3 0.1	2.0 0.1	0.5 0.1	(2) Analog Amp (6)	A BA	SHU-30 EE SGU-30-M	255 231
50	0.40	0.3	2.0	0.5	(2)	A	SHU-50EE	255
100	0.20	0.3	2.0	0.5	(2)	A	SHU-100EE	255
250	0.08	0.3	2.0	0.5	(2) Vacuum Tube	A	SHU-250EE	255
500	0.04	0.3	2.0	0.5	(2)	A	SHU-500EE	271
750	0.02	0.3	2.0	0.5	(2)	A	SHU-750EE	271
1000	0.02	0.3	2.0	0.5	(2) Photo Tubes	A	SHU-1000EE	288
1500	0.01	0.3	2.0	0.5	(2)	A	SHU-1500EE	321
2000	0.01	0.3	2.0	0.5	(2) Laser	A	SHU-2000EE	370
2500	0.01	0.3	2.0	0.5	(2) CRT	A	SHU-2500EE	414
15 −15	0.40 0.40	0.3	2.0	0.5	(2) Op Amp	A	SHU-30CT EE	290
15 −15	2.00 2.00	0.1	0.1	0.1	(6)	CA	SGU-30CT-M	289
24 12	0.20 0.40	0.3	2.0	0.5	(2) MOS	A	SHU-24-12 EE	305
24 12	1.00 2.00	0.1	0.1	0.1	(6)	CA	SGU-24-12-M	289
180 5	0.05 2.00	0.3	3.0	0.5 0.5	(2) Display Logic	A	SHU-180-5	305
15 −15 5	0.20 0.20 1.00	0.3	3.0	0.5 0.5 0.5	(2) Op Amp Logic	A	SHU-30CT-5 EE	340
−24 −12 5	0.10 0.20 1.00	0.3	3.0	0.5 0.5 0.5	(2) MOS	A	SHU-24-12-5 EE	355
180 15 −15 5	0.02 0.20 0.20 1.00	0.3	3.0	0.5 0.5 0.5 0.5	(2) Display Op Amp Logic	A	SHU-180-30CT-5	390

NOTES:

(1) Add 10 MV to Load Regulation and Line Regulation for All Models.

(2) Add 10 MV RMS to ripple for all models.

HOW TO ORDER:

(1) Standard models: Use model numbers listed. Add option letters as required per Table 1.

(2) Special models: For SHU converters use three letter model number followed by voltage (volts/current (amps). Use standard model of highest voltage for output power rating and price.

EXAMPLE: SHU-44CT has output of ±22 VDC at 0.80 Amps with a 1 pc. price of $269.00.

For other Models see "Design As You Order" pages.

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CASE SIZES FOR POWER CONVERTERS

Table II

Case Size	W (Width)	H (Height)	L (Length)	Mounting Holes				Dwg. Fig.	Weight (Oz.)
				M	N	No. Holes	Size		
A	1 5/8	3 5/8	3 1/2	1.125	2.750	4	6-32NC ¼" Min.	1	27
B	1 5/8	3 5/8	5	1.125	4.250	4	6-32NC ¼" Min.	1	38
C	1 5/8	3 5/8	7	1.125	5.500	6	6-32NC ¼" Min.	1	54
D	1 5/8	3 5/8	10 1/2	1.125	9.000	6	6-32NC ¼" Min.	1	81
K	2 1/2	2 1/2	4	2.000	3.500	6	6-32NC ¼" Min.	2	28
L	4	2 1/2	5	3.420	4.420	6	8-32NC ¼" Min.	2	56
M	2 1/32	2 3/4	1 7/8		1.590	2	6-32NC ¼" Min.	3	4
N	2 9/16	3/4	2 9/16	2.190	2.190	2	6-32NC ¼" Min.	4	5
O	2 9/16	1	2 9/16	2.190	2.190	2	6-32NC ¼" Min.	4	11
Q	3/4	4 9/16	1 15/16		1.590	2	6-32NC ¼" Min.	3	8
R	1 5/8	3 5/8	3 1/2	1.125	2.750	4	6-32NC ¼" Min.	5	27
S	1 5/8	3 5/8	5	1.125	4.250	4	6-32NC ¼" Min.	5	38
T	1 5/8	3 5/8	7	1.125	5.500	6	6-32NC ¼" Min.	5	54
U	1 5/8	3 5/8	10 1/2	1.125	9.000	6	6-32NC ¼" Min.	5	81
V	1 5/8	AR*	AR	1.125	2.750C	AR	6-32NC ¼" Min.	5	1.3 oz/in^3
AA	1 5/8	3 5/8	3 1/2	1.125	2.750	4	6-32NC ¼" Min.	6	27
BA	1 5/8	3 5/8	5	1.125	4.250	4	6-32NC ¼" Min.	6	38
CA	1 5/8	3 5/8	7	1.125	5.500	6	6-32NC ¼" Min.	6	54
DA	1 5/8	3 5/8	10 1/2	1.125	9.000	6	6-32NC ¼" Min.	6	81

*AR = As Required (Units Are Fabricated From Extrusions)

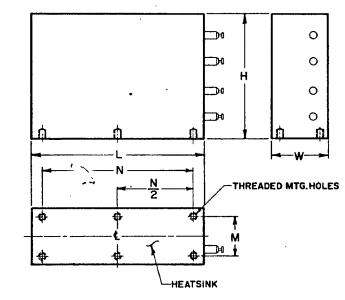

Figure 1

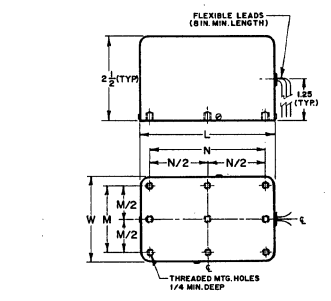

Figure 2

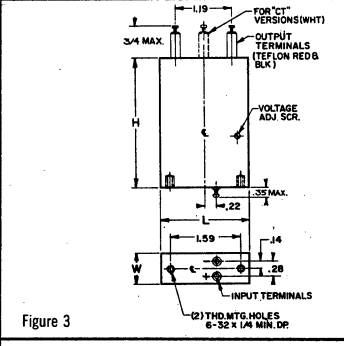

Figure 3

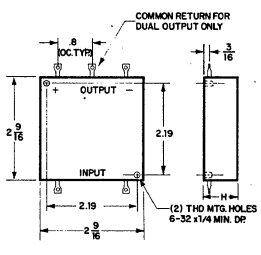

Figure 4

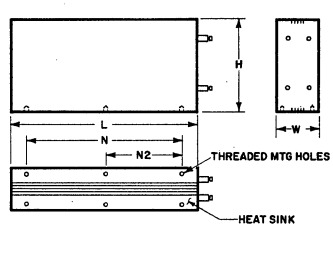

Figure 5

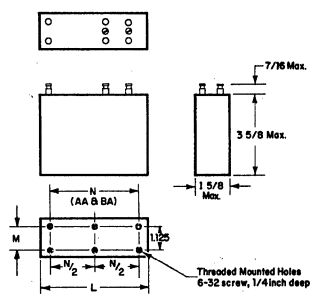

Figure 6

Note: All dimensions in inches (to convert to MM, multiply inches by 25.4).

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ARNOLD MAGNETICS

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OPTIONS FOR POWER CONVERTERS

Table I

Option Letter	Option	Specifications	Use on Models	Price (1 pc)
A	External (Remote) Adjustment of Output Voltage	Two (2) flexible leads for external pot. All performance specifications unchanged, 5K pot PHU, SMU; 10K pot SHU	SHU, SMU, PHU	$ 25
(CT)	Center Tapped Outputs	Put "CT" in parenthesis for center tapped output. Example: SHU-30(CT) provides ± 15 VDC @ 1.3A. Output voltage available to 500 volts except 50 volts for SMU	SHU, SMU, PHU	30
D	Output Adjust on Side	Output voltage adjustment control located on the side for convenience of adjustment when units are stacked together	SMU	25
E	Input Voltage Alteration	Permits operation over specified range of input voltage: E_L to E_H. Output power and adjustment range are affected. Consult factory for maximum values. When E – E exceeds 4V, observe case temperature closely. Specify lowest and highest input voltage (E & E). Example: SHU-30E (20-30) will deliver 30 volts @ .87A at any input from 20 to 30 VDC	ALL MODELS	35
EE	12 Volt Nominal Input	Derate output current 50%. Input: 11-14 VDC. Max. Output: 2500 VDC	SHU, SMU	35
G	Flexible Leads	Leads per MIL-W-16878 where applicable. Lead length: 10 inches minimum	ALL MODELS	15
I	EMI/RFI Qualified	Conducted and radiated noise below spec. Level of MIL-I-26600, Class I and MIL-I-6181D. Qualification is by similarity. PHU and SHU to MIL-I-6181D only case size B SMU case size Q	SHU, SMU, PHU	75
L	Tighter Load Regulation	See individual product literature for specifications which vary with output voltage	SHU, PHU	25
M	Modular Construction	Electrically same with terminals extending from top of case 7/16 inch max. Adjustments (where used) lie between output terminals.	MOST MODELS	0
P	Programmable Output Voltage	Output varies directly with 9 ± 4 VDC applied between negative input terminal and control lead (violet). Input resistance to control lead: 2K ohm approx. Output voltage range: 50% to 105% (Min. of rated output). Linear deviation will not exceed 5%.	SHU, SMU, SHV, SMV	35
R	Tighter Line Regulation	See individual product literature for specifications	SHU, PHU	25
S	Short Terminals	3/8 inch maximum terminal length. Sleeving will be required for high voltage outputs.	SHU, SMU, STB, STG, STL, PHU, PIB, PIG, PIL	10
V	Overvoltage Protection	Prevents output voltage from increasing above overvoltage set point. PHU – increase to case size B. Other models add 0.6 inch to total module length for each output. Set to 120 ± 10% of nominal output. Other settings may be specified 115 to 200% of nominal output by V (voltage) Example: PHU-5V(18) will crowbar at 8 volts	PHU, PIB, PIG, PIL, STB, STG, STL, MAP, PEN, PEP, PER, PET, SLC	42
W	Higher Power Output	Increased output current rating up to 50%. For input less than 26 VDC see factory. Derate output power .5W/ C above 60 C base temperature. 2 through 500 VDC output only	SHU	35
Z	Broaded Adjustment Range	Adjustment range 40 to 105% of nominal output voltage	SMU	10

NOTES: 1. The following modification combinations cannot be made. A. for SHU: E with EE: I with A, I with P
2. Options A and P are excluded from warranty
3. See "Special Products" Section for Modifications PE, PI and KI

ARNOLD MAGNETICS

Arnold Magnetics

TRANSFORMERS, INDUCTORS, ETC.

MINIATURE POWER TRANSFORMER

Series	Max. Power Watts	L	W	H	Max. Output Voltage	Max. No. of Terminals	Weight (Oz.)	Outline Fig.
TTA	1.0	1 1/16 O.D.		1/2	100	8	.5	10
TTH	20	1 5/8 O.D.		1 1/8	1000	8	4	10
TNA	50	2 5/16	1	2 7/8	1000	10	13	11
TNB	120	2 1/4	1 3/16	3	1750	10	15	11
TND	235	2 1/2	1 1/2	3 1/8	1750	10	23	11
TNE	335	3	1 1/2	4	1750	10	38	11
TEA	160	2.4	2	2	3000	14	22	12
TEB	100	2.4	1.7	1.7	3000	14	11	12
TEF	32	1.8	1.4	1.4	2000	10	8	12
TEH	21	1.5	1.3	1.2	2000	10	4.5	12
TEM	8	1.1	1.2	.9	850	8	2.0	12
TEQ	4.6	1.1	.9	.9	370	8	1.2	12

Input: 115 V 400 Cycles 1 phase
Temp.: 55° to 100°C
Environment: Encapsulated to meet MIL-E-5272D or MIL-T-27A
Output: Up to three windings

HOW TO ORDER (Example):

TBN	115	26/3.8	5/3	FE
Series No.	Primary VRMS	Secondary No. 1 VRMS/AMPS	Secondary No. 2 VRMS/AMPS	Terminations

FE—Flattened & Pierced Pins **SE**—Straight Pins
HS—Hooked Pins **LS**—Flexible Leads

MINIATURE INDUCTORS

Series	Inductance (MH)	Max. "Q"	Max. "Q" Freq. (KC)	Size (See Fig. 10) O.D.	H
ITV	1 to 17000	175 to 52	15 to 1.7	1.44	.75
ITW	1 to 17000	240 to 50	40 to 2.5	1.44	.75
ITR	1 to 7000	145 to 55	19 to 3	1.06	.47
ITS	1 to 500	168 to 50	100 to 13	1.06	.47
ITU	1 to 3000	190 to 50	40 to 5	1.06	.47

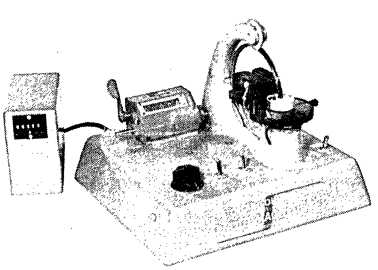
HOW TO ORDER (Example):

ITV	15	HS
Series No.	Inductance (MH)	Termination

HS—Hook Pins
SE—Straight Pins

TOROIDAL COIL WINDER

Sets up quickly - easy to operate - take wide range of wire sizes



■ Min. finished hole size: .18 in. ■ Max. finished toroid O.D.: 4.0 in. ■ Winding speed: 1500 turns/min. ■ Wire range: AWG 44 to AWG 26 ■ Dual, self-checking turns counting system Loading (wire length) counter ■ Core range: 9/32" I.D. to 4" O.D. to 1 1/2" high.

LABORATORY USE — Change wire and core size in 45 sec.
■ **PRODUCTION USE** — 1500 turns per minute ■ Insert core and load in 20 sec.

Model WTA — $1,200 includes all rings, counters and accessories
Model WTB — $930.00 without mechanical counter or extra rings.

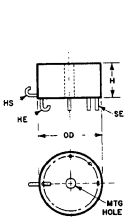


Fig. 10

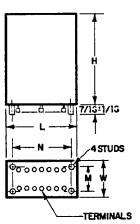


Fig. 11

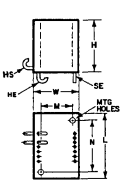


Fig. 12

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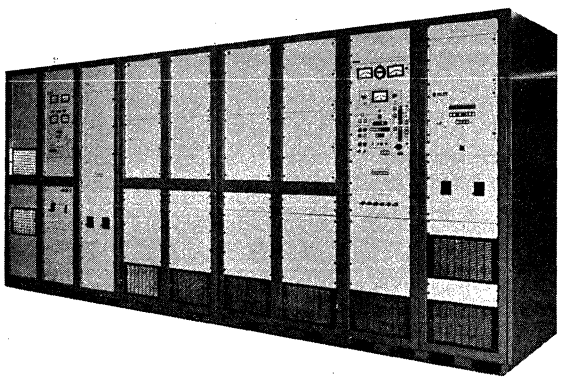
UPS UNINTERRUPTIBLE POWER SYSTEMS

AVTEL

On-line solid state AC power systems which guarantee uninterrupted, transient-free power to your critical equipment, regardless of power line conditions.

CONDITIONED POWER

AVTEL's Uninterruptible Power Systems (UPS) offer the maximum in reliability and efficiency for applications where even a momentary power failure or disturbance cannot be tolerated. High mean-time-between-failure (MTBF) coupled with modular construction for low mean-time-to-repair (MTTR) make Avtel UPS the most practical systems for continuous on-line operation.



250 KVA UPS with Solid State Bypass Switch

AVTEL UPS ARE DESIGNED TO PROVIDE THESE OUTSTANDING ADVANTAGES:

True Sinewave Output: The maximum harmonic distortion under the worst combination of conditions is less than 2%. Under normal operating conditions, less than 1.5% is typical.

Tight Frequency Control: The output frequency is completely unaffected by load and line variations. If desired, the output frequency can be phase-locked to the commercial line or other reference source. 0.5% stability is standard, 0.01% available.

Minimum Maintenance: Modular construction throughout permits quick access to and exchange of any component. A MTTR of less than 30 minutes is typical. Cleaning the air filter is the only required preventive maintenance, other than battery watering. In non-redundant systems, the bypass switch is used to supply power to the critical load directly from the commercial lines during maintenance.

Low Cost of Ownership: Avtel's low maintenance, high efficiency and trouble-free operation yield substantial savings over other approaches to uninterruptible power. This advantage becomes increasingly significant with time, and savings of over 50 percent overall in ten years ownership are not improbable.

Silent Operation: Unlike rotary systems which produce substantial noise and vibration, these compact and silent units can be installed in close proximity to the load with which they are associated thereby avoiding expensive installations.

High Power Density: These systems are the smallest and lightest yet offered in these power ranges. For example, a 75 KVA system occupies only 18 square feet of floor space, exclusive of batteries.

Unprecedented Efficiency: Operating efficiencies normally exceed 85%. This low dissipation allows laboratory operation without special cooling considerations.

RFI Suppression: Careful and effective filtration of both the input and output lines, together with ample shielding afford RFI attenuation far superior to other uninterruptible systems.

Choice of Outputs: Avtel's UPS can be ordered in standard 120/208 or 460 V, 60 Hz models or 50 Hz versions at voltage levels found in overseas installations. A complete line of 415 Hz models is also available.

Rapid Response Time: Regulation response time is typically faster than 20 ms at nominal line conditions for a 100% step load change.

Wide Range of Batteries: Batteries may be sized from 2 minutes to several hours on most Avtel models. Lead-calcium batteries are normally provided, but nickel-cadmium or other types may also be employed.

Choice of Configurations: Avtels UPS are available in basic non-redundant configurations with standard electro-mechanical bypass (A), non-redundant with solid state transfer switch, using the utility line as a redundant source (B), and fully redundant configurations (C), as dictated by individual customer requirements.

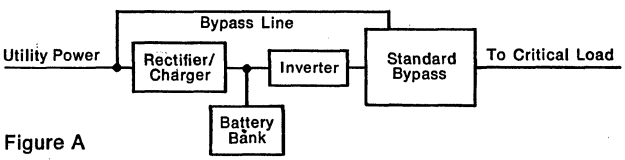


Figure A

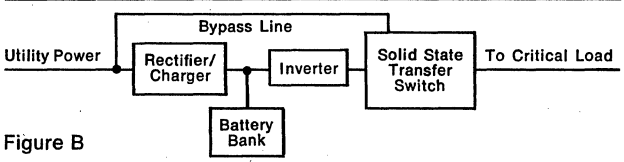


Figure B

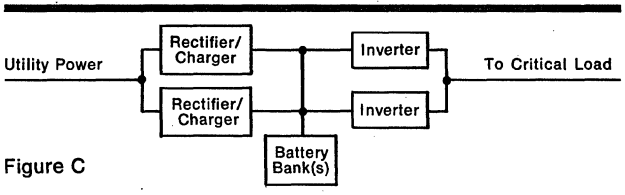


Figure C

Standard Models — 60 Hz, Non Redundant

Model	Output Power (KVA)	Phases	Size–Less Batteries (W x D x H)
UPS-1	1.25	1	17 x 22 x 10.5
UPS-2	2.5	1	17 x 22 x 19.25
UPS-5-1	5	1	25 x 36 x 64
UPS-5	5	3	25 x 36 x 64
UPS-7-1	7.5	1	25 x 36 x 82
UPS-7	7.5	3	25 x 36 x 82
UPS-10-1	10	1	25 x 36 x 82
UPS-10	10	3	25 x 36 x 82
UPS-15-1	15	1	48 x 36 x 82
UPS-15	15	3	48 x 36 x 82
UPS-20	20	3	48 x 36 x 82
UPS-25	25	3	48 x 36 x 82
UPS-37	37.5	3	71 x 36 x 82
UPS-50	50	3	71 x 36 x 82
UPS-62	62.5	3	71 x 36 x 82
UPS-75	75	3	71 x 36 x 82
UPS-100	100	3	120 x 36 x 82
UPS-125	125	3	142 x 36 x 82
UPS-150	150	3	142 x 36 x 82
UPS-175	175	3	164 x 36 x 82
UPS-200	200	3	164 x 36 x 82
UPS-250	250	3	210 x 36 x 82
UPS-313	313	3	220 x 36 x 82

Note: Larger and redundant models are made by parallelling, i.e., UPS-500 = 2 x UPS- 250- non-redundant, 3 x 250- redundant. Consult your representative for detail specifications.

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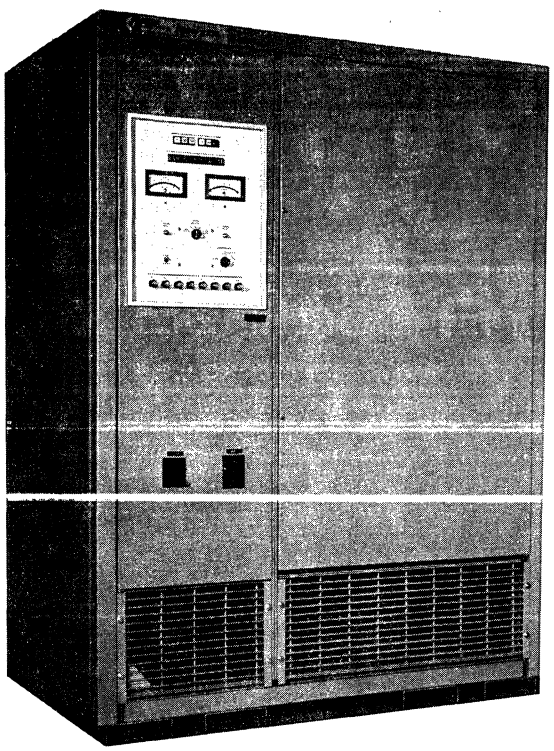
AVTEL

415 CYCLE COMPUTER POWER

AVTEL

All solid state converters provide precision 415 Hz power for high capacity computers. Specifically designed for use with IBM 370-165/168, 360-85, 360-195 and similar models.

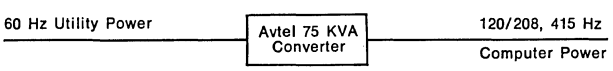


SPECIFICATION SUMMARY

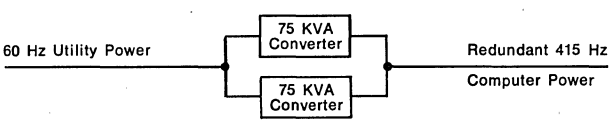
Input:	480 V or 120/208 V (specify which) ±10%, 45-66 Hz, 3ϕ
Output Voltage:	120/208 V ±1%
Frequency:	415 Hz ±0.5% (400 Hz also available)
Power:	75 KVA continuous, 125% for 20 minutes, 150% for 10 seconds
Waveform Distortion:	2% THD maximum
Load Power Factor:	0.9 lead to 0.7 lag
Output Modulation:	±0.5%
Response Time:	20 ms
Efficiency:	86% at full load
Heat Dissipation:	30,000 BTU/hr.
Accoustical Noise:	70 db maximum
Physical Size:	60" W x 36" D x 82" H
Weight:	4000 lbs
Fully Instrumented:	Remote monitoring panels available

CONFIGURATIONS

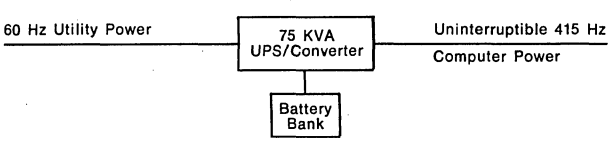
Due to the cost per hour of these large computers, Avtel recommends the redundant configuration consisting of two of the 75 KVA converters for one computer, three for two computers, etc. With this system a converter can fail and be automatically disconnected from the critical bus without affecting the computer. Complete Uninterruptible Power systems with just the 415 Hz output, or combination 60 Hz (for peripherals) and 415 Hz outputs may also be specified in redundant or non-redundant configurations.



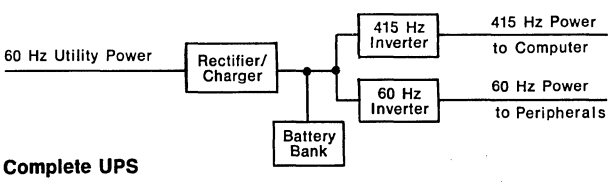
Basic Converter



Redundant System



415 Hz UPS



Complete UPS

AVTEL'S SOLID STATE CONVERTERS OFFER THESE ADVANTAGES OVER CONVENTIONAL MOTOR-GENERATOR SETS.

Higher Efficiency: 86% at full load; thus less heat is generated, less power consumed.

Quiet Operation: 70 db maximum accoustical noise and no structureborne noise.

Redundant Configurations Available: Converters may be paralleled so that no failure will disturb the computer.

Ease of Installation: Due to low noise and heat generation and convenient form factors, Avtel's solid state converters may be installed anywhere, even adjacent to the computer.

Superior Performance: Waveform purity, voltage and frequency regulation are better than IBM requirements.

Uninterruptible Option: Systems may be purchased as complete UPS initially or modified at a later date if Uninterruptible Power becomes essential.

High Reliability: There are no moving parts, nothing to wear out. Redundant systems offer MTBF's in excess of 100,000 hours.

Low Cost of Ownership: All these advantages result in a smooth running computer installation with lower operating costs than other approaches. The inherent flexibility and expandability (through parallelling) of the converters prevents obsolescence even though your load profile changes.

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HIGH POWER SOLID STATE FREQUENCY CHANGERS

AVTEL

CR SERIES

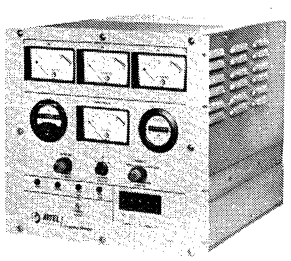
2.5 to 175 KVA. 45-66 and 400 Hz input. 45-66, 350-450, or 700-900 Hz output available.

Efficient, reliable and silent in operation, these completely solid state electronic systems are ideal for any application requiring AC power in the KVA ranges. In this series, there are 27 standard models in ten power ratings from 2.5 KVA to 175 KVA. Three output frequency bands are available from 45 to 66, 350 to 450, and 700 to 900 Hz. Most frequency and power ratings are available with either single or polyphase output. Unique electronic circuitry provides complete protection from overloads or short circuits.

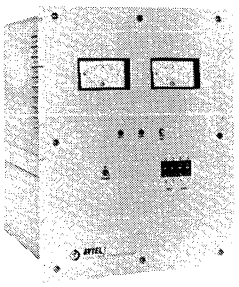
These highly versatile and rugged units are capable of fulfilling the majority of AC power source requirements. Twenty-six standard options are offered to meet virtually any special or unusual requirement for conditioned AC power.

The unique design of this equipment results in an AC source which is a direct replacement for motor alternator sets, but with the following superior characteristics:

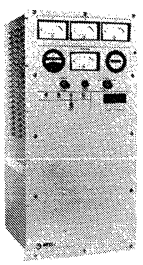
Output frequency unaffected by load.
Low acoustical noise.
Efficiencies approaching 90%.
Instant starting.
Sinewave output with less than 2% total harmonic distortion.
Ease of frequency variation.
No maintenance required.
Lightweight.
Impervious to overloads.
Remote sensing.
Remote programming.
Low cost of ownership.



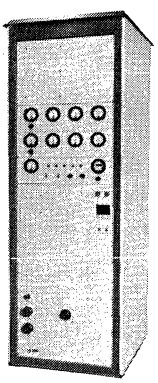
CR 074-3 7.5 KVA, 400 Hz, 3-Phase



CR 056-1 5 KVA, 60 Hz, 1-Phase



CR 204-3 20 KVA, 400 Hz, 3-Phase



CR 504-3 50 KVA, 400 Hz, 3-Phase

INPUT

Voltage: 187 to 242 for nominally 120/208 volt input units. Allows connection to 230 three wire without modification.
±10% of nominal for all other AC inputs. See Options B through G.

Power:

Output Frequency Band	Percent of Full Load Rating
45-66 Hz	116
350-450 Hz	125
700-900 Hz	135

Frequency: 45-66 Hz. See Option B, C & H.

OUTPUT

Voltage: Adjustable. See Options I & K.

Current: Adjustable. See Options J & L.

Power Rating: Based on continuous duty.

Frequency: Continuously adjustable over the entire operating band. See Options M through R.

Bands: 45-66, 350-450, 700-900 Hz.

Regulation:

Voltage:	±1% or 0.5 V
Current:	±1% or 1 ampere
Frequency:	±0.50% for variable frequency operation
	±0.010% for fixed frequency operation

Distortion: For linear loads, the output sinewave contains less than 2% total harmonic distortion. See Option U.

Power Factor: 0.7 lead to 0.7 lag for full rated power. Power factor loads to 0.2 are permissible with load ratings of 50%.

Phase Balance: 2% typical deviation for 50% load unbalance in any combination. 0.25% for any balanced load.

Transient Response: Typically 20 ms but may vary from 4 to 100 ms depending on model and options.

Incidental Modulation:

Amplitude:	Varies 0.1 to 1% peak to peak depending on model and options.
Frequency:	Less than 0.05% for variable frequency operation and negligible for fixed frequency operation.

CONTROLS

Input: Toggle-operated circuit breakers.

Output: Toggle switch drives regulator to zero output condition in standby position.

Voltage Control: Adjusts output voltage.

Current Control: Adjusts output current limit.

Frequency Control: Adjusts output frequency.

Frequency Selector: Selects discrete frequencies. Options P & R only.

Voltmeter Switch: Selects voltmeter circuit.

Function Switch: Selects operating mode. Options M through O only.

METERS & INDICATORS

Meter Accuracy: 2% of full scale.

Meter Functions: Input/output voltmeter. Independent ammeter for each output phase.

Indicators: Input power • Output power • Overload • Overheat • Phase sequence (3-phase units).

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AVTEL

SOLID STATE AC POWER FOR CRITICAL APPLICATIONS

AVTEL

PROTECTION CIRCUITS

Load: Widely adjustable current limiting capability can be set to the maximum normal requirements of the load. In the event of load malfunction, the unit will become a constant current source at the set limit.

Overload: The unit cannot be damaged by any overload or short circuit of transient or indefinite duration. Finite overloads are permitted for periods inversely proportional to the magnitude of the overload. When the permissible overload limitations are exceeded, the output voltage will reduce to such value as necessary to produce the load current limit set by the current adjust control. If the load instantaneously exceeds 150% of ratings, the output voltage will reduce to zero. If the load is gradually increased, the current will limit at 125% or the set point, whichever is lower. Reduction of the load to specification limits or current control settings will automatically reinstate normal operation.

Overheat: The output is interrupted by thermo-switches in the event of excessive internal temperatures. In such event, the cooling fan continues to operate and upon reduction of internal temperatures to specification limits, normal operation is automatically reinstated.

Backup Protection: The input power line is protected by a toggle-operated magnetic circuit breaker which doubles as the primary input and power switch. In the event of electronic protection circuitry malfunction or component failure in the power system, these breakers will prevent consequential damage to the unit, its load or the input power source.

ENVIRONMENTAL

Operating Temperature: 0 to 50°C, continuous operation.
Storage Temperature: −20 to +71°C.
Humidity: 0 to 95%. R.H., non-condensing.
Shock & Vibration: Normal transportation and handling.

ELECTROMAGNETIC INTERFERENCE

Constructed in accordance with Military EMI/RFI requirements.

CONSTRUCTION

Welded frame covered with easily removable non-structural dust covers. See Option X & Y.

OPTIONS

See last page.

PRICE

For price quotations, specify model number and options.

KVA	Output Volts	Phases	Input Volts	Rack Mount Dimensions			Unitized Dimensions			Weight†	Model No.*
				Height	Width	Depth	Height	Width	Depth		
350-450 or 700-900 Hz Output with 45-66 Hz, 3-Phase Input											
2.5	120/208	3	115/200	17.5	19	21	17.25	17	21	175	CR 024-3
2.5	120	1	115/200	17.5	19	21	17.25	17	21	185	CR 024-1
5	120/208	3	115/200	17.5	19	21	17.25	17	21	190	CR 054-3
5	120	1	115/200	17.5	19	21	17.25	17	21	205	CR 054-1
7.5	120/208	3	115/200	17.5	19	21	17.25	17	21	220	CR 074-3
7.5	120	1	115/200	31.5	19	24	31.25	17	24	240	CR 074-1
10	120/208	3	115/200	31.5	19	24	64	25	36	315	CR 104-3
10	120	1	115/200	31.5	19	24	64	25	36	330	CR 104-1
15	120/208	3	115/200	31.5	19	24	64	25	36	350	CR 154-3
20	120/208	3	115/200	—	—	—	64	25	36	850	CR 204-3
37.5	120/208	3	460	—	—	—	82	25	36	2000	CR 374-3
50	120/208	3	460	—	—	—	82	25	36	2200	CR 504-3
75	120/208	3	460	—	—	—	82	60	36	4000	CR 754-3
150	440	3	460	—	—	—	82	120	36	8000	CR 1504-3
45-66 Hz Output With 45-66 Hz, 3-Phase Input											
2.5	120/208	3	115/200	17.5	19	21	17.25	17	21	225	CR 026-3
2.5	120	1	115/200	17.5	19	21	17.25	17	21	245	CR 026-1
5	120/208	3	115/200	31.5	19	24	31.5	17	24	310	CR 056-3
5	120	1	115/200	31.5	19	24	31.5	17	24	355	CR 056-1
7.5	120/208	3	115/200	31.5	19	24	31.5	17	24	390	CR 076-3
7.5	240	1	115/200	31.5	19	24	31.5	17	24	435	CR 076-1
10	120/208	3	115/200	—	—	—	64	25	36	1100	CR 106-3
10	240	1	115/200	—	—	—	64	25	36	1175	CR 106-1
15	120/208	3	115/200	—	—	—	64	25	36	1200	CR 156-3
15	240	1	115/200	—	—	—	64	25	36	1400	CR 156-1
20	120/208	3	460	—	—	—	64	25	36	1700	CR 206-3
20	240	1	460	—	—	—	82	25	36	2000	CR 206-1
37.5	440	3	460	—	—	—	60	48	36	3600	CR 376-3
50	440	3	460	—	—	—	82	48	36	4500	CR 506-3
125 (and above) Various CR and UPS Models available. Consult the factory.											

*Third digit specifies frequency, for example: CR 024-3 = 400 Hz; CR 028-3 = 800 Hz.
†Weights given are for rack mount versions when available. Options frequently affect size and weight. Please consult the factory when ordering options.
Specifications subject to change without notice.

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LOW POWER SOLID STATE FREQUENCY CHANGERS

AVTEL

TR SERIES

250-2000 VA—45 to 450 Hz Input. 50/60, 400, 800, or 1600 Hz Output available on most models.

The low power Avtel TR Series Frequency Changers are all transistorized sources of conditioned AC power. Available in 20 standard models from 250 VA to 2000 VA, the TR Series supplies output frequencies in four different bands: 45-66 Hz, 350-450 Hz, 700-900 Hz, and 1500-1700 Hz.

The unique design of TR Frequency Changers ensures that output waveform and frequency are unaffected by changes in the load. The unit is quiet, maintenance free, and impervious to overloads and short circuits. Avtel's TR Series Frequency Changers are the ultimate solution to smaller load applications where well-regulated AC power is essential.

Specifications for Standard Units (less options)

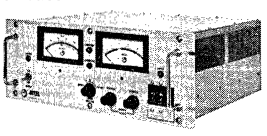
Output			19" Rack Mount			
VA	Volts	Phases	Height	Depth	Weight	Model No.
45-66 Hz Output With 115 V, 45-450 Hz, 1-Phase Input						
250	120/208	3	5.25	17	45	TR 026-3*
250	120	1	5.25	17	60	TR 026-1*
500	120/208	3	7.0	22	75	TR 056-3
500	120	1	7.0	22	85	TR 056-1
1000	120/208	3	8.75	22	125	TR 106-3
1000	120	1	8.75	22	140	TR 106-1
1500	120/208	3	12.25	22	150	TR 156-3
1500	120	1	12.25	22	160	TR 156-1
2000	120/208	3	12.25	22	175	TR 206-3
2000	120	1	12.25	22	190	TR 206-1
350-450 or 700-900 Hz Output With 115 V, 45-450 Hz, 1-Phase Input						
250	120/208	3	3.5	17	40	TR 024-3*
250	120	1	3.5	17	45	TR 024-1*
500	120/208	3	5.25	22	55	TR 054-3
500	120	1	5.25	22	55	TR 054-1
1000	120/208	3	7.0	22	95	TR 104-3
1000	120	1	7.0	22	95	TR 104-1
1500	120/208	3	8.75	22	115	TR 154-3
1500	120	1	8.75	22	125	TR 154-1
2000	120/208	3	12.25	22	150	TR 204-3
2000	120	1	12.25	22	160	TR 204-1

Third (and fourth) digit specifies frequency, for example: TR 024-3 = 400 Hz; TR 028-3 = 800 Hz; TR 0216-3 = 1600 Hz.

*Special order only, not standard models.

Specifications subject to change without notice.

TR 054-3 (System)
500 VA, 400 Hz, 3-Phase



TR 104-3 (Lab)
1000 VA, 400 Hz, 3-Phase

The TR Series systems version is designed for continuous unattended optration. It has limited controls on the front panel (status indicators, breaker, and standby switch) with adjustments located on the rear of the unit. The laboratory version is fully metered, with frequency, voltage, and current adjustments on the front panel. This model is ideally suited for use as precision test equipment.

INPUT

Voltage: 115 volts ±10% is standard. See Options B, E, F, G & H.

Frequency: 45-450 Hz. See Options A and H. 45 to 1200 Hz also available upon request.

OUTPUT

Voltage: 120 VRMS. Lab models, 95-130 VRMS.

Current: 75-120% of full rating with automatic voltage-current crossover, adjustable on lab models.

Frequency: ±0.5% fixed frequency is standard on system models. Crystal controlled output with 0.01% regulation at 50, 60, 400, 800, or 1600 Hz available. Continuously adjustable frequency over the respective band on lab models.

Bands: 45-66, 350-450, 700-900, 1500-1700 Hz.

Regulation:
Voltage: ±1%
Current: ±2%
Frequency: ±0.5% for variable frequency
±0.01% for fixed frequency, Option Q

Distortion: 3% THD maximum for linear loads; 4%, 1ϕ 60 Hz.

Power Factor: 0.7 lead to 0.7 lag.

PROTECTION

Automatic protection and recovery from overloads, short circuits and overheating.

SYSTEM VERSION—CONTROLS AND INDICATORS

Input: Circuit breaker.

Standby: Toggle switch for output on-off.

Voltage Control: Screwdriver adjustment for output voltage.

Current Control: Screwdriver adjustment for current limit.

Frequency Control: On variable frequency units only.

Indicators: Front panel indicators for input power, output power, overload.

LAB VERSION—CONTROLS AND INDICATORS

Input and Standby: Identical to system version.

Indicators: Same as system version.

Voltage, Frequency and Current Controls: Front panel knobs provided.

Voltmeter: Input/output voltmeter.

Ammeter: Output ammeter.

Frequency Meter: On variable frequency models only, Option S & T.

Voltmeter-Ammeter Switch: Used to select input or output phase.

ENVIRONMENTAL

Operating Temperature: 0 to 50°C.

Storage Temperature: −20 to +71°C.

Humidity: 0 to 95% R.H., non-condensing.

Shock and Vibration: Normal transportation and handling.

ELECTROMAGNETIC INTERFERENCE

Constructed in accordance with Military EMI/RFI requirements.

CONSTRUCTION

Rack mount packaging is standard. Connectors are rear-mounted with mating connectors provided.

OPTIONS

See last page.

PRICE

For price quotations, specify model number, options and system or lab version.

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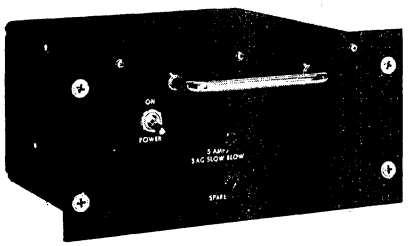
CONDITIONED AC POWER FOR ANY APPLICATION

OPTIONS FOR FREQUENCY CONVERTERS

Options A through G available on most models. Options H through Z available on all models.

Option	Description
A.	Switchable delta/wye output with dual-range meter scales and front panel mode indicator.
B.	105-140 VDC input (to 2 KVA).
C.	210-280 VDC input (above 2 KVA).
D.	115 V, single-phase input.
E.	230 V, single-phase input.
F.	115/200, three-phase input.
G.	380, 410, 440, 460 or 480 V three-phase input (please specify).
H.	115/200, 45-450 Hz three-phase input (460 V for above 20 KVA).
I.	Output voltage adjustable from 0 to 135 VRMS via front panel control for CR, 10 to 130 VRMS for TR.
J.	Output current limit adjustable from 10-125% of rated output via front panel control.
K.	Output voltage adjustable from 95 to 135 VRMS via front panel control for CR, 95 to 130 VRMS for TR.
L.	Output current limit adjustable from 75-125% of rated current via front panel control.
M.	External synchronization from pulse, sine or complex waveform sources.
N.	Remote voltage sensing.
O.	Phase lock and load coupler for parallel operation of 2 or more units. This option has provisions for alarm and automatic shut-down of a malfunctioning unit.
P.	Fixed frequency operation in addition to standard variable frequency selectable by front panel switch. The fixed frequency has a tolerance of 0.01% for the combined effects of line, load and environmental extremes and can be supplied at any frequency within the band.
Q.	Single fixed frequency operation in lieu of variable frequency. (0.01% tolerance.)
R.	Multiple fixed frequency operation, switch-selected. No variable frequency. (±0.01% tolerance.)
S.	Remote Programmable Output Voltage.
T.	Frequency meter, Reed type.
U.	Output waveform—1% THD maximum.
V.	Qualified to MIL-I-6181, MIL-STD-826 or MIL-STD-461.
W.	Running time meter, 0-9999 hours. Recycles at 10,000 hours.
X.	Unitized construction for application where rack-mounting is not intended.
Y.	Unitized construction, mounted on rubber-tired, full castering wheels. (CR models only.)
Z.	120 V Delta output (three-phase models only).

Note: Certain options effect equipment size and weight. When specifying options, please check with the factory for equipment physical characteristics.



Model: TRM 036-1
400 Hz, 1ϕ to 60 Hz, 1ϕ, 350 VA—Qualified to MIL-E-5400J, Airborne

UNIQUE FEATURES

Extremely Small Size: 8″ x 8″ x 5″—High packaging density saves critical space—Fits in many otherwise unusable areas.

Lightweight: Approximately 16 lbs. About half the weight of competitive models.

Rugged: All solid state. Meets Mil Spec MIL-T-5422 for shock.

Overload Protected: Internally protected against overloads and shorts.

High Efficiency: In excess of 80%.

MIL Qualified: All solid state, rugged construction. Qualified for sand, dust, vibration, fungus, humidity and salt atmosphere portion of MIL-E-5400J, and shock per MIL-T-5422.

NOTE: Many Avtel CR, TR, and UPS Series are available in military versions.

UNPARALLELED RELIABILITY

Avtel's design practices incorporate maximum derating of critical components, modular construction and minimum components consistent with performance. Add the minimum 100-hr burn-in all Avtel equipment receives prior to shipment, and you can be assured of maximum availability of continuous, transient-free, conditioned power.

Fifteen years ago, Avtel began its specialization in solid state power conversion equipment and has concentrated its efforts in this area ever since. Whatever your individual power conversion requirements may be, you are assured that our technical staff will give them prompt and skillful analysis. With over 200 custom designs and years of systems experience, these power conversion specialists appreciate the value of timely recognition and consideration of potential problem areas associated with integrating power sources into complex systems. In the interest of precluding systems interface problems, Avtel offers the assistance of its applications engineers to study your requirements and formulate suitable specifications.

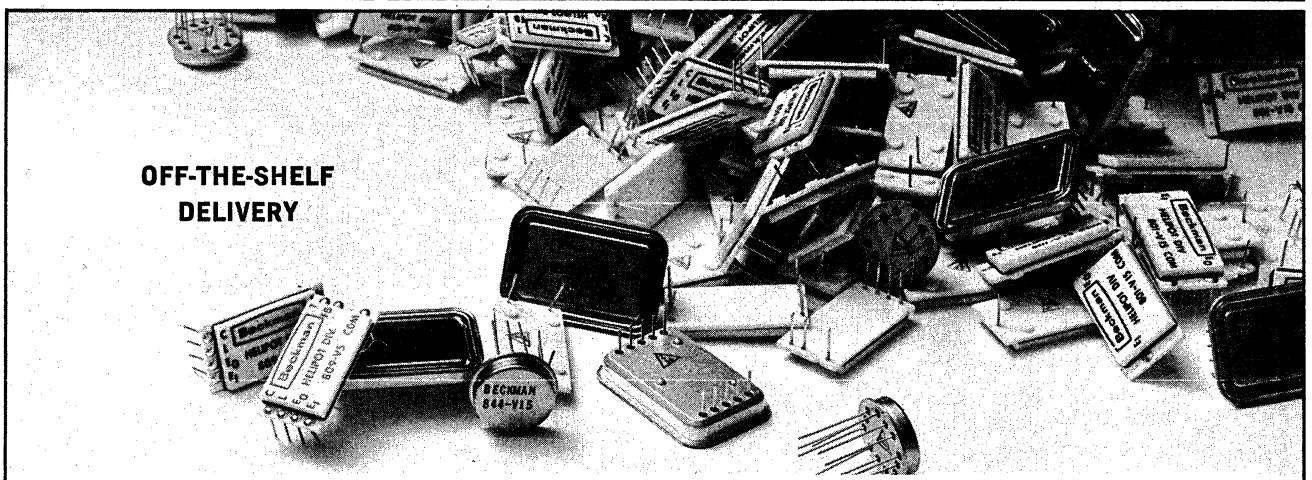
Note: Avtel also manufactures subcarrier oscillators. Consult your local representative.

AVTEL CORPORATION 1130 East Cypress Street, Covina, California 91724
Division of Airtronics, Inc. Phone (213) 331-0661 TWX 910-584-1311

Beckman®

Hybrid, cermet thick film

DC VOLTAGE REGULATORS



Fixed Output Models	809	859	801	851	803	853	805	855	807	808
Output Voltage Range	+5 to +28V	−5 to −28V	+9 to +21V	−9 to −21V	+21 to +32V	−21 to −32V	+3 to +9V	−3 to −9V	+30 to +60V	+60 to +120V
Max. Load Current	0.75 Amps		0.5 Amps						0.150 Amps	
DC Load Regulation	±0.003%/mA		±0.05%				±0.1%		±0.05% −20°C to +125°C ±0.1% −55°C to +20°C	
Oper. Temp. Range	−55°C to +125°C		−55°C to +125°C						−55°C to +125°C	
Reg. Power Dissipation T_A = +25°C T_A = +125°C T_C = +25°C T_C = +125°C	 1.6W 0.7W 4.0W 1.7W	 1.6W 0.7W 4.0W 1.7W	 1.8W 0.8W 5.0W 2.25W	 1.6W 0.7W 4.0W 1.7W	 1.8W 0.8W 5.0W 2.25W	 1.6W 0.7W 4.0W 1.7W	 1.8W 0.8W 5.0W 2.25W	 1.6W 0.7W 4.0W 1.7W	 1.6W 0.7W 4.0W 1.7W	 1.6W 0.7W 4.0W 1.7W
Min. Input Voltage	e_o + 2 Volts		e_o + 4.0 Volts						e_o + 6 Volts	
Max. Input Voltage	+40V DC	−40V DC	+40V DC	−40V DC	+40V DC	−40V DC	+40V DC	−40V DC	+150V DC	
Max. Input Regulation For ±10% Input Voltage Change	±0.3%	±0.3%	±0.05%				±0.1%		±0.05%	
Standard Voltages Available (Example: Order Model 809-V5)	+5, +6, +9, +12, +15, +18 +21, +24, +28	−5, −6, −9, −12, −15, −18 −21, −24, −28	+9, +12, +15, +18, +21	−9, −12, −15, −18, −21	+24, +28, +32	−24, −28, −32	+5, +6	−5, −6	+36, +48	+60, +100
Price (1-9 Qty.)	$8.95	$8.95	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00

Fixed & Adjustable Models	High Performance—Fixed		Dual	Adjustable Models						Current Regulators	
	828A	838A	844	802	852	804	854	806	856	868	878
Output Voltage Range	+5 to +30V	−5 to −30V	±12 to ±20V	+9 to +12V	−9 to −12V	+20 to +32V	−20 to −32V	+3 to +9V	−3 to −9V	E_{IN} −5 to E_{IN} −42V	E_{IN} +5 to E_{IN} +42V
Max. Load Current	500mA		300mA	0.5 Amps						+1.0 to +400mA	−1.0 to −400mA
DC Regulation Line	±0.01%/V		±0.005%/V	±0.05% for ±10% Δe_i				±0.1% for ±10% Δe_i		±0.01%/V	
DC Regulation Load	±0.01%		±0.005% NL/FL	±0.05% NL/FL				±0.1% NL/FL		±0.001%/V	
Oper. Temp. Range	−55°C to +125°C			−55°C to +125°C						−55°C to +125°C	
Reg. Power Dissipation T_A = +25°C T_A = +125°C T_C = +25°C T_C = +125°C	 1.8W 0.8W 5.0W 2.25W	 1.6W 0.7W 4.0W 1.7W	 — — 3.0W —	 1.8W 0.8W 5.0W 2.25W	 1.6W 0.7W 4.0W 1.7W	 1.8W 0.8W 5.0W 2.25W	 1.6W 0.7W 4.0W 1.7W	 1.8W 0.8W 5.0W 2.25W	 1.6W 0.7W 4.0W 1.7W	 1.6W 0.7W 4.0W 1.7W	 1.8W 0.8W 5.0W 2.25W
Min. Input Voltage	| e_o | +3.5 + $I_L R_S$			| e_o | +4.0 Volts						e_o + 5.0 V	e_o − 5.0 V
Max. Input Voltage	+45V	−45V	±45V	+40V	−40V	+40V	−40V	+40V	−40V	+45V	−45V
Max. Output Voltage Tolerance	±0.5%		±0.5%	—						—	
Standard Voltages Available (Example: Order 838A-V15)	+5, +6, +9, +12, +15	−5, −6, −9, −12, −15	±12, ±15	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	—	
Price (1-9 Qty.)	$50.00	$50.00	$20.00	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$40.00	$40.00

Beckman INSTRUMENTS, INC. **HELIPOT DIVISION** 2500 Harbor Blvd., Fullerton, Calif. 92634

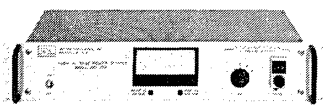
BERTAN ASSOCIATES, INC.

HIGH VOLTAGE

REGULATED POWER SUPPLIES

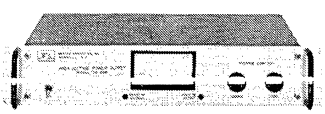
- TO 50 KV
- REMOTE PROGRAMMABLE
- PROPRIETARY LINEAR CIRCUITRY RESULTS IN EXCEPTIONALLY LOW NOISE AND HIGH STABILITY
- FULLY SOLID STATE AND INTEGRATED CIRCUIT DESIGN
- SHORT CIRCUIT PROOF
- ARC PROTECTED
- SELF RESTORING
- LABORATORY INSTRUMENTS
- OEM MODULES
- CUSTOM DESIGNS

PRECISELY CALIBRATED HIGH VOLTAGE LABORATORY POWER SUPPLIES



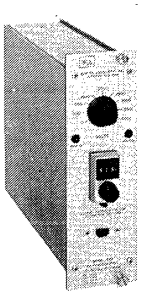
SERIES 205

GENERAL PURPOSE HIGH VOLTAGE POWER SUPPLIES



SERIES 212

NUCLEAR INSTRUMENTATION MODULE POWER SUPPLIES



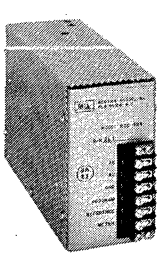
NIM SERIES

Model	Output Volts	Output mA	Regulation Line/Load %	Ripple mV p-p	Remote Program	H x W x D Inches	Price
205-01R	0 to ±1000	0 to 30	0.001/0.01	10	√	3.5 x 19 x 10	$ 450
205-03R	0 to ±3000	0 to 10	0.001/0.01	30	√	3.5 x 19 x 10	450
205-05R	0 to ±5000	0 to 5	0.001/0.01	50	√	3.5 x 19 x 10	450
205-10P	0 to +10,000	0 to 2	0.001/0.01	100	√	3.5 x 19 x 10	550
205-10N	0 to −10,000	0 to 2	0.001/0.01	100	√	3.5 x 19 x 10	550
205-20P	0 to +20,000	0 to 1	0.001/0.01	400	√	3.5 x 19 x 10	750
205-20N	0 to −20,000	0 to 1	0.001/0.01	400	√	3.5 x 19 x 10	750
205-30P	0 to +30,000	0 to 0.5	0.001/0.01	600	√	5.3 x 19 x 15	950
205-30N	0 to −30,000	0 to 0.5	0.001/0.01	600	√	5.3 x 19 x 15	950
205-50P	0 to +50,000	0 to 0.3	0.001/0.01	2000	√	5.3 x 19 x 15	1250
205-50N	0 to −50,000	0 to 0.3	0.001/0.01	2000	√	5.3 x 19 x 15	1250
212-03R	0 to ±3000	0 to 5	0.001/0.01	15		3.5 x 19 x 10	375
212-15P	0 to +15,000	0 to 1	0.001/0.01	300		3.5 x 19 x 10	525
212-15N	0 to −15,000	0 to 1	0.001/0.01	300		3.5 x 19 x 10	525
212-25P	0 to +25,000	0 to 0.5	0.001/0.01	500		3.5 x 19 x 10	650
212-25N	0 to −25,000	0 to 0.5	0.001/0.01	500		3.5 x 19 x 10	650
NIM 301	0 to ±1000	0 to 3	0.001/0.01	1	√	Dual NIM	350
NIM 303	0 to ±3000	0 to 1	0.001/0.01	3	√	Dual NIM	375
NIM 305	0 to ±5000	0 to 0.5	0.001/0.01	5	√	Dual NIM	400
NIM 313	0 to ±3000	0 to 10	0.001/0.01	10	√	Dual NIM	425
NIM 315	0 to ±5000	0 to 5	0.001/0.01	25	√	Dual NIM	450
602-15P	0 to +1500	0 to 10	0.001/0.01	15	√	5 x 3 x 7.5	265
602-15N	0 to −1500	0 to 10	0.001/0.01	15	√	5 x 3 x 7.5	265
602-30P	0 to +3000	0 to 5	0.001/0.01	30	√	5 x 3 x 7.5	265
602-30N	0 to −3000	0 to 5	0.001/0.01	30	√	5 x 3 x 7.5	265
602-50P	0 to +5000	0 to 2	0.001/0.01	50	√	5 x 3 x 7.5	265
602-50N	0 to −5000	0 to 2	0.001/0.01	50	√	5 x 3 x 7.5	265
620*	6 — 20 kV	0.2	0.002/0.03	0.02%	√	6 x 5 x 10	495
	0 — 5 kV	0.2	0.002/0.03	0.02%			
	150 — 500 V	1	0.002/1	0.05%			
625	5 — 15 kV	0.2	0.002/0.03	0.03%		5.1 x 2.8 x 4.8	295
	300 — 1000 V	1	0.002/1	0.05%			

*MODEL 620 IS ALSO AVAILABLE WITH HIGH SPEED DYNAMIC FOCUS CONTROL.

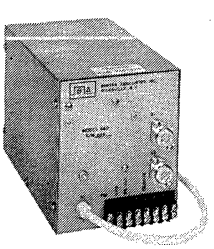
Prices and specifications subject to change.

FULLY PROGRAMMABLE HIGH VOLTAGE MODULES



SERIES 602

MULTIPLE OUTPUT CRT POWER SUPPLIES



MODEL 620 AND 625

BERTAN ASSOCIATES, INC.
180 MILLER PLACE
HICKSVILLE, NEW YORK 11801
(516) 433-3110

A.C. POWER

from the A.C. POWER SUPPLY PROBLEM SOLVERS

STANDARDS ■ SPECIALS ■ CUSTOM

20 years of innovation by the A.C. power supply pioneers — power outputs from milliwatts to tens of kilowatts — all silicon solid state.

The smallest, lightest, least expensive units available. ■ All units rated at worst case condition. ■ All units capable of continuous duty at 150% of their power rating at nominal line and high power factor load. ■ Single, two and three phase outputs. ■ Units available with switch selection of single or multi-phase output.

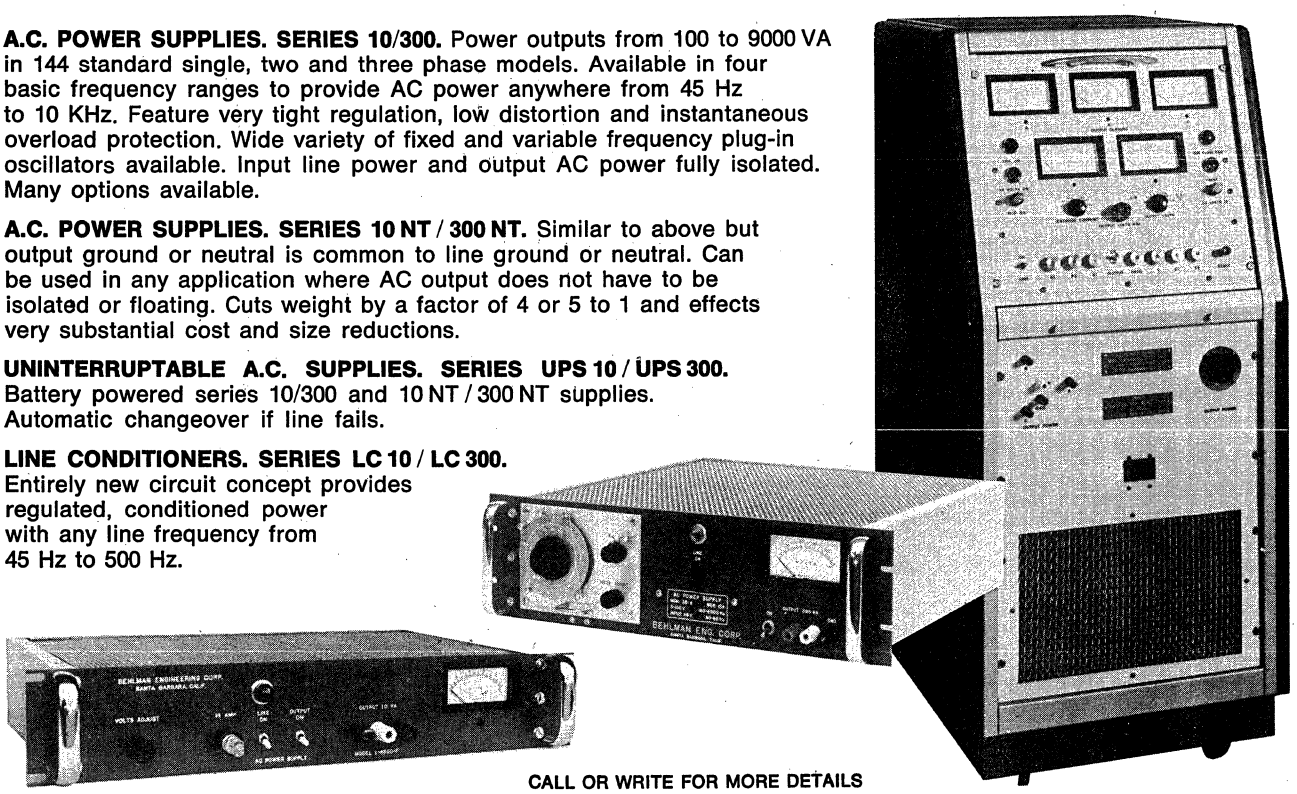
Ultra-sophisticated magnetics in combination with highly simplified circuitry effect dramatic size, weight and cost reduction plus greatly improved reliability. Basic power amplifiers are available in frequency ranges to suit your application, thereby eliminating the need to pay size, weight and price penalties for unnecessary frequency capability.

A.C. POWER SUPPLIES. SERIES 10/300. Power outputs from 100 to 9000 VA in 144 standard single, two and three phase models. Available in four basic frequency ranges to provide AC power anywhere from 45 Hz to 10 KHz. Feature very tight regulation, low distortion and instantaneous overload protection. Wide variety of fixed and variable frequency plug-in oscillators available. Input line power and output AC power fully isolated. Many options available.

A.C. POWER SUPPLIES. SERIES 10 NT / 300 NT. Similar to above but output ground or neutral is common to line ground or neutral. Can be used in any application where AC output does not have to be isolated or floating. Cuts weight by a factor of 4 or 5 to 1 and effects very substantial cost and size reductions.

UNINTERRUPTABLE A.C. SUPPLIES. SERIES UPS 10 / UPS 300. Battery powered series 10/300 and 10 NT / 300 NT supplies. Automatic changeover if line fails.

LINE CONDITIONERS. SERIES LC 10 / LC 300. Entirely new circuit concept provides regulated, conditioned power with any line frequency from 45 Hz to 500 Hz.



CALL OR WRITE FOR MORE DETAILS

Behlman Engineering Corporation

P.O. BOX 4518 · 427 N. NOPAL STREET · SANTA BARBARA, CALIFORNIA 93103 (805) 963-9019

SERIES 10/300 AND 10 NT/300 NT A.C. POWER SUPPLIES
SERIES UPS 10/UPS 300 AND UPS 10 NT/UPS 300 NT UNINTERRUPTIBLE A.C. POWER SUPPLIES

OUTPUT POWER	MODEL NUMBERS				BASIC POWER AMPLIFIER Output Frequency Range (Hz)			
	A.C. Power Supplies		Uninterruptible A.C. Supplies					
	Isolated Output	Common Ground	Isolated Output	Common Ground	150-2000	150-10,000	45-2000	45-10,000
SINGLE PHASE					A	B	C	D
100 VA	10-	10 NT-	UPS-10-	UPS-10 NT-				
250 VA	25-	25 NT-	UPS-25-	UPS-25 NT-				
350 VA	35-	35 NT-	UPS-35-	UPS-35 NT-				
500 VA	50-	50 NT-	UPS-50-	UPS-50 NT-				
750 VA	75-	75 NT-	UPS-75-	UPS-75 NT-				
1000 VA	100-	100 NT-	UPS-100-	UPS-100 NT-				
1500 VA	150-	150 NT-	UPS-150-	UPS-150 NT-				
2000 VA	200-	200 NT-	UPS-200-	UPS-200 NT-				
3000 VA	300-	300 NT-	UPS-300-	UPS-300 NT-				
TWO PHASE								
200 VA	2-10-	2-10 NT-	UPS2-10-	UPS2-10 NT-				
500 VA	2-25-	2-25 NT-	UPS2-25-	UPS2-25 NT-				
700 VA	2-35-	2-35 NT-	UPS2-35-	UPS2-35 NT-				
1000 VA	2-50-	2-50 NT-	UPS2-50-	UPS2-50 NT-				
1500 VA	2-75-	2-75 NT-	UPS2-75-	UPS2-75 NT-				
2000 VA	2-100-	2-100 NT-	UPS2-100-	UPS2-100 NT-				
3000 VA	2-150-	2-150 NT-	UPS2-150-	UPS2-150 NT-				
4000 VA	2-200-	2-200 NT-	UPS2-200-	UPS2-200 NT-				
6000 VA	2-300-	2-300 NT-	UPS2-300-	UPS2-200 NT-				
THREE PHASE T								
200 VA	2T-10-	2T-10 NT-	UPS2T-10-	UPS2T-10 NT-				
500 VA	2T-25-	2T-25 NT-	UPS2T-25-	UPS2T-25 NT-				
700 VA	2T-35-	2T-35 NT-	UPS2T-35-	UPS2T-35 NT-				
1000 VA	2T-50-	2T-50 NT-	UPS2T-50-	UPS2T-50 NT-				
1500 VA	2T-75-	2T-75 NT-	UPS2T-75-	UPS2T-75 NT-				
2000 VA	2T-100-	2T-100 NT-	UPS2T-100-	UPS2T-100 NT-				
3000 VA	2T-150-	2T-150 NT-	UPS2T-150-	UPS2T-150 NT-				
4000 VA	2T-200-	2T-200 NT-	UPS2T-200-	UPS2T-200 NT-				
6000 VA	2T-300-	2T-300 NT-	UPS2T-300-	UPS2T-300 NT-				
THREE PHASE Y								
300 VA	3-10-	3-10 NT-	UPS3-10-	UPS3-10 NT-				
750 VA	3-25-	3-25 NT-	UPS3-25-	UPS3-25 NT-				
1050 VA	3-35-	3-35 NT-	UPS3-35-	UPS3-35 NT-				
1500 VA	3-50-	3-50 NT-	UPS3-50-	UPS3-50 NT-				
2250 VA	3-75-	3-75 NT-	UPS3-75-	UPS3-75 NT-				
3000 VA	3-100-	3-100 NT-	UPS3-100-	UPS3-100 NT-				
4500 VA	3-150-	3-150 NT-	UPS3-150-	UPS3-150 NT-				
6000 VA	3-200-	3-200 NT-	UPS3-200-	UPS3-200 NT-				
9000 VA	3-300-	3-300 NT-	UPS3-300-	UPS3-300 NT-				
					A	B	C	D

To Order: Use model no. corresponding to output power level and number of phases required. Add letter corresponding to desired frequency range. Plug-in oscillators are available in a very wide variety of frequencies, both fixed and variable. Most units are in rack mounting enclosure. Cabinet enclosed versions of any of these units are available. Specify desired lengths of time for battery operation and battery recharge of UPS units.

SERIES LC 10/LC 300 A.C. LINE CONDITIONERS

These line conditioners are not frequency sensitive and will accept and condition line power of any frequency over the range of 45-500 Hz. They are not frequency converters but true line conditioners and provide very high correction ratios of Line voltage variations, distortion, noise, spikes and transients. They are exceptionally efficient, compact, light and inexpensive.

This series of line conditioners is available in all of the power output ratings and phase configurations applicable to the A.C. power supplies listed above. For example a line conditioner to provide 1050 VA of 3 phase conditioned power in a wye configuration would be ordered as model 3-LC35. Specify nominal line voltage.

CALL OR WRITE FOR MORE DETAILS

Behlman Engineering Corporation

P.O. BOX 4518 · 427 N. NOPAL STREET · SANTA BARBARA, CALIFORNIA 93103 (805) 963-9019

BULOVA®

PRECISION INVERTERS FREQUENCY CHANGERS

Features

- Stock units to 1,000 VA.
- All solid state with more VA output per dollar.
- Fully regulated sine wave
- Protected Input/Output

Performance Specifications:

OUTPUT:

Frequency Output: 50 or 60 Hz (standard) — any other specific frequency custom

Frequency Accuracy to .005% or greater. Standard units: ±0.1%, ±0.015% and ±0.005%

Temperature Range: 0°C to +50°C

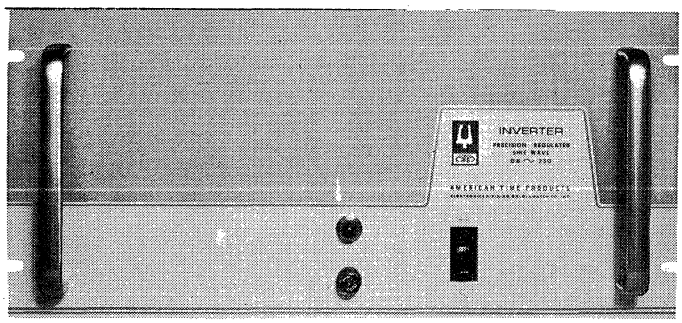
Wave Shape: Sine Wave, 3% Distortion max.

Output Voltage: 115 or 230V AC nominal Voltage Regulation: ±1% any combination of full line and load change

INPUT:

115V AC or 230V AC, ±10%, 22 to 30V DC Normal (11 to 15V DC, and 45 to 56V DC available)

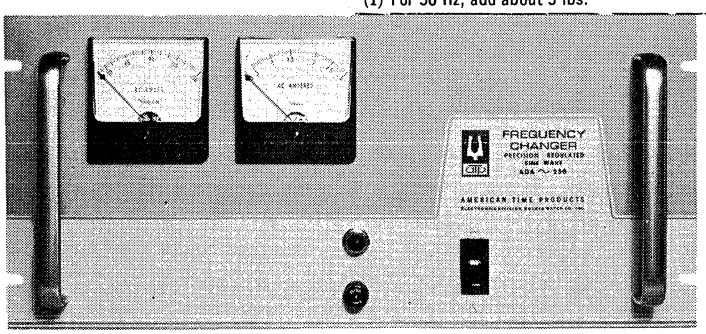
Some models available from stock . . . custom designs to meet special needs for systems, equipment or laboratory use, up to 1000 VA and ±.005% frequency accuracy. Meters are optional.



INVERTERS Outputs from 100 to 1000 VA

Type	Input VDC	Output VA	Output Freq. Hz	Output Volt	Wt. Lbs. (1)	Dimensions (For 19" Rack) H	Dimensions (For 19" Rack) D
DA-100S	22-30	100	50 or 60	115/230	65	5¼"	13"
DA-250S	22-30	250	50 or 60	115/230	70	8¾"	13"
DA-500S	22-30	500	50 or 60	115/230	130	10½"	15"
DA-1000S	22-30	1000	50 or 60	115/230	170	14"	24"

(1) For 50 Hz, add about 5 lbs.

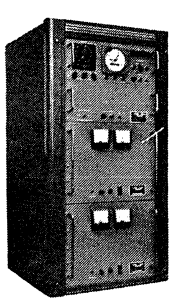


FREQUENCY CHANGERS Outputs from 100 to 1000 VA

Type	Input VAC. ±10%	Input Freq. Hz	Output VA	Output Freq. Hz	Output Volt	Wt. Lbs. (1)	Dimensions (For 19" Rack) H	Dimensions (For 19" Rack) D
ADA-100S	115/230	47-65	100	50 or 60	115/230	75	5¼"	13"
ADA-250S	115/230	47-65	250	50 or 60	115/230	80	8¾"	13"
ADA-500S	115/230	47-65	500	50 or 60	115/230	130	10½"	15"
ADA-1000S	115/230	47-65	1000	50 or 60	115/230	170	14"	24"

(1) For 50 Hz, add about 5 lbs.

MASTER TIME-OF-DAY SYSTEMS



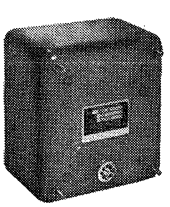
ATP has a new series of frequency stabilized master time-of-day systems. Systems are available to drive up to 500 synchronous clocks. Features include:

- Accuracy up to ±1 second per year
- Automatic switchover to batteries in case of power failure
- Modular construction for expansion
- Semi-automatic correction of clocks with .1 second resolution

5VA INVERTER — PRECISION FREQUENCY

Model DA5S

Standard 115 V 60 Hz, available at any fixed frequency from 50 to 400 Hz



- Accuracy to ±.0002%
- Sine Wave, max. THD 5%
- Input 28V DC ± 4V

Size: 4½" x 5" x 3¼"
Weight: 3 lbs. approx.

From Bulova Electronics Division: Frequency Control Components • Crystal Oscillators • Crystal Filters • LC Filters • Fork Oscillators • Coils • Servo D.C. Amplifiers • Optical Devices • Time Period Generators • Time of Day Systems • Inverters • Frequency Changers • Frequency Deviation Counters

BULOVA atp

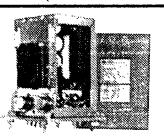
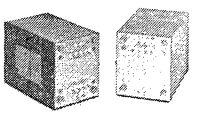
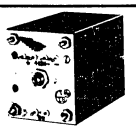
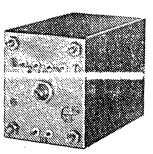
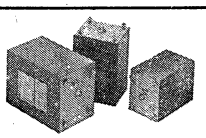
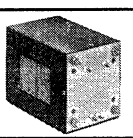
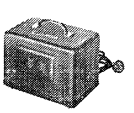
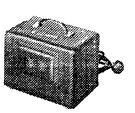
BULOVA AMERICAN TIME PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

CEA, a division of Berkleonics, Inc.
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

PRODUCT LIST INDEX

PRODUCT DESCRIPTION	TECHNICAL SPECIFICATIONS											PAGE
	INPUT	OUTPUT RANGE E VOLTS	OUTPUT RANGE I AMPS	OUTPUT RANGE P WATTS	BEST EFF.	BEST RESPONSE	CLASS	LINE + LOAD REG. (%)	RIPPLE (P-P) (%)	TEMP. COEFF. (%/°C)		
CEA6 SERIES SINGLE OUTPUT MODULES HIGHEST REGULATION	A.C. or D.C.	3.5 to 500	.05 to 25	to 800	50%	10 μsec	A	.05	.04	.01		3 & 4
							B	.01	.004	.005		
							C	.0025	.002	.001		
							D	.0005	.0011	.0005		
CEAC6 SERIES CONSTANT CURRENT SUPPLIES	A.C. or D.C.	0 to 200	.002 to 5.0	to 160	50%	10 μsec	A	.5	.4	.1		5 & 6
							B	.1	.04	.05		
							C	.025	.02	.01		
							D	.005	.011	.005		
CEAD6 SERIES DUAL OUTPUT MODULES HIGHEST REGULATION	A.C. or D.C.	3.5 to 500	.05 to 10	to 300	50%	10 μsec	A	.05	.04	.01		7 & 8
							B	.01	.004	.005		
							C	.0025	.002	.001		
							D	.0005	.0011	.0005		
CEAT SERIES TRIPLE OUTPUT MODULES +5V & ±15V	A.C. or D.C.	4.5 to 6.0 ±10 to ±18	.1 to 20 .25 to 5.0	to 250	50%	10 μsec	—	.02% .01%	1 mv rms	.01		2
CEA3 SERIES SINGLE OUTPUT MODULES MINIATURE SIZE HIGH EFFICIENCY	A.C. or D.C.	4.0 to 256	.1 to 60	to 640	80%	1 m sec	A	1.0	2.0	0.1		9 & 10
							B	0.1	0.2	.01		
CEA2 SERIES D.C. CONVERTERS	D.C. ONLY	3.5 to 500	.05 to 40	to 640	90%	10 μsec	A	LINE = NONE LOAD = 10%	3.0	0.1		11 & 12
						1 m sec	C	LINE = 1% LOAD = 1%	1.0	.05		
CEA1 SERIES SINGLE OUTPUT MODULES UNREGULATED	A.C. or D.C.	4.5 to 620	.05 to 25	to 1000	90%	—	—	LINE = NONE LOAD = 10%	5.0 rms	—		13 & 14
CEA11 THRU CEA35 SERIES SHIELDED LINE ISOLATORS UNREGULATED	A.C. ONLY	110 or 220	2.2 to 17.3	250 to 2000	96%	60 Hz	4%	—	—	Available in Three Classes of Shielding. Maximum Coupling Capacitance of .01 pfd, .001 pfd, and 0.0005 pfd		15 & 16
OL21 THRU OL25 SERIES SHIELDED LINE ISOLATORS MEDICAL	A.C. ONLY	110 or 220	2.2 to 17.3	250 to 2000	90%	60 Hz	4%	—	—	Available in Two Classes of Shielding. Output-Input Leakage, 1 μA. Output-Case Leakage 5 μA		17
COMPACT NI-CAD BATTERY CHARGERS	110 VAC ONLY	1.2 to 36	22 MA to 1.1	to 40		60 Hz	Available in Two Configurations, One for Commercial Applications, One for Military (Sealed Case and Connector)					18
THERMAL DATA THERMAL RADIATORS	(a) Internal Dissipation (b) Temperature Rise — Chassis Mounting (c) Temperature Rise — Chassis & Radiator Mounting Effect of forced air cooling.											19
MOUNTING & TERMINATIONS	Sizes — Weights — Wiring											20
SHIELDING DATA	Common Mode Coupling Capacity and Leakage Currents											1

SHIELDING DATA

CEA, *a division of Berkleonics, Inc.*
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

WHY DOES CEA GO TO ALL THE TROUBLE OF USING A SHIELDED TRANSFORMER ON EVERY POWER SUPPLY?

. . . Because it's the most logical way to provide electrical isolation for your system circuit. With today's IC, isolation of the circuit is mandatory by one means or another, so why not do it in the most direct, effective and least costly manner?

The extreme sensitivity of INTEGRATED CIRCUITS makes them highly vulnerable to both destruction and nuisance triggering by any extraneous voltages. This statement I'm sure we agree on, but did you know that your system's POWER SUPPLY is probably the culprit of your problems?

The power transformer of any Power Supply has a very significant amount of coupling capacitance between the primary and secondary windings (Reference column 2 of figure below) which emphatically provides an undesired direct path for all stray voltages. This direct path, which allows a complete open door for unwanted signals, is the most significant factor in the majority of today's system application field problems. As one computer engineer put it, "being off by one bit is as good as a mile."

While the exact value of this coupling capacitance is a variable with the size of the transformer, and the quality of its manufacture, CEA has taken the unique approach of providing at least 20 db of shielding at the transformer on every power supply produced.

Effectively this says that with a CEA supply, you will be getting ten (10) times less capacitance between primary and secondary (hence between line and circuit) than you would with an unshielded transformer. It's one of the real bargains of life where you benefit more by getting less.

The more critical your application the more shielding you need, so CEA also provides optional shielding of 40 db and 100 db for reduction factors of 100 and 100,000. For convenience, the typical values of capacitance for each of the 13 CEA power supply sizes and the classes of shielding are shown below.

While the circuit designer will normally think of noise as coming directly from the input line, it is also common to find that dangerous signals are being generated internally by heavy demand or high speed switching circuits. The cure to this problem is the discriminate use of separate power supplies at critical points within the system to effectively isolate the sensitive circuits. The isolation function of the shielded transformer works as a wall, blocking noise from going in either direction, in or out of the supply.

Only with CEA can your power supply take on a new function — that of being an isolator within your system.

. . . So that's why we go to all the trouble of using a shielded transformer in every Power Supply!

COMMON MODE PRIMARY TO SECONDARY COUPLING CAPACITY (pfd)

CASE SIZE	UNSHIELDED TRANSFORMER			20 db SHIELDING (STANDARD)			40 db SHIELDING (T OPTION)			100 db SHIELDING (T1 OPTION)		
	COUPLING CAPACITY pfd[2]	LEAKAGE CURRENT[3] 60 Hz µA	LEAKAGE CURRENT[3] 400 Hz µA	COUPLING CAPACITY pfd[2]	LEAKAGE CURRENT[3] 60 Hz µA	LEAKAGE CURRENT[3] 400 Hz µA	COUPLING CAPACITY pfd[2]	LEAKAGE CURRENT[3] 60 Hz µA	LEAKAGE CURRENT[3] 400 Hz µA	COUPLING CAPACITY pfd[2]	LEAKAGE CURRENT[3] 60 Hz µA	LEAKAGE CURRENT[3] 400 Hz µA
FA	150	6.5	43	15	.65	4.3	1.5	.065	.43	.0015	.065	.43
GA	150	6.5	43	15	.65	4.3	1.5	.065	.43	.0015	.065	.43
HA	170	7.3	49	17	.73	4.9	1.7	.073	.49	.0017	.073	.49
JA	170	7.3	49	17	.73	4.9	1.7	.073	.49	.0017	.073	.49
KA	200	8.6	57	20	.86	5.7	2.0	.086	.58	.002	.086	.57
LA	200	8.6	57	20	.86	5.7	2.0	.086	.58	.002	.086	.57
MA	200	8.6	57	20	.86	5.7	2.0	.086	.58	.002	.086	.57
NA	350	15	100	35	1.5	10.0	3.5	.15	1.00	.0035	.15	1.00
PA	350	15	100	35	1.5	10.0	3.5	.15	1.00	.0035	.15	1.00
QA	350	15	100	35	1.5	10.0	3.5	.15	1.00	.0035	.15	1.00
RA	500	22	147	50	2.2	14.7	5.0	.22	1.47	.005	.22	1.47
SA	700	30	200	70	3.0	20.0	7.0	.30	2.00	.007	.30	2.00
TA	1000	43	285	100	4.3	28.5	10.0	.43	2.85	.010	.43	2.85

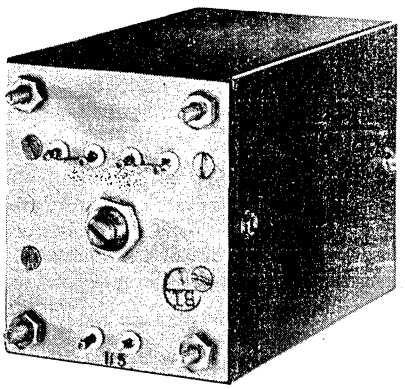
NOTES: [1] Tolerance: ±50% [2] Tolerance: ±100%
[3] Leakage currents measured are partially due to the secondary voltage and are not a function of coupling capacity alone.

CEA. *a division of Berkleonics, Inc.*
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

AC-DC Regulated TRIPLE OUTPUT +5V & ±15V MODULAR POWER SUPPLIES

CEAT SERIES

STANDARD FEATURES INCLUDE



- OUTPUTS +5, ±15VDC. .25 to 20 AMPS, to 250 WATTS.
- INPUTS 50 to 420 Hz, 95 to 460VAC and DC inputs are optional.
- REGULATION ±.02% and ±.04% for line plus load.
- 80°C BASE TEMPERATURE without derating.
- SHIELDING line isolation eliminating glitches and other noise problems. 20 db standard up to 100 db optional.
  Floating outputs, + or − may be ±500VDC from case.
  No voltage overshoot on turn-on or turn-off.
  Short ciruit protected.
  MIL-T-27 modular case sizes with removable covers for servicing.
  Critical components pretested aged and graded.
- BURN-IN (stabilization) 16 hrs. min. at rated load and high base temperature.
  100% TESTING after burn-in, test data with shipment.
  Specifications guaranteed, not just typical
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.

SPECIFICATIONS — PART NUMBERS — PRICE

Part Number	+5V Output Current	±15V Output Current	Line Regulation (10% Change) +5V	Line Regulation (10% Change) ±15V	Load Regulation (N/L to F/L) +5V	Load Regulation (N/L to F/L) ±15V	RMS Ripple	Temperature Coefficient	Case Size	Ther-Mal No.	Base Price
CEAT50J15	1.0A	.25A							JA	3	$105
CEAT50M15	2.5A	.5A	±.02% for all Models	±.01% for all Models	±.02% for all Models	±.01% for all Models	1 mV for all Models	±.01%/°C for all Models	MA	4	160
CEAT50N15	5.0A	1.0A							NA	5	185
CEAT50Q15	10.0A	2.5A							QA	6	285
CEAT50S15	20.0A	5.0A							SA	7	380

Input Voltage and Frequency: 105 to 125VAC, 50 to 420 Hz are standard. DC and other voltage ranges are optional.

Output Voltage and Current: +5, ±15VDC. .25 to 20A. See correlation in table above. +4.5-6.0VDC. ±10-18VDC also aavilable. Call factory.

Voltage Setting Accuracy: +5V ±1%. −15V ±2%. +15V tracks ±1%.

Temperature Base: −20°C to +80°C operating. −40°C to +85°C storage.

Thermal Data: Details associated with thermal curve numbers (3 thru 7) in table above are shown on page 19.

Size - Weight - Terminations: Details associated with MIL-T-27 case (JA thru SA) in table above are shown on page 20.

OPTIONAL FEATURES

The extra charge for each option is either a flat rate or a percentage of the base price; add the larger number to the base price.

Sym-bol	Option Description	Prices	Extend Delivery (Weeks)	REMARKS
G	+15 remote balance adjust ±3%	$5	None	
G5	±5 remote adjust ±10%	$5	None	Increase thermal number by one.
G15	±15 remote adjust ±10%	$5	None	Increase thermal number by one.
L	Input 95-135 VAC, 50-420 Hz	10%	1	Reduce case size to next smaller. Derate ripple by 5X.
L1	Input 208 VAC ±10%, 50-420 Hz	$15 or 10%	1	
L2	Input 230 VAC ±10%, 50-420 Hz	$15 or 10%	1	
L3	Input 460 VAC ±10%, 50-420 Hz	$25 or 15%	1	
L4	Input 105-125 VAC, 400 Hz ±20 Hz	$15 or 10%	1	Derate current to 60% of rated.
L5	Input 115/230 VAC, 50-420 Hz	$30 or 20%	1	Input terminals parallel or series for 115/230 volts.
L6	Input 12 VDC (11.6-13.8 VDC)	$70 or 40%	1	Derate current to 60% of rated.
L7	Input 24 VDC (23.2-27.6 VDC)	$70 or 40%	1	Derate current to 80% of rated.
L8	Input 48 VDC (46.4-55.2 VDC)	$70 or 40%	1	Derate current to 80% of rated.
P2	Overtemperature cutout	$20	1	Limits base temperature to maximum rated. Self restarting.
P3	Crowbar voltage limit on +5 V	$30 or 15%	1	Operates at 10% or 1 volt over maximum settable voltage.
T	40 db transformer shielding	$25 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$50 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
U	Output float up to ±1000 V	10%	1	Any output terminal will withstand ±1000 volts to case or input.
W	Potted for ruggedization JA	$5	1	Weight increased about 30%.
	MA, NA	$15	1	
	QA	$25	1	
	SA	$35	1	

PRICE

The **total price** is the **base price** from the table, **plus** the **price** of the **optional features** selected.

Quantity Discount Schedule

1-4	net
5-9	less 5%
10-24	less 10%
25-99	less 15%
100-	factory

TERMS

NET 30 days, F.O.B. San Luis Obispo, California

DELIVERY

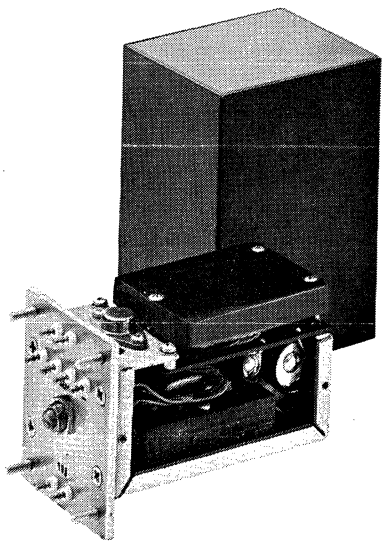
All supplies 3 weeks. Some options extend delivery as shown above. Shipments will be as directed. United Parcel where serviced or Parcel Post for the remaining.

AC-DC Regulated SINGLE OUTPUT MODULAR POWER SUPPLIES

CEA, *a division of Berkleonics, Inc.*
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

CEA6 SERIES

STANDARD FEATURES INCLUDE



- OUTPUTS from 3.5 to 500VDC, .05 to 25 AMPS, to 800 WATTS.
- INPUTS 50 to 420 Hz, 95 to 460VAC and DC inputs are optional.
- REGULATION from .05% to .0005% for line plus load.
- 80°C BASE TEMPERATURE without derating.
- SHIELDING, line isolation, eliminating glitches and other noise problems. 20 db standard, up to 100 db optional.
  Floating outputs, + or − output may be ±500VDC from case.
  Remote sensing standard, all models, eliminates load lead errors.
  Adjustment of output ±5% standard. Other ranges are optional.
  Remote adjustment optional at no charge.
  Series starting with rated load, for multiple supplies to a common load.
  Short circuit output current will not damage supplies.
  No voltage overshoot on turn-on or turn-off.
  MIL-T-27 modular case sizes with removable covers for servicing.
  Critical components pretested, aged, and graded.
- BURN-IN (stabilization), 16 hrs. min. at rated load and high base temperature.
- 100% TESTING after burn-in, test data with shipment. **Specifications guaranteed, not just typical.**
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.

SPECIFICATIONS

REGULATION — STABILITY — RIPPLE — BASE MODEL PRICE

Class of Regulation	Line Plus Load Regulation	Line Regulation for 10% Line Change	Load Regulation for No Load to Full Load	Temperature Coefficient Per Degree C	Stability for 40 Hours	RMS Ripple	Option Required	Output Current Limit	BASE MODEL PRICE
A	±0.05%	±0.01%	±0.04%	±0.01%	±0.05%	0.01%	None	25A	Tabulated below
B	±0.01%	±0.002%	±0.008%	±0.005%	±0.01%	0.001%	None	25A	A plus $10.00
C	±0.0025%	±0.0005%	±0.002%	±0.001%	±0.0025%	0.0005%	F's or R's	5A	A plus $65.00
D	±0.0005%	±0.0001%	±0.0004%	±0.0005%	±0.0005%	0.0003%	F's or R's	1A	A plus $140.00

Input Voltage and Frequency: 105 to 125 volts — 50 to 420 Hz are standard. DC and other voltage ranges are optional.
Output Voltage and Current: 3.5 to 500VDC — .05 to 25A. See correlation in table below.
Recovery Time: As fast as 10 microseconds, depending on model selected.
Insulation Resistance: 100 Megohms — standard for input, output and case; 1K Megohms for option "T"; 10K Megohms for option "TI".
Temperature, Base: −20°C to +80°C operating, −40°C to +85°C storage.
Thermal Data: Details associated with thermal curve numbers (1 thru 9) in table below are shown on page 19.
Size-Weight-Terminations: Details associated with MIL-T-27 case (FA thru TA), tabulated below, are shown on pages 4 and 20.

PART NUMBERS

Example: .01% Reg, 5V, 1A with options "F" and "P3"; "CEA6B50X102FP3"

YOUR SELECTION: **CEA6**_____

Specify regulation — Insert A, B, C or D

Specify output voltage — Insert any digits, 35 to 500

Specify voltage decimal — Insert X, Y or Z

Specify desired options — Insert option symbols

Specify output currents — Insert bracketed digits

OUTPUT VOLTAGE		OUTPUT RATED CURRENT																														
2 digits under 10V 3 digits 10V & over	Decimal Code	.05A (500)			.1A (101)			.25A (251)			.5A (501)			1A (102)			2.5A (252)			5A (502)			10A (103)			25A (253)		
Select any voltage between limits		Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price
3.5 to 9.9	X				FA	1	90	GA	2	90	HA	3	105	JA	4	105	MA	5	160	NA	7	185	QA	7	285	SA	8	380
10.0 to 12.4	Y				FA	1	90	GA	2	90	HA	3	105	JA	5	105	MA	5	160	NA	7	185	QA	7	285	SA	9	380
12.5 to 27.4	Y				GA	1	90	HA	3	100	JA	4	105	KA	5	125	NA	6	185	PA	7	230	RA	7	350	TA	9	395
27.5 to 29.9	Y				GA	1	90	HA	3	100	KA	3	125	LA	5	130	NA	6	185	PA	7	230	RA	8	350	TA	9	395
30.0 to 39.9	Y				GA	2	90	JA	3	105	LA	3	130	NA	4	185	PA	6	230	QA	7	285	SA	8	380			
40.0 to 49.9	Y				HA	2	105	JA	3	105	LA	4	130	NA	5	185	PA	7	230	QA	7	285	SA	8	380			
50.0 to 59.9	Y	HA	1	105	JA	2	105	KA	3	125	MA	4	160	PA	5	230	QA	6	285	RA	7	350	TA	8	395			
60.0 to 79.9	Y	JA	1	130	KA	2	150	LA	3	160	MA	5	190	PA	5	280	QA	7	335	SA	7	460	TA	9	500			
80.0 to 89.9	Y	JA	1	130	KA	2	150	LA	4	160	MA	5	190	PA	5	280	RA	6	440	SA	8	460						
90.0 to 99.9	Y	JA	2	130	KA	2	150	LA	4	160	MA	5	190	QA	5	335	RA	7	440	SA	7	460						
100 to 119	Z	KA	2	150	LA	2	160	MA	4	190	NA	5	215	QA	5	335	RA	7	420	TA	8	500						
120 to 139	Z	KA	2	150	LA	3	160	MA	4	200	NA	6	235	QA	6	370	SA	7	525	TA	8	585						
140 to 159	Z	KA	3	150	LA	3	160	MA	5	200	NA	6	235	RA	5	475	SA	7	525									
160 to 199	Z	LA	3	160	MA	3	190	NA	5	235	PA	6	300	RA	6	475	SA	8	525									
200 to 219	Z	LA	3	160	MA	3	200	NA	5	235	PA	6	300	RA	6	475	TA	7	585									
220 to 259	Z	MA	3	210	NA	3	255	PA	5	320	QA	6	400	SA	6	590	TA	8	665									
260 to 279	Z	MA	3	210	NA	4	255	PA	5	320	QA	6	400	SA	6	590												
280 to 339	Z	NA	3	270	PA	3	330	QA	5	420	RA	5	555	SA	7	625												
340 to 379	Z	NA	3	270	PA	4	330	QA	5	420	RA	6	555	TA	7	705												
380 to 500	Z	PA	3	330	QA	4	420	RA	5	555	SA	6	625	TA	7	705												

"C" and "D" regulation not available in FA case for voltage range 3.5VDC to 8.4VDC, order GA or larger case.

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AC-DC Regulated SINGLE OUTPUT MODULAR POWER SUPPLIES

CEA6 SERIES

OPTIONAL FEATURES

The extra charge for each option is either a flat rate or percentage of the base model price; add the larger number to the base price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	REMARKS
	FIXED OUTPUTS			
F	Fixed output ±1.0%	No charge	None	Available in all classes. Not available with "G" or "R" options.
F1	Fixed output ±0.1%	$15	1	Available in classes B, C & D.
F2	Fixed output ±0.01%	$50	1	Available in class D only.
	ADJUSTABLE OUTPUTS			
G	Output adjust range ±1%	$5	None	Increases resolution of adjustment output.
Std.	Output adjust range ±5%	No charge	None	Provided unless a "G" or "F" option is specified.
G1	Output adjust range ±10%	$5 or 5%	1	Reduce maximum current to 80% of rated output.
G2	Output adjust range ±20%	$10 or 10%	1	Reduce maximum current to 60% of rated output.
G3	Output adjust range ±30%	$15 or 15%	1	Reduce maximum current to 50% of rated output.
G4	Output adjust range ±40%	$20 or 20%	1	Reduce maximum current to 45% of rated output.
G5	Output adjust range ±50%	$25 or 25%	1	Reduce maximum current to 40% of rated output.
Note: Next larger case size required for options G2, G3, G4 & G5. The temperature coefficient is degraded in classes B, C & D for options G2 thru G5.				
	EXTENDED TEMPERATURE RANGE			
H1	Temperature range −55°C to +80°C	$100 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temperature range −40°C to +80°C	$20 or 20%	4	Storage to −55°C
H3	Temperature range −55°C to +115°C	$200 or 100%	6	Requires next larger case size. Storage to −62°C.
	RAPID PROGRAMMING INTO LARGE CAPACITANCE LOADS			
J	Voltage pull down circuit	$40 or 30%	2	Has circuit equivalent to an output resistor of one-tenth of rated load.
	AC INPUT VOLTAGE AND FREQUENCY			
L	Input 95-135V, 50-420 Hz	$10 or 10%	1	Derate maximum current to 60% of rated output.
L1	Input 208V ±10%, 50-420 Hz	$15 or 10%	1	
L2	Input 230V ±10%, 50-420 Hz	$15 or 10%	1	
L3	Input 460V ±10%, 50-420 Hz	$25 or 15%	1	
L4	Input 105-125V, 400 ±20 Hz	$15 or 10%	1	Reduce case size to next smaller. Derate ripple by 5X.
L5	Input 115/230V, 50-420 Hz	$30 or 20%	1	Input terminals parallel or series for 115/230 volts.
	DC INPUT VOLTAGES			
L7	Input 12 VDC (11.6 to 13.8 VDC)	$70 or 40%	1	Derate output to 60% of normal.
L8	Input 24 VDC (23.2 to 27.6 VDC)	$70 or 40%	1	Derate output to 80% of normal.
L9	Input 14 VDC (12.0 to 16.0 VDC)	$90 or 50%	1	Derate output to 60% of normal.
L10	Input 28 VDC (24.0 to 32.0 VDC)	$90 or 50%	1	Derate output to 80% of normal.
	SPECIAL CONNECTIONS			
N	Octal plug in lieu of standard terminations	$15	3	Specify option "R" or "F" with N. Sizes GA or larger, 5 amps or less.
N1	Screw terminals #6-32	$15	3	Used for connections of 20A or less.
	PROTECTION CIRCUITS			Available in all sizes except FA.
P1	Current limiting	$25 or 15%	1	Protects system circuit. Limits current to 130% of rated.
P2	Overtemperature cutout	$20	1	Limits base temperature to maximum rated. Self restarting.
P3	Crowbar voltage limit	$30 or 15%	1	Protects power supply and system circuit under all circumstances. Operates at 10% or 1 volt, whichever is greater over maximum settable voltage. Remove input power to restart.
	REMOTE PROGRAMMING			
R	Remote adjust (no pot provided)	No charge	None	Remote programming options allow power supply to be externally adjusted. Resistance to output ratio is approximately 5 mv per ohm except for class C and D units below 8.5 volts which are approximately 1 mv per ohm.
R1	Remote adjust with 1% linearity	$20 or 10%	1	
R2	Remote adjust plus internal pot (A & B only)	$5	1	
R3	Remote adjust with pot provided (A & B only)	$5	1	
	START INTO HIGH CAPACITANCE LOADS			
S1	Start with 30,000 mfd/amp-100,000 mfd max.	$20 or 10%	1	Recommended for all capacitance loads over 500 mfd/amp.
	HIGH ISOLATION			
T	40 db transformer shielding	$25 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$50 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
	HIGH FLOAT VOLTAGE			
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 volts to case or input.
	RUGGEDIZED			
W	Potted for ruggedization (No internal potentiometer) FA, GA, HA, JA	$5	1	Weight increased about 30%. **Fixed output** or **remote programming** option is required with option "W".
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	
W1	Potted for ruggedization (With internal potentiometer)	"W" prices Plus $25	1	Model number should not include either "R" or "F" option. Internal potentiometer included.

CASE SIZES AND WEIGHTS (UNPOTTED)

CASE SIZE	FA	GA	HA	JA	KA	LA	MA	NA	PA	QA	RA	SA	TA
WIDE	2 5/16	2 3/4	3 1/16	3 3/16	3 15/16	4 15/16	4 11/16	5 1/16	6 1/16	7 1/16	8 1/16	11 11/16	11 11/16
DEEP	2 1/16	2 3/8	2 5/8	3 1/16	3 3/8	3 11/16	4	4 5/16	4 13/16	5 5/16	6 11/16	5 5/16	6 11/16
HIGH	3 1/8	3 13/16	4 1/4	4 7/8	5 1/4	5 5/16	6	6 13/16	6 13/16	7 1/16	7 1/16	7 1/16	8 1/16
WT (lbs)	1	1 3/4	2 1/2	3 1/2	4 1/4	5 1/2	7	9	12	17	30	35	50

PRICE

The **total price** is the **base model price** from the regulation table, **plus** the **price of optional features** selected.

PRICE EXAMPLE: "CEA6B150Y101GRW"

"B"	$10	"B" REGULATION BASE	
"150Y101"	90	MODEL PRICE	$100.00
"G"		OPTION	5.00
"R"		OPTION	NO CHARGE
"W"		OPTION	5.00
		TOTAL PRICE	$110.00

Discount Schedule

Quantity Discount	
1-4	net
5-9	less 5%
10-24	less 10%
25-99	less 15%
100-	factory

TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

Regulation class "A" and "B" supplies 2 weeks; "C" supplies 3 weeks; "D" supplies 4 weeks. Some options extend delivery as shown above. Shipments will be as directed, United Parcel where serviced, or Parcel Post for the remaining.

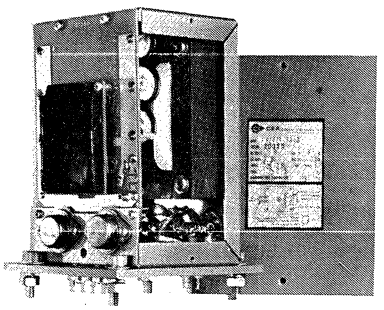
AC-DC Regulated CONSTANT CURRENT MODULAR POWER SUPPLIES

CEA, *a division of Berkleonics, Inc.*
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

CEAC6 SERIES

STANDARD FEATURES INCLUDE

- OUTPUTS from .002 to 5.0 AMPS, zero to 200 volts, to 160 WATTS.
- INPUTS 50 to 420 Hz, 95 to 460VAC and DC inputs are optional.
- REGULATION from .5% to .005% for line plus load.
- 80°C BASE TEMPERATURE without derating.
- SHIELDING, line isolation, eliminating glitches and other noise problems. 20 db standard, up to 100 db optional.
  Floating outputs, + or − output may be ±500VDC from case.
  Adjustment of output, current from 20% to 100% standard.
  Remote adjustment optional at no charge.
  No current overshoot on turn-on or turn-off.
  MIL-T-27 modular case sizes with removable covers for servicing.
  Critical components pretested, aged, and graded.
- BURN-IN (stabilization), 16 hrs. min. at rated load and high base temperature.
- 100% TESTING after burn-in, test data with shipment.
  Specifications guaranteed, not just typical.
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.



SPECIFICATIONS

REGULATION — STABILITY — RIPPLE — BASE MODEL PRICE

Class of Regulation	Line Plus Load Regulation	Line Regulation for 10% Line Change	0 to 100% Rated Votage Change	Temperature Coefficient Per Degree C	Guaranteed Stability for 40 Hours	Guaranteed RMS Ripple	Option Required	Output Current Limit	BASE MODEL PRICE
A	±0.5%	±0.1%	±0.4%	±0.1%	±0.5%	0.1%	None	5A	Tabulated below
B	±0.1%	±0.02%	±0.08%	±0.05%	±0.1%	0.01%	None	5A	A plus $10.00
C	±0.025%	±0.005%	±0.02%	±0.01%	±0.025%	0.005%	R's	5A	A plus $65.00
D	±0.005%	±0.001%	±0.004%	±0.005%	±0.005%	0.003%	R's	1A	A plus $140.00

Input Voltage and Frequency: 105 to 125 volts, 50 to 420 Hz are standard. DC and other ranges are optional.

Output Current and Compliance Voltage: .002 to 5.0A, 12 to 200VDC. See correlation tabulated below.

Recovery Time: As fast as 10 microseconds, depending on model selected.

Insulation Resistance: 100 Megohms DC standard for input, output and case; 1K Megohms for option "T"; 10K Megohms for option "TI".

Temperature, Base: −20°C to +80°C operating, −40°C to +85°C storage.

Thermal Data: Details associated with thermal curve numbers (1 thru 7) in table below are shown on page 19.

Size-Weight-Terminations: Details associated with MIL-T-27 case (FA thru TA), tabulated below, are shown on pages 6 and 20.

PART NUMBERS

Example: .1% Reg, 2A, 0-12V, with options "P2" and "TI"; "CEAC6B120Y202P2TI"

YOUR SELECTION: **CEAC6** ____ ____ ____ ____

Specify regulation — Insert A, B, C or D
Specify output voltage — Insert any digits listed
Specify voltage decimal — Insert Y or Z
Specify desired options — Insert option symbols
Specify output currents — Insert bracketed digits

OUTPUT COMPLIANCE VOLTAGE		OUTPUT CURRENT (Adjustable 20% to 100%)																								
Operation, 100% Voltage Listed	Decimal Code	.01A (100)			.02A (200)			.05A (500)			.1A (101)			.2A (201)			.5A (501)			1A (102)			2A (202)			5A (502)		
		Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price
12.0	Y	FA	1	100	FA	1	100	GA	1	100	HA	1	105	JA	1	110	MA	3	170	NA	3	200	QA	4	265	SA	5	460
30.0	Y							HA	1	105	JA	2	110	KA	3	125	NA	4	205	PA	5	235	RA	5	345	TA	7	505
40.0	Y	GA	1	105	GA	1	105																					
50.0	Y										LA	2	140	NA	3	210	PA	5	235				SA	6	505			
60.0	Y	HA	1	110	JA	1	110	KA	2	125										RA	5	345						
80.0	Y																QA	5	380				TA	7	590			
90.0	Y													PA	4	315												
100	Z	JA	1	150	KA	2	180	LA	3	190	MA	4	230							SA	6	565						
120	Z																RA	5	420									
140	Z													QA	5	385				TA	7	600						
160	Z	KA	2	180	LA	3	190	MA	4	230	NA	5	295															
200	Z	LA	2	190	MA	3	230	NA	4	295	PA	5	335	RA	5	420	SA	7	565									

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AC-DC Regulated CONSTANT CURRENT MODULAR POWER SUPPLIES

CEAC6 SERIES

OPTIONAL FEATURES

The extra charge for each option is either a flat rate or percentage of the base model price; add the larger number to the base price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	REMARKS
	EXTENDED TEMPERATURE RANGE			
H1	Temperature range −55°C to +80°C	$100 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temperature range −40°C to +80°C	$20 or 20%	4	Storage to −55°C
H3	Temperature range −55°C to +115°C	$200 or 100%	6	Requires next larger case size. Storage to −62°C.
	AC INPUT VOLTAGE AND FREQUENCY			
L	Input 95-135V, 50-420 Hz	$10 or 10%	1	Derate maximum current to 60% of rated output.
L1	Input 208V ±10%, 50-420 Hz	$15 or 10%	1	
L2	Input 230V ±10%, 50-420 Hz	$15 or 10%	1	
L3	Input 460V ±10%, 50-420 Hz	$25 or 15%	1	
L4	Input 105-125V, 400 ±20 Hz	$15 or 10%	1	Reduce case size to next smaller. Derate ripple by 5X.
L5	Input 115/230V, 50-420 Hz	$30 or 20%	1	Input terminals parallel or series for 115/230 volts.
	DC INPUT VOLTAGES			
L7	Input 12 VDC (11.6 to 13.8 VDC)	$70 or 40%	1	Derate output to 60% of normal.
L8	Input 24 VDC (23.2 to 27.6 VDC)	$70 or 40%	1	Derate output to 80% of normal.
L9	Input 14 VDC (12.0 to 16.0 VDC)	$90 or 50%	1	Derate output to 60% of normal.
L10	Input 28 VDC (24.0 to 32.0 VDC)	$90 or 50%	1	Derate output to 80% of normal.
	PROTECTION CIRCUITS			
P2	Overtemperature cutout	$20	1	Available in all sizes except FA. Limits base temperature to maximum rated. Self restarting.
	REMOTE PROGRAMMING			
R	Remote adjust (no pot provided)	No charge	None	Remote programming options allow power supply to be externally adjusted. Resistance to ouput ratio is approximately 1% linearity from 10% to 100% rated output. For potentiometer requirements see below.
R1	Remote adjust with 1% linearity	$20 or 10%	1	
R2	Remote adjust plus internal pot (A & B only)	$5	1	
R3	Remote adjust with pot provided (A & B only)	$5	1	
	HIGH ISOLATION			
T	40 db transformer shielding	$25 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$50 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
	HIGH FLOAT VOLTAGE			
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 volts to case or input.
	RUGGEDIZED			
W	Potted for ruggedization (No internal potentiometer) FA, GA, HA, JA	$5	1	Weight increases about 30%
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	**Remote Programming** option is required with option "W".
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	
W1	Potted for ruggedization (With internal potentiometer)	"W" prices Plus $25	1	Model number should not include "R" option. Internal potentiometer included.

EXTERNAL ADJUSTMENT

For **CONSTANT CURRENT** supplies (CEAC6 series), remote programming is accomplished by adding resistance to the remote adjust terminals. With the terminals shorted, the output current will be at maximum. To decrease the output current on supplies rated at 1 amp and below, add approximately 1 ohm of resistance for each .1% of change wanted. For supplies rated above 1 amp, add 1 ohm per each .2% of change wanted. Constant current supplies may also be voltage programmed. Use zero to 1 volt for units 1 amp and below and zero to ½ volt for units over 1 amp.

CASE SIZES AND WEIGHTS (UNPOTTED)

CASE SIZE	FA	GA	HA	JA	KA	LA	MA	NA	PA	QA	RA	SA	TA
WIDE	2 5/16	2 3/4	3 1/16	3 5/16	3 15/16	4 15/16	4 11/16	5 1/16	6 1/16	7 1/16	8 1/16	11 11/16	11 11/16
DEEP	2 1/16	2 3/8	2 5/8	3 1/16	3 3/8	3 11/16	4	4 5/16	4 13/16	5 5/16	6 1/16	5 5/16	6 1/16
HIGH	3 1/8	3 13/16	4 1/4	4 7/8	5 1/4	5 5/16	6	6 13/16	6 13/16	7 1/16	7 1/16	7 1/16	8 1/16
WT (lbs)	1	1 3/4	2 1/2	3 1/2	4 1/4	5 1/2	7	9	12	17	30	35	50

PRICE

The **total price** is the **base model price** from the regulation table, **plus** the **price of optional features** selected.

PRICE EXAMPLE: CEAC6B120Y500LRW

"B"	$10	"B" REGULATION BASE	
"120Y500"	100	MODEL PRICE	$110.00
"G"		OPTION	11.00
"R"		OPTION	NO CHARGE
"W"		OPTION	5.00
		TOTAL PRICE	$126.00

Discount Schedule

Quantity	Discount
1-4	net
5-9	less 5%
10-24	less 10%
25-99	less 15%
100-	factory

TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

Regulation class "A" and "B" supplies 2 weeks; "C" supplies 3 weeks; "D" supplies 4 weeks. Some options extend delivery as shown above. Shipments will be as directed, United Parcel where serviced, or Parcel Post for the remaining.

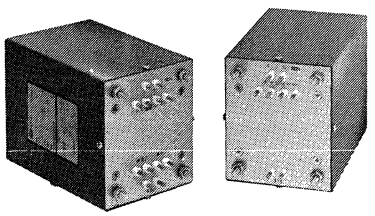
AC-DC Regulated DUAL OUTPUT MODULAR POWER SUPPLIES

CEA, *a division of Berkleonics, Inc.*
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

CEAD6 SERIES

STANDARD FEATURES INCLUDE

- OUTPUTS from 3.5 to 500VDC, .05 to 10 AMPS, to 300 Watts each output.
- INPUTS 50 to 420 Hz, 95 to 460VAC and DC inputs are optional.
- REGULATION from .05% to .0005% for line plus load.
- 80°C BASE TEMPERATURE without derating.
- SHIELDING, line isolation, eliminating glitches and other noise problems. 20 db standard, up to 100 db optional.
  Floating outputs, + or − output may be ±500VDC from case.
  Remote sensing standard, all models, eliminates load lead errors.
  Fixed output voltages to within 1% unless specified otherwise.
  Remote adjustment optional at no charge.
  Series starting with rated load, for multiple supplies to a common load.
  Short circuit output current will not damage supplies.
  No voltage overshoot on turn-on or turn-off.
  MIL-T-27 modular case sizes with removable covers for servicing.
  Critical components pretested, aged, and graded.
- BURN-IN (stabilization), 16 hrs. min. at rated load and high base temperature.
- 100% TESTING after burn-in, test data with shipment.
  Specifications guaranteed, not just typical.
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.



SPECIFICATIONS

REGULATION — STABILITY — RIPPLE — BASE MODEL PRICE

Class of Regulation	Line Plus Load Regulation	Line Regulation for 10% Line Change	Load Regulation for No Load to Full Load	Temperature Coefficient Per Degree C	Stability for 40 Hours	RMS Ripple	Tracking	Option Required	Output Current Limit	BASE MODEL PRICE
A	±0.05%	±0.01%	±0.04%	±0.01%	±0.05%	0.01%	±0.05%	F's or R's	10A	Tabulated below
B	±0.01%	±0.002%	±0.008%	±0.005%	±0.01%	0.001%	±0.01%	F's or R's	10A	A plus $20.00
C	±0.0025%	±0.0005%	±0.002%	±0.001%	±0.0025%	0.0005%	±0.0025%	F's or R's	5A	A plus 115.00
D	±0.0005%	±0.0001%	±0.0004%	±0.0005%	±0.0005%	0.0003%	±0.0005%	F's or R's	1A	A plus 245.00

Input Voltage and Frequency: 105 to 125 volts — 50 to 420 Hz are standard. DC and other voltage ranges are optional.
Output Voltage and Current: 3.5 to 500VDC. 0.05 to 10A. See correlation in table below.
Recovery Time: As fast as 10 microseconds, depending on model selected.
Insulation Resistance: 100 Megohms DC standard for input, output and case; 1K Megohms for option "T"; 10K Megohms for option "TI".
Temperature, Base: −20°C to +80°C operating, −40°C to +85°C storage.
Thermal Data: Details associated with thermal curve numbers (1 thru 9) in table below are shown on page 19.
Size-Weight-Terminations: Details associated with MIL-T-27 case (HA thru TA), tabulated below, are shown on pages 8 and 20.

PART NUMBERS

Example: .01% Reg, 15V, 1A with option "F" and "P3"; "CEAD6B150Y102FP3"

YOUR SELECTION:

CEAD6____ ____ ____

Specify regulation — Insert A, B, C or D
Specify output voltage — Insert any digits, 35 to 500
Specify voltage decimal — Insert X, Y or Z
Specify desired options — Insert option symbols
Specify output currents — Insert bracketed digits

OUTPUT VOLTAGE		OUTPUT RATED CURRENT																														
2 digits under 10V 3 digits 10V & over	Decimal Code	.05A (500)			.1A (101)			.25A (251)			.5A (501)			1A (102)			2.5A (252)			5A (502)			10A (103)									
		Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price							
Select any voltage between limits																																
3.5 to 9.9	X				HA	1	165	JA	3	165	KA	4	190	LA	5	190	PA	6	285	QA	7	330	SA	8	510							
10.0 to 12.4	Y				HA	1	165	JA	3	165	KA	4	190	LA	5	190	PA	6	285	QA	7	330	SA	8	510							
12.5 to 27.4	Y				JA	2	165	KA	3	180	LA	5	190	MA	6	225	QA	7	330	RA	7	415	TA	8	635							
27.5 to 29.9	Y				JA	2	165	KA	3	180	MA	4	225	NA	6	235	QA	6	330	RA	8	415	TA	9	635							
30.0 to 39.9	Y				JA	3	165	LA	4	190	NA	5	235	QA	5	330	RA	6	415	SA	8	510										
40.0 to 49.9	Y				KA	3	190	LA	4	190	NA	5	235	QA	5	330	RA	7	415	SA	8	510										
50.0 to 59.9	Y	KA	2	190	LA	3	190	MA	4	225	PA	5	285	RA	5	415	SA	7	510	TA	8	635										
60.0 to 79.9	Y	LA	2	235	MA	3	275	NA	4	285	PA	5	340	RA	5	505	SA	7	605													
80.0 to 89.9	Y	LA	2	235	MA	3	275	NA	5	285	PA	6	340	RA	6	505	TA	7	795													
90.0 to 99.9	Y	LA	3	225	MA	3	275	NA	5	285	PA	6	340	SA	5	605	TA	7	795													
100 to 119	Z	MA	3	275	NA	3	285	PA	5	340	QA	5	390	SA	6	605	TA	6	745													
120 to 139	Z	MA	3	275	NA	4	285	PA	5	355	QA	6	425	SA	6	640																
140 to 159	Z	MA	3	275	NA	4	285	PA	5	355	QA	6	425	TA	6	850																
160 to 199	Z	NA	4	285	PA	4	340	QA	5	425	RA	6	540	TA	7	850																
200 to 219	Z	NA	4	285	PA	4	355	QA	5	425	RA	6	540	TA	7	850																
220 to 259	Z	PA	4	380	QA	4	460	RA	5	580	SA	6	720																			
260 to 279	Z	PA	4	380	QA	4	460	RA	5	580	SA	6	720																			
280 to 339	Z	QA	3	485	PA	4	600	SA	5	800	TA	6	1005																			
340 to 379	Z	QA	4	485	RA	4	600	SA	5	800	TA	7	1005																			
380 to 500	Z	RA	4	600	SA	4	800	TA	6	1005																						

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AC-DC Regulated DUAL OUTPUT MODULAR POWER SUPPLIES

CEAD6 SERIES

OPTIONAL FEATURES

The extra charge for each option is either a flat rate or percentage of the base model price; add the larger number to the base price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	REMARKS
	FIXED OUTPUTS			
F	Fixed output ±1.0%	No charge, std.	None	Not available with "G" or "R" options.
F1	Fixed output ±0.1%	$30	1	Available in all classes.
F2	Fixed output ±0.01%	$100	1	Available in classes B, C & D.
				Available in class D only.
	ADJUSTABLE OUTPUTS			
G	Output adjust range ±1%	$10	None	Increases resolution of output adjustment.
Std.	Output adjust range ±5%	No charge	None	Provided with "R" option if no other "G" option is specified.
G1	Output adjust range ±10%	$10 or 5%	1	Reduce maximum current to 80% of rated output.
G2	Output adjust range ±20%	$20 or 10%	1	Reduce maximum current to 60% of rated output.
G3	Output adjust range ±30%	$30 or 15%	1	Reduce maximum current to 50% of rated output.
G4	Output adjust range ±40%	$40 or 20%	1	Reduce maximum current to 45% of rated output.
G5	Output adjust range ±50%	$50 or 25%	1	Reduce maximum current to 40% of rated output.
Note: Next larger case size required for options G2, G3, G4 & G5. The temperature coefficient is degraded in classes B, C & D for options G2 thru G5.				
	EXTENDED TEMPERATURE RANGE			
H1	Temperature range −55°C to +80°C	$200 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temperature range −40°C to +80°C	$40 or 20%	4	Storage to −55°C
H3	Temperature range −55°C to +115°C	$400 or 100%	6	Requires next larger case size. Storage to −62°C.
	DUAL OUTPUT ISOLATION			
K	Isolated outputs	$20 or 10%	1	Outputs isolated from each other and case ±500 volts.
	AC INPUT VOLTAGE AND FREQUENCY			
L	Input 95-135V, 50-420 Hz	$10 or 10%	1	Derate maximum current to 60% of rated output.
L1	Input 208V ±10%, 50-420 Hz	$15 or 10%	1	
L2	Input 230V ±10%, 50-420 Hz	$15 or 10%	1	
L3	Input 460V ±10%, 50-420 Hz	$25 or 15%	1	
L4	Input 105-125V, 400 ±20 Hz	$15 or 10%	1	Reduce case size to next smaller. Derate ripple by 5X.
L5	Input 115/230V, 50-420 Hz	$30 or 20%	1	Input terminals parallel or series for 115/230 volts.
	DC INPUT VOLTAGES			
L7	Input 12 VDC (11.6 to 13.8 VDC)	$70 or 40%	1	Derate output to 60% of normal.
L8	Input 24 VDC (23.2 to 27.6 VDC)	$70 or 40%	1	Derate output to 80% of normal.
L9	Input 14 VDC (12.0 to 16.0 VDC)	$90 or 50%	1	Derate output to 60% of normal.
L10	Input 28 VDC (24.0 to 32.0 VDC)	$90 or 50%	1	Derate output to 80% of normal.
	PROTECTION CIRCUITS			Available in all sizes except HA.
P1	Current limiting	$50 or 15%	1	Protects system circuit. Limits current to 130% of rated.
P2	Overtemperature cutout	$20	1	Limits base temperature to maximum rated. Self restarting.
P3	Crowbar voltage limit	$60 or 15%	1	Protects power supply and system circuit under all circumstances. Operates at 10% or 1 volt, whichever is greater over maximum settable voltage. Remove input power to restart.
	REMOTE PROGRAMMING			
R	Remote adjust (no pot provided)	No charge	None	Remote programming options allow power supply to be externally adjusted. Resistance to output ratio is approximately 5 mv per ohm except for class C and D units below 8.5 volts which are approximately 1 mv per ohm.
R1	Remote adjust with 1% linearity	$40 or 10%	1	
R3	Remote adjust with pot provided (A & B only)	$10	1	
	OPTIONAL STARTING CIRCUITS			
S1	Start with 30,000 mfd/amp-100,000 mfd max.	$40 or 10%	1	Recommended for all capacitance loads over 500 mfd/amp.
S2	Start positive output first	$20	1	
S3	Start negative output first	$20	1	
	HIGH ISOLATION			
T	40 db transformer shielding	$40 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$80 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
	HIGH FLOAT VOLTAGE			
U	Output float up to ±1000V	$20 or 10%	1	Either output terminal will withstand ±1000 volts to case or input.
	RUGGEDIZED			
W	Potted for ruggedization (No internal potentiometer) HA, JA	$5	1	Weight increased about 30%.
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	

CASE SIZES AND WEIGHTS (UNPOTTED)

CASE SIZE	HA	JA	KA	LA	MA	NA	PA	QA	RA	SA	TA
WIDE	3 1/16	3 5/16	3 15/16	4 5/16	4 11/16	5 1/16	6 1/16	7 1/16	8 1/16	11 11/16	11 11/16
DEEP	2 5/8	3 1/16	3 3/8	3 11/16	4	4 5/16	4 13/16	5 5/16	6 11/16	5 5/16	6 11/16
HIGH	4 1/4	4 7/8	5 1/4	5 5/16	6	6 13/16	6 13/16	7 1/16	7 1/16	7 1/16	8 1/16
WT (lbs)	2 1/2	3 1/2	4 1/4	5 1/2	7	9	12	17	30	35	50

PRICE

The **total price** is the **base model price** from the regulation table, **plus** the **price of optional features** selected.

PRICE EXAMPLE: CEAD6B150Y101GRW"

"B"	$20	"B" REGULATION BASE	
"150Y101"	165	MODEL PRICE	$185.00
"G"		OPTION	10.00
"R"		OPTION	NO CHARGE
"W"		OPTION	5.00
		TOTAL PRICE	$200.00

Discount Schedule

Quantity	Discount
1-4	net
5-9	less 5%
10-24	less 10%
25-99	less 15%
100-	factory

TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

Regulation class "A" and "B" supplies 2 weeks; "C" supplies 3 weeks; "D" supplies 4 weeks. Some options extend delivery as shown above. Shipments will be as directed, United Parcel where serviced, or Parcel Post for the remaining.

AC/DC-DC HF Regulated COMPACT MODULAR POWER SUPPLIES

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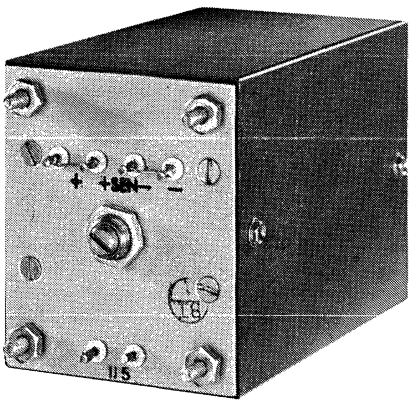
CEA3 SERIES

STANDARD FEATURES INCLUDE



- OUTPUTS from 4.0 to 256VDC, .1 to 60 AMPS, to 640 WATTS.
- INPUTS 50 to 420 Hz, 95 to 135VAC or 105-190VDC.
- REGULATION, 1% or .1% for line plus load.
- 80°C BASE TEMPERATURE without derating.
  - Floating outputs, + or − output may be ±500VDC from case.
  - Remote sensing standard, all models, eliminates load lead effects.
  - Adjustment of output voltage, 50% to 100% is standard. Ranges tabulated below.
  - Remote adjustment optional at no charge.
  - Series starting with rated load, for multiple supply to a common load application.
  - Short circuit output currents will not damage supplies.
  - No voltage overshoot on turn-on or turn-off.
  - MIL-T-27 modular case sizes with removable covers for servicing.
  - Critical components pretested, aged, and graded.
- BURN-IN (stabilization), 16 hrs. min. at rated load and high base temperature.
- 100% TESTING after burn-in, test data with shipment. **Specifications guaranteed, not just typical.**
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.

SPECIFICATIONS

REGULATION — STABILITY — RIPPLE — BASE MODEL PRICE

Class of Regulation	Line Plus Load Regulated	Line Regulation for 10% Line Change	Load Regulation 10% Load to Full Load	Temperature Coefficient Per Degree C	Stability for 40 Hours	Ripple P-P	BASE MODEL PRICE
A	±1.0%	±0.5%	±0.5%	±0.1%	±1.0%	2.0%	Tabulated below
B	±0.1%	±0.05%	±0.05%	±0.01%	±0.1%	0.2%	A plus $20.00

Input Voltage and Frequency: 105 to 125 volts, 50 to 420 Hz or 120 to 180VDC.

Output Voltage and Current: 4.0 to 256VDC, 0.1 to 60A. See correlation in table below.

Efficiency: Up to 80%. The output rectifier voltage drop of 1.2 volts is a major loss, hence a 5V output is 64% eff. on some models.

Recovery Time: Typically less than 1ms for a 50% to 100% load change.

Insulation Resistance: 100 Megohm DC standard for input, output and case.

Temperature, Base: −20°C to +80°C operating, −40°C to +85°C storage.

Thermal Data: Details associated with thermal curve numbers (4 thru 9) in table below are shown on page 19.

Size-Weight-Terminations: Details associated with MIL-T-27 case (GA thru RA), tabulated below, are shown on pages 10 and 20.

PART NUMBERS

Example: .1% Reg, 5V, 60A, with options "F" and "W"; "CEA3B50X603FW"

YOUR SELECTION: **CEA3**_____

Specify regulation — Insert A or B

Specify output voltage — Insert any digit, 40 to 256

Specify voltage decimal — Insert X, Y or Z

Specify desired options — Insert option symbols

Specify output currents — Insert bracketed digits

OUTPUT VOLTAGE		OUTPUT RATED CURRENT																														
2 Digits Under 10V 3 Digits 10V and Over	Decimal Code	.1A (101)			.25A (251)			.5A (501)			1A (102)			2.5A (252)			5A (502)			10A (103)			20A (203)			40A (403)			60A (603)		
† Specify max. voltage listed for adjustable standards Select any voltage between limits for "F" option		Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price
4.0 to 8.0	X													GA	5	215	HA	6	260	JA	7	285	MA	7	350	NA	9	405	PA	9	455
*8.0 to 9.9 10.0 to 16.0	X Y										GA	5	215	HA	6	260	JA	7	300	KA	8	320	NA	9	405	RA	8	565			
16.0 to 32.0	Y							GA	5	215	NA	5	250	JA	7	300	KA	8	320	NA	8	405	RA	7	565						
32.0 to 64.0	Y				GA	5	215	HA	5	250	HA	6	300	KA	8	320	NA	8	400	RA	7	565									
*64.0 to 99.9 100 to 128	Y Z	GA	4	215	HA	5	250	JA	6	285	KA	7	300	NA	8	405	RA	7	565												
128 to 256	Z	HA	5	250	JA	6	285	KA	7	320	NA	7	405	RA	7	565															

† Adjustment from 50% to 100% is standard for the ranges shown.

* These are single standard supplies for the ranges (8.0 to 16.0VDC) & (64.0 to 128VDC), they are shown split to indicate decimal code for application of "F" options.

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AC/DC-DC HF Regulated COMPACT MODULAR POWER SUPPLIES

CEA3 SERIES

OPTIONS

The extra charge for each option is either a flat rate or percentage of the base model price; add the larger number to the base price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	REMARKS
	FIXED OUTPUTS			
F	Fixed output ±1.0%	No charge	None	Not available with "R" options.
F1	Fixed output ±0.1%	$15	1	Available in both classes. Available in class B only.
	EXTENDED TEMPERATURE RANGE			
H1	Temperature range −55°C to +80°C	$100 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temperature range −40°C to +80°C	$20 or 20%	4	Storage to −55°C
H3	Temperature range −55°C to +115°C	$200 or 100%	6	Requires next larger case size. Storage to −62°C.
	RAPID PROGRAMMING INTO LARGE CAPACITANCE LOADS			
J	Voltage pull down circuit	$40 or 30%	2	Has circuit equivalent to an output resistor of one-tenth load.
	INPUT VOLTAGE AND FREQUENCY			
L	Input 95-135VAC, 50-420 Hz or 105-190VDC	$20 or 10%	1	Derate maximum current to 60% of rated output.
	SPECIAL CONNECTIONS			
N	Octal plug in lieu of standard terminations	$15	3	Specify option "R" or "F" with "N". Sizes GA or larger, 5 amps or less.
N1	Screw terminals #6-32	$15	3	Used for connections of 20A or less.
	PROTECTION CIRCUITS			
P1	Current limiting	$25 or 10%	1	Protects system circuit. Limits current to 130% of rated.
P2	Overtemperature cutout	$20	1	Limits base temperature to maximum rated. Self restarting.
P3	Crowbar voltage limit	$30 or 15%	1	Protects power supply and system circuit under all circumstances. Operates at 10% or 1 volt, whichever is greater over maximum settable voltage. Remove input power to restart.
	REMOTE PROGRAMMING			
R	Remote adjust (no pot provided)	No charge	None	Remote programming options allow power supply to be externally adjusted. Resistance to output ratio is approximately 1 mv per ohm.
R1	Remote adjust with 1% linearity (Class B Only)	$20 or 10%	1	
R2	Remote adjust plus internal pot	$5	1	
R3	Remote adjust with pot provided	$5	1	
	START INTO HIGH CAPACITANCE LOADS			
S1	Start with 30,000 mfd/amp-100,000 mfd max.	$20 or 10%	1	Recommended for all capacitance loads over 500 mfd/amp.
	HIGH FLOAT VOLTAGE			
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 volts to case or input.
	RUGGEDIZED			Weight increased about 50%.
W	Potted for ruggedization (No internal potentiometer) GA, HA, JA	$5	1	**Fixed output** or **remote programming** option is required with option "W".
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
W1	Potted for ruggedization (With internal potentiometer)	"W" prices Plus $25	1	Model number should not include either "R" or "F" option. Internal potentiometer included.

CASE SIZES AND WEIGHTS (UNPOTTED)

CASE SIZE	GA	HA	JA	KA	LA	MA	NA	PA	QA	RA
WIDE	2¾	3 1/16	3 3/16	3 15/16	4 15/16	4 11/16	5 1/16	6 1/16	7 1/16	8 1/16
DEEP	2⅜	2⅝	3 1/16	3⅜	3 11/16	4	4 5/16	4 13/16	5 5/16	6 11/16
HIGH	3 13/16	4¼	4⅞	5¼	5 5/16	6	6 13/16	6 13/16	7 1/16	7 1/16
WT (lbs)	1	1½	1⅞	2½	3⅓	4¼	5⅜	7¼	10	18

PRICE

The **total price** is the **base model price** from the regulation table, **plus** the **price of optional features** selected.

PRICE EXAMPLE: "CEA3B160Y102LRW"

"B"	$20	"B" REGULATION BASE	
"160Y102"	215	MODEL PRICE	$235.00
"L"		OPTION	23.50
"R"		OPTION	NO CHARGE
"W"		OPTION	5.00
		TOTAL PRICE	$263.50

Discount Schedule

Quantity	Discount
1-4	net
5-9	less 5%
10-24	less 10%
25-99	less 15%
100-	factory

TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

Regulation class "A" and "B" supplies 4 weeks. Some options extend delivery as shown above. Shipments will be as directed, United Parcel where serviced, or Parcel Post for the remaining.

DC-DC Regulated/Unregulated CONVERTERS MODULAR POWER SUPPLIES

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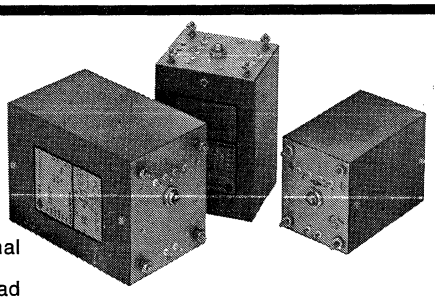
CEA2 SERIES



STANDARD FEATURES INCLUDE

- OUTPUTS from 3.5 to 500VDC, .05 to 40AMPS, to 640 WATTS.
- INPUTS from 10.5 to 60VDC.
- REGULATION 1% for line or load and unregulated.
- 80°C BASE TEMPERATURE without derating.
  Floating outputs, + or − output may be ±500VDC from case.
  Remote sensing on regulated models, eliminating load lead errors.
  Adjustment of output ±5% regulated models. Other ranges are optional
  Remote adjustment optional at no charge.
  Series starting with rated load, for multiple supply to common load application.
  Short circuit output currents will not damage supplies.
  No voltage overshoot on turn-on or turn-off.
  MIL-T-27 modular case sizes with removable covers for servicing.
  Critical components pretested, aged, and graded.
- BURN-IN (stabilization), 16 hrs. min. at rated load and high base temperature.
- 100% TESTING after burn-in, test data with shipment.
  Specifications guaranteed, not just typical.
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.

SPECIFICATIONS

REGULATION — STABILITY — RIPPLE

Class of Regulation	Line Regulation for Full DC Input Change	Load Regulation from 10% to Full Load	Ripple P-P	Temperature Coefficient Per Degree C	Efficiency Up to
A	None	10% + .5 Volt	3%	0.1%	90%
C	1%	1%	1%	0.05%	80%

FOR CLOSER REGULATION SUPPLIES SEE DC INPUT OPTIONS FOR CEA6 SERIES ON PAGES 3 AND 4.

Input Voltage: 21 to 30VDC standard, other input ranges are optional.

Output Voltage and Current: 3.5 to 500VDC .05 to 40A. See correlation in table below.

Recovery Time: As fast as 10 μs for "A" regulation supplies. For "C" supplies typically less than 1ms for a 50% to 100% load change.

Insulation Resistance: 100 Megohms DC for input, output and case.

Temperature, Base: −20°C to +80°C operating, −40°C to +85°C storage.

Thermal Data: Details associated with thermal curve numbers (4 thru 9) in table below are shown on page 19.

Size-Weight-Terminations: Details associated with MIL-T-27 case (FA thru RA), tabulated below, are shown on pages 12 and 20.

PART NUMBERS

Example: 1% Reg, 5V, 40A with options "F1" and "P3"; "CEA2C50X403F1P3"

YOUR SELECTION: **CEA2**___ ___ ___ ___ __

Specify regulation — Insert A or C
Specify output voltage — Insert any digits, 35 to 500
Specify voltage decimal — Insert X, Y or Z
Specify desired options — Insert option symbols
Specify output currents — Insert bracketed digits

OUTPUT VOLTAGE		OUTPUT RATED CURRENT																																					
2 Digits Under 10V 3 Digits 10V and Over	Decimal Code	.05A (500)			.1A (101)			.25A (251)			.5A (501)			1A (102)			2.5A (252)			5A (502)			10A (103)			20A (203)			40A (403)											
select any voltage between limits		Size	Thermal	Price	Size	Thermal	Price	Size	Thermal	Price	Size	Thermal	Price	Size	Thermal	Price	Size	Thermal	Price	Size	Thermal	Price	Size	Thermal	Price	Size	Thermal	Price	Size	Thermal	Price									
"A" Regulation Below																																								
3.5 to 9.9	X													FA	3	85	GA	4	90	HA	5	100	KA	6	115	NA	7	185	QA	7	270								
10.0 to 15.9	Y													FA	3	85	GA	5	90	JA	6	100	MA	6	155	PA	7	230	RA	7	340								
16.0 to 29.9	Y										FA	3	85	GA	4	90	JA	5	100	MA	5	160	PA	6	230	RA	7	340											
30.0 to 59.9	Y										GA	4	90	JA	4	105	MA	5	160	PA	6	230	RA	6	340														
60.0 to 99.9	Y				FA	1	85	GA	3	90	HA	5	100	KA	5	115	NA	6	195	RA	6	340																	
100 to 159	Z				FA	3	85	GA	5	90	JA	5	105	MA	5	160	QA	6	270																					
160 to 299	Z	FA	2	85	GA	3	90	JA	5	105	MA	5	160	PA	6	230																							
300 to 500	Z	GA	3	90	HA	4	100	LA	5	150	NA	6	185	RA	5	340																							
"C" Regulation Below																																							
3.5 to 9.9	X													FA	5	160	GA	7	165	HA	8	185	KA	9	205	NA	9	325	QA	9	475								
10.0 to 15.9	Y													FA	5	160	GA	7	165	JA	8	185	MA	8	270	PA	9	410	RA	9	590								
16.0 to 29.9	Y										FA	5	160	GA	6	165	JA	7	185	MA	8	270	PA	9	410	RA	9	590											
30.0 to 59.9	Y										GA	6	165	JA	7	185	MA	7	270	PA	8	410	RA	9	590														
60.0 to 99.9	Y				FA	4	160	GA	5	165	HA	7	185	KA	7	205	NA	9	325	RA	8	590																	
100 to 159	Z				FA	5	160	GA	7	165	JA	7	185	MA	8	270	QA	8	475																					
160 to 299	Z	FA	5	160	GA	6	165	JA	7	185	MA	7	270	PA	8	410																							
300 to 500	Z	GA	5	165	HA	7	185	LA	7	265	NA	9	325	RA	8	590																							

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DC-DC Regulated/Unregulated CONVERTERS MODULAR POWER SUPPLIES

CEA2 SERIES

OPTIONAL FEATURES

The extra charge for each option is either a flat rate or percentage of the base model price; add the larger number to the base price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	REMARKS
	FIXED OUTPUTS			
F	Fixed output ±5%	No charge	None	Setting at 50% load and mid voltage. Standard for class A. Available for CEA2C.
F1	Fixed output ±1%	$15	1	CEA2C series only.
	ADJUSTABLE OUTPUTS			
G	Output adjust range ±1%	$10	1	CEA2C only.
Std.	Output adjust range ±5%	No charge	None	CEA2C only.
G1	Output adjust range ±10%	$5 or 5%	1	CEA2C only.
G2	Output adjust range ±20%	$10 or 10%	1	CEA2C only.
Note: Adjustable units will have an internal potentiometer unless "R" option specified.				
	EXTENDED TEMPERATURE RANGE			
H1	Temperature range −55°C to +80°C	$50 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temperature range −40°C to +80°C	$15 or 15%	2	Storage to −55°C
H3	Temperature range −55°C to +115°C	$100 or 100%	6	Requires next larger case size. Storage to −62°C.
	INPUT VOLTAGE OPTIONS			
L	Input 10.5 to 15.0 VDC	$10 or 10%	1	(For 105 to 190VDC see CEA3 Series)
L1	Input 24 to 32 VDC	$10 or 10%	1	
L2	Input 42 to 60 VDC	$10 or 10%	1	
	SPECIAL CONNECTIONS			
N	Octal plug (replace solder terminal)	$15	3	Available in limited models.
N1	Screw terminals #6-32	$15	3	Used for connections of 20A or less.
	PROTECTION CIRCUITS			
P2	Overtemperature cutout	$20	1	Set at base temperature rating. Self restarting.
P3	Crowbar voltage limit	$30 or 15%	1	Set at 1 volt or 20% over maximum settable voltage, whichever is larger.
	REMOTE PROGRAMMING			
R	Remote adjust (no pot provided)	No charge	None	Remote program options allow power supply to be externally adjusted with resistance (1 mv/ohm). Not available in CEA2A series. Available in CEA2C series only.
R1	Remote adjust with 1% linearity	$20 or 10%	1	
R2	Remote adjust plus internal pot	$5	1	
R3	Remote adjust with pot provided	$5	1	
	START INTO HIGH CAPACITANCE LOADS			
S1	Start with 30,000 mfd/amp-100,000 mfd max.	$20 or 20%	1	Recommended for all capacitance loads over 500 mfd/amp.
	HIGH FLOAT VOLTAGE			
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 volts to case or input.
	RUGGEDIZED			
W	Potted for ruggedization (No internal potentiometer) FA, GA, HA, JA	$5	1	Weight increased about 50%.
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	**Fixed output** or **remote programming** option is required with option "W".
	QA	$25	1	
	RA	$30	1	
W1	Potted for ruggedization (With internal potentiometer)	"W" prices Plus $25	1	Model number should not include either "R" or "F" option. Internal potentiometer included.

CASE SIZES AND WEIGHTS (UNPOTTED)

CASE SIZE	FA	GA	HA	JA	KA	LA	MA	NA	PA	QA	RA
WIDE	2 5/16	2 3/4	3 1/16	3 9/16	3 15/16	4 15/16	4 11/16	5 1/16	6 1/16	7 1/16	8 1/16
DEEP	2 1/16	2 3/8	2 5/8	3 1/16	3 3/8	3 11/16	4	4 5/16	4 13/16	5 5/16	6 11/16
HIGH	3 1/8	3 13/16	4 1/4	4 7/8	5 1/4	5 5/16	6	6 13/16	6 13/16	7 1/16	7 1/16
WT (lbs)	3/4	1	1 1/2	1 7/8	2 3/4	3 1/3	4 1/4	5 3/8	7 1/4	10	18

PRICE

The **total price** is the **base model price** from the table, **plus** the **price of optional features** selected.

PRICE EXAMPLE: "CEA2C150Y102LRW"

"C150Y102"	BASE MODEL PRICE	$160.00
"L"	OPTION	16.00
"R"	OPTION	NO CHARGE
"W"	OPTION	5.00
	TOTAL PRICE	$181.00

Discount Schedule

Quantity	Discount
1-4	net
5-9	less 5%
10-24	less 10%
25-99	less 15%
100-	factory

TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

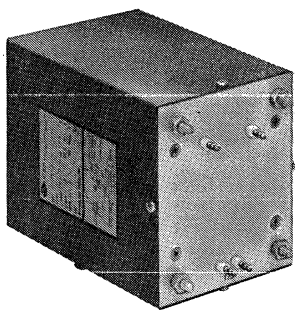
Regulation class "A" and "C" supplies 4 weeks. Some options extend delivery as shown above. Shipments will be as directed, United Parcel where serviced, or Parcel Post for the remaining.

AC-DC Unregulated SINGLE OUTPUT MODULAR POWER SUPPLIES

CEA, *a division of Berkleonics, Inc.*
1 Aerovista Park. San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

CEA1A SERIES

STANDARD FEATURES INCLUDE



- OUTPUTS from 4.5 to 620VDC, up to 25 Amps, to 1000 WATTS
- INPUTS 95 to 460VAC, 50 to 420 Hz.
- 80°C BASE TEMPERATURE without derating.
- SHIELDING, line isolation, eliminating glitches and other noise problems. 20 db standard, up to 100 db optional.
  Floating outputs, + or − output may be ±500VDC from case.
  Series starting with rated load, for multiple supplies to a common load.
  MIL-T-27 modular case sizes with removable covers for servicing.
- BURN-IN (stabilization), 16 hrs. min. at rated load and high base temperature.
- 100% TESTING after burn-in, test data with shipment.
  Specifications guaranteed, not just typical.
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.

SPECIFICATIONS

Input Voltage and Frequency: 105 to 125 volts, 50 to 420 Hz are standard. Other voltage ranges are optional.

Output Voltage and Current: 4.5 to 620VDC, .05 to 25A See tabulation below. For DUAL OUTPUT SUPPLIES (CEAD1 series), contact the factory.

Regulation: Line; proportional to input. Load; 10% plus 1VDC from no load to full load.

Ripple, RMS: Less than 5%, standard. Less than 2% optional.

Voltage Setting: ±5% of any specified voltage from 4.5 to 620VDC while at 115 volts 60 Hz input and fully loaded.

Insulation Resistance: 100 Megohms DC standard for input, output and case; 1K Megohms for option "T"; 10K Megohms for option "TI".

Temperature, Base: −20°C to +80°C operating, −40°C to +85°C storage.

Thermal Data: Details associated with thermal curve numbers (1 thru 7) in table below are shown on page 19.

Size-Weight-Terminations: Details associated with MIL-T-27 case (FA thru TA), tabulated below, are shown on pages 14 and 20.

PART NUMBERS

Example: 5V, 1A with options "P3" and "T1"; "CEA1A50X102P3T1"

YOUR SELECTION: **CEA1A**__ __ ___ __

Specify output voltage — Insert any digits, 45 to 620
Specify voltage decimal — Insert X, Y or Z
Specify desired options — Insert option symbols
Specify output currents — Insert bracketed digits

OUTPUT VOLTAGE		OUTPUT RATED CURRENT																														
2 digits under 10V 3 digits 10V & over	Decimal Code	.05A (500)			.1A (101)			.25A (251)			.5A (501)			1A (102)			2.5A (252)			5A (502)			10A (103)			25A (253)		
Select any voltage between limits		Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price	Size	Thermal	A-Reg. Price
4.5 to 9.9	X				FA	1	35	GA	1	40	HA	1	45	JA	1	50	MA	3	70	NA	3	90	QA	4	120	SA	5	155
10.0 to 16.9	Y				FA	1	35	GA	1	40	HA	1	45	JA	2	55	MA	3	75	NA	4	100	QA	5	135	SA	6	185
17.0 to 35.4	Y				GA	1	40	HA	1	45	JA	1	50	KA	2	60	NA	3	85	PA	5	110	RA	5	160	TA	6	215
35.5 to 38.4	Y				GA	1	40	HA	1	45	KA	1	60	LA	2	75	NA	3	95	PA	5	135	RA	5	190	TA	7	245
38.5 to 49.9	Y				GA	1	45	JA	1	55	LA	1	70	NA	1	90	PA	3	115	QA	4	150	SA	5	210			
50.0 to 64.9	Y				HA	1	45	JA	1	60	LA	2	80	NA	2	100	PA	4	135	QA	5	190	SA	5	240			
65.0 to 75.9	Y	HA	1	50	JA	1	55	KA	1	65	MA	2	90	PA	2	110	QA	3	150	RA	4	210	TA	5	260			
76.0 to 99.9	Y	JA	1	50	KA	1	60	LA	1	70	MA	2	105	PA	2	120	QA	4	170	SA	5	245	TA	6	290			
100 to 111	Z	JA	1	55	KA	1	60	LA	1	80	MA	2	115	PA	2	150	RA	3	205	SA	5	270						
112 to 123	Z	JA	1	55	KA	1	65	LA	1	90	MA	2	120	QA	2	165	RA	3	225	SA	5	290						
124 to 147	Z	KA	1	60	LA	1	65	MA	1	95	NA	2	125	QA	2	175	RA	4	240	TA	5	305						
148 to 172	Z	KA	1	60	LA	1	70	MA	1	100	NA	2	130	QA	3	185	SA	4	250	TA	5	320						
173 to 196	Z	KA	1	60	LA	1	70	MA	1	110	NA	3	135	RA	2	195	SA	4	275									
197 to 246	Z	LA	1	65	MA	1	90	NA	1	125	PA	2	165	RA	3	230	SA	5	310									
247 to 270	Z	LA	1	70	MA	1	95	NA	1	135	PA	3	190	RA	3	255	TA	4	340									
271 to 320	Z	MA	1	75	NA	1	105	PA	1	145	QA	2	200	SA	3	280	TA	5	370									
321 to 344	Z	MA	1	85	NA	1	110	PA	1	150	QA	2	210	SA	3	295												
345 to 419	Z	NA	1	95	PA	1	125	QA	1	165	RA	2	250	SA	3	330												
420 to 468	Z	NA	1	135	PA	1	145	QA	1	185	RA	2	265	TA	3	360												
469 to 620	Z	PA	1	150	QA	1	165	RA	1	220	SA	3	315	TA	4	405												

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AC-DC Unregulated SINGLE OUTPUT MODULAR POWER SUPPLIES

CEA1A SERIES

OPTIONAL FEATURES

The extra charge for each option is either a flat rate or percentage of the base model price; add the larger number to the base price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	REMARKS
	EXTENDED TEMPERATURE RANGE			
H1	Temperature range −55°C to +80°C	$100 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temperature range −40°C to +80°C	$20 or 20%	4	Storage to −55°C.
H3	Temperature range −55°C to +115°C	$200 or 100%	6	Requires next larger case size. Storage to −62°C.
	AC INPUT VOLTAGE AND FREQUENCY			
L1	Input 208V ±10%, 50-420 Hz	$15 or 10%	1	
L2	Input 230V ±10%, 50-420 Hz	$15 or 10%	1	
L3	Input 460V ±10%, 50-420 Hz	$25 or 15%	1	
L4	Input 105-125V, 400 ±20 Hz	$15 or 10%	1	Reduce case size to next smaller.
L5	Input 115/230V, 50-420 Hz	$30 or 20%	1	Input terminals parallel or series for 115/230 volts.
	DC INPUT VOLTAGES			See CEA2A series page 11.
	SPECIAL CONNECTIONS			
N	Octal plug	$15	3	Available in limited models.
N1	Screw terminals #6-32	$15	3	Used for connections of 20A or less.
	PROTECTION CIRCUITS			
P1	Current limiting and shorted output	$25 or 15%	1	Protects system circuit. Limits current to about 150% of rated.
P2	Overtemperature cutout	$20	1	Limits base temperature to maximum rated. Self restarting.
P3	Crowbar voltage limit (P1 features included)	$30 or 25%	1	Protects power supply and system circuit under all circumstances. Operates at 10% or 1 volt, whichever is greater over maximum settable voltage. Remove input power to restart.
	RIPPLE REDUCTION			
Q	Ripple at rated load, 2% or less	$10 or 20%	1	Increase the size to the next larger case.
	HIGH ISOLATION			
T	40 db transformer shielding	$25 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$50 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
	HIGH FLOAT VOLTAGE			
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 volts to case or input.
	RUGGEDIZED			
W	Potted for ruggedization FA, GA, HA, JA	$5	1	Increases weight about 30%.
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	

CASE SIZES AND WEIGHTS (UNPOTTED)

CASE SIZE	FA	GA	HA	JA	KA	LA	MA	NA	PA	QA	RA	SA	TA
WIDE	2 5/16	2 3/4	3 1/16	3 5/16	3 15/16	4 15/16	4 11/16	5 1/16	6 1/16	7 1/16	8 1/16	11 1/16	11 1/16
DEEP	2 1/16	2 3/8	2 5/8	3 1/16	3 3/8	3 11/16	4	4 5/16	4 13/16	5 5/16	6 1/16	5 5/16	6 1/16
HIGH	3 1/8	3 13/16	4 1/4	4 7/8	5 1/4	5 5/16	6	6 13/16	6 13/16	7 1/16	7 1/16	7 1/16	8 1/16
WT (lbs)	1	1 3/4	2 1/2	3 1/2	4 1/4	5 1/2	7	9	12	17	30	35	50

PRICE

The **total price** is the **base model price** from the output table, **plus** the **price of optional features** selected.

PRICE EXAMPLE: "CEA1A150Y102UW"

"150Y102"	BASE MODEL PRICE	$55.00
"U"	OPTION	10.00
"W"	OPTION	5.00
	TOTAL PRICE	$70.00

Discount Schedule

Quantity Discount	
1-4	net
5-9	less 5%
10-24	less 10%
25-99	less 15%
100-	factory

TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

All supplies 2 weeks. Some options extend delivery as shown above. Shipments will be as directed. United Parcel where serviced, or Parcel Post for the remaining.

SHIELDED LINE ISOLATORS
AC-AC Unregulated

CEA, a division of Berkleonics, Inc.
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

CEA11 TO CEA35 SERIES

FEATURES

- Stops high frequency line transients.
- Stops 60 Hz leakage current.
- Breaks AC power ground loops.
- 250 VA to 2 KVA units available from stock to two weeks.
- Input - output voltages, 95 to 270 VAC
- Portable — Ready to plug-in and use anywhere.
- Rack-mounted easily by removing feet and using bolts.
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.

APPLICATIONS

This series of highly-shielded power Line Isolators offers the systems and laboratory engineers an opportunity to fully isolate electronic test equipment such as oscilloscopes, DVM's, power supplies, oscillators, amplifiers, counters, VTVM's and signal conditioning equipment. For example, with a Line Isolator connected between the power source and an oscilloscope, electrical measurements may be made without fear of tripping circuit breakers or blowing fuses because of power ground loops. Most high-frequency line transients are capacitance-coupled through standard power transformers (500 to 5000 pfd), and cause considerable unexplained interference. Reduction of such coupling capacity is the CEA secret to interference-free performance and high common mode rejection. CEA offers three choices of Line Isolators with reduced coupling capacity; 0.01 pfd, 0.001 pfd, and 0.0005 pfd. The effect of input-to-output coupling capacity is illustrated by the impedance of that capacity at various frequencies (5000 pfd for an unshielded transformer).

CEA shielded line isolators are also finding wide acceptance among OEM manufacturers of computers and computer peripheral equipment such as computer terminals. Line transients are coupled directly thru the unshielded power supplies of such equipment and act as bona fide signals to the sensitive I.C. circuits. For integral installation into OEM equipment, special physical packaging can be designed to accommodate the particular system space.

SPECIFICATIONS

Isolation: Input-to-output coupling capacity; less than 0.01, 0.001, or 0.0005 pfd.
Input-to-output DC resistance; greater than 100,000 megohms.
60 Hz leakage current less than .001μamps.

Input: 95-135 VAC, 50-65 Hz standard, other ranges optional.

Output Voltage: Within 2% of the input voltage, from no load to full load.

Output Current: See model table.

Efficiency: Better than 95%.

Mechanical: Unit has chrome handle, deep drawn case with grey baked enamel finish, 6 ft. shielded line cord, non-scuff feet and #¼-20 inserts for bolt mounting.

Frequency	Impedance of Capacity in Megohms			
	Unshielded	Shielded Line Isolator		
	5000 pfd	0.01 pfd	0.001 pfd	0.0005 pfd
60 Hz	0.53	265,000	2,650,000	5,300,000
100 Hz	0.32	160,000	1,600,000	3,200,000
1 KHz	0.032	16,000	160,000	320,000
10 KHz	0.0032	1,600	16,000	32,000
100 KHz	0.00032	160	1,600	3,200
1 MHz	0.000032	16	160	320
10 MHz	0.0000032 (3.2Ω)	1.6	16	32

SIZE — PART NUMBER — PRICE

VA Rating	Max. Output (Amps)	Size (Inches) W	D	H	Wt. Lbs.	Coupling Capacity 0.01 pfd Model	Price	Coupling Capacity 0.001 pfd Model	Price	Coupling Capacity 0.0005 pfd Model	Price
250	2.2	5⅜	5⅛	7	12	CEA11	$105.00	CEA21	$135.00	CEA31	$175.00
500	4.3	6½	6⅛	8	27	CEA12	120.00	CEA22	160.00	CEA32	205.00
1000	8.6	9⅜	6⅛	8	33	CEA13	145.00	CEA23	195.00	CEA33	250.00
1500	13.0	9⅜	6⅛	9	38	CEA14	180.00	CEA24	225.00	CEA34	300.00
2000	17.3	9	9	9	55	CEA15	230.00	CEA25	305.00	CEA35	395.00

DISCOUNT SCHEDULE: 1-4 net, 5-9 less 5%, 10-24 less 10%, 25-99 less 15%, 100 — factory.

OPTIONAL INPUT AND OUTPUT VOLTAGES

(add the option symbol to model selected, add whichever price is greater to the base price).

"L1" Input 190-270 VAC
Output within 2% of Input $20 or 10%

"L2" Input 190-270 VAC
Output 95-135 VAC (50% of Input) $20 or 10%

"L3" Input 95-135 VAC
Output 190-270 VAC (200% of Input) $20 or 10%

TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

Isolators and cables (next page) available from stock, 2 weeks ARO. Shipment will be as directed, United Parcel where serviced, or Parcel Post for the remaining.

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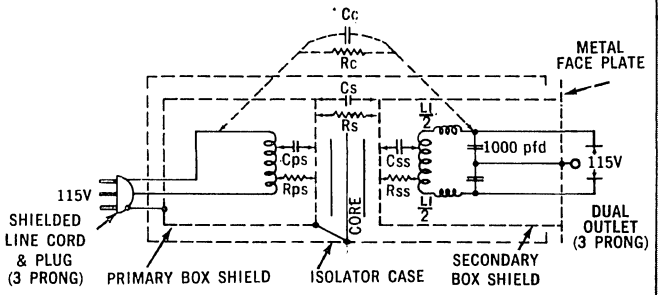
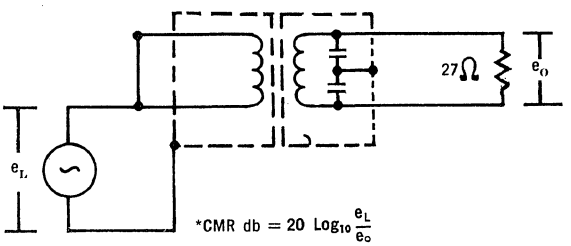
SHIELDED LINE ISOLATORS
AC-AC Unregulated

CEA11 TO CEA35 SERIES
TECHNICAL DATA

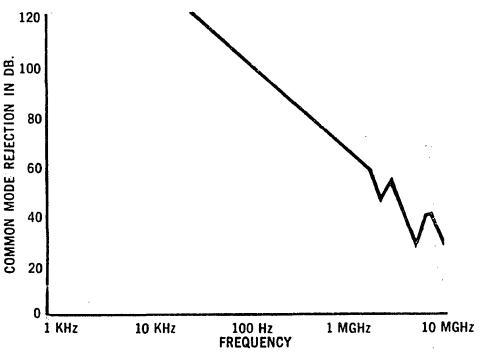


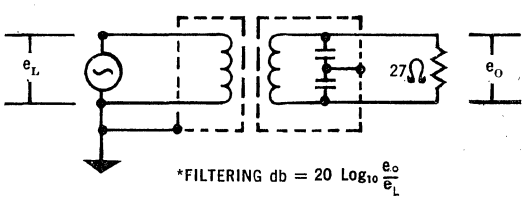
EQUIVALENT CIRCUIT

Symbol	Description	Worst Values For CEA11	Worst Values For CEA35
Cc	Capacity between primary & secondary windings	.01 pfd	.0005 pfd
Rc	Resistance between primary & secondary windings	100K MegΩ	100K MegΩ
Cs	Capacity between primary shield plus case & secondary shield	300 pfd	1000 pfd
Rs	Resistance between primary shield plus case & secondary shield	100K MegΩ	100K MegΩ
Cps	Capacity between primary winding & primary shield	1000 pfd	3000 pfd
Rps	Resistance between primary winding & primary shield	100 MegΩ	100 MegΩ
Css	Capacity between secondary winding & secondary shield	1000 pfd	3000 pfd
Rss	Resistance between secondary winding & secondary shield	100 MegΩ	100 MegΩ
Li	Leakage inductance (referred to secondary)	15 mh	.7 mh

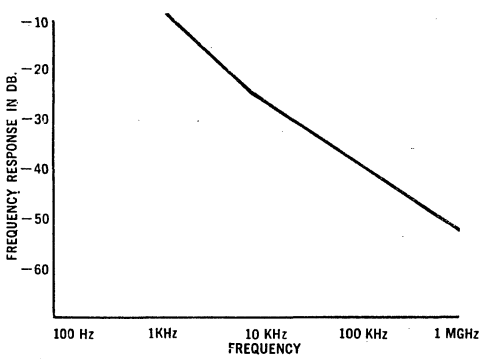


COMMON MODE REJECTION* VS. FREQUENCY
*DATA TAKEN FROM A STANDARD CEA12 ISOLATOR

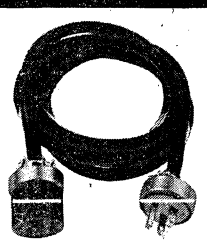




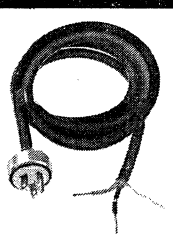
FILTER ACTION* VS. FREQUENCY
*DATA TAKEN FROM A STANDARD CEA12 ISOLATOR



SHIELDED LINE CORDS FOR ISOLATOR OUTPUTS



STYLE A



STYLE B

To make optimum use of CEA Line Isolators, CEA offers specially designed shielded line cords in two styles and several lengths. Style A can be used as an extension cord for equipment that has a line receptacle mounted at the chassis (such as Tektronix scopes). Style B has stripped and tinned leads on one end and can be installed into equipment as a direct replacement for unshielded line cords (such as Hewlett-Packard equipment). The plugs on these cords, as well as the cable, are shielded and are constructed of the finest materials available. Other lengths, current ratings, and connectors are available on request.

STANDARD SHIELDED LINE CORDS

Model	Max. Current (Amps)	Length (Feet)	Style	Price (Each)
CEA8A6	5	6	A	$22.00
CEA8B6	5	6	B	17.00
CEA8A10	5	10	A	30.00
CEA8B10	5	10	B	25.00
CEA9A6	15	6	A	28.00
CEA9B6	15	6	B	23.00
CEA9A10	15	10	A	40.00
CEA9B10	15	10	B	35.00

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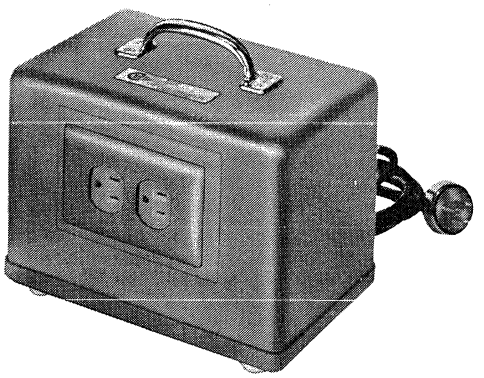
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

MEDICAL-SHIELDED LINE ISOLATORS
AC-AC Unregulated

OL21 - OL25 / OWEN LABORATORIES PART DISTRIBUTED BY CEA

FEATURES

- Stops 60 Hz leakage currents
- Stops high frequency line transients.
- Less than 25 db audio noise
- Portable — Ready to plug-in and use anywhere.
- 250 VA to 2 KVA units available.
- Rack-mounted easily by removing feet and using bolts.
- 3 YEAR WARRANTY for parts and labor against defects in workmanship and materials.



APPLICATIONS

Recent investigations by safety conscious people in the medical field have shown that stray currents in the order of 10 microamps can be dangerous to patients exposed to surgical and intensive care instrumentation in hospitals. CEA's line isolators are capable of reducing line leakage currents to less than 5.0 microamps thus providing the necessary safety factor between hospital instrumentation and patient.

SPECIFICATIONS

Isolation: Leakage currents, 60 Hz, either output to case less than 5μA. DC resistance, output to case or to input, greater than 100,000 megohms.

Input: 95-135 VAC, 50 - 65 Hz is standard, other ranges are optional.

Output Voltage: Within 2% of input voltage at full load.

Output Current: See tabulation below.

Efficiency: Better than 90% at full load.

Mechanical: Unit has chrome handle, deep drawn metal case with grey baked enamel finish, 6 ft. shielded line cord on the input, non-scuff feet, and #¼-20 inserts for bolt mounting.

SIZE — PART NUMBER — PRICE

VA Rating	Max. Output (Amps)	Overall Size W	D	H	Wt. Lbs.	Model	Price
250	2.2	5⅜	5⅛	7	12	OL21	$140.00
500	4.3	6½	6⅛	8	27	OL22	160.00
1000	8.6	9⅜	6⅛	8	33	OL23	195.00
1500	13.0	9⅜	6⅛	9	38	OL24	225.00
2000	17.3	9	9	9	55	OL25	300.00

DISCOUNT SCHEDULE QUANTITY DISCOUNT

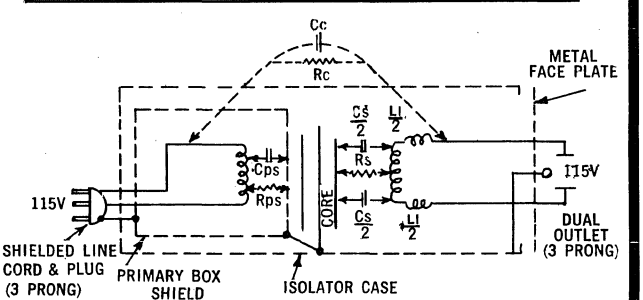
1-4	net	25-99	less 15%
5-9	less 5%	100-	factory
10-24	less 10%		

OPTIONAL INPUT VOLTAGES

Add the option symbol "L2" to the model selected for an input voltage of 190-270 VAC, output voltage 95-135 VAC (50% of input) and add $20.00, to the base price.

CIRCUIT AND VALUES:

	Worst Values For	OL21	OL25
Cc	Capacity between primary & secondary windings	.01 pfd	.01 pfd
Rc	Resistance between primary & secondary windings	100k meg	100K meg
Cs	Capacity between primary shield, case & secondary	150 pfd	150 pfd
Rs	Resistance between primary shield, case & secondary	100K meg	100K meg
Cps	Capacity between primary winding & primary shield	1000 pfd	3000 pfd
Rps	Resistance between primary winding & primary shield	100 meg	100 meg
Li	Leakage inductance (referred to secondary)	15 mh	.7 mh



TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

Isolators and cables, available from stock, to 4 weeks. Shipments will be as directed, United Parcel where serviced, or Parcel Post for the remaining.

SPECIAL PACKAGING AVAILABLE

- Chassis Mounted.
- Instrument Inputs
- Isolator and Power Supply combined module.

Contact the factory toll-free: 800-235-4510, in Calif.: 800-592-5910

BATTERY CHARGERS FOR NI-CAD CELLS

CEA, a division of Berkleonics, Inc.
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

C1.2 TO C36 / BERKLEONICS PART DISTRIBUTED BY CEA

FEATURES

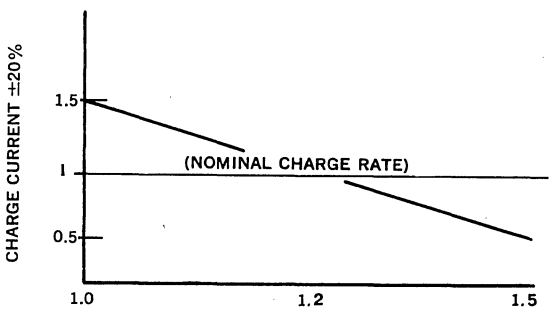
These 115V, 60 Hz battery chargers are designed specifically for nickel cadmium and similar rechargeable cells. Average charge time for these chargers is 14 to 16 hours with **no damage to cells or charger** if the charger is left on indefinitely.

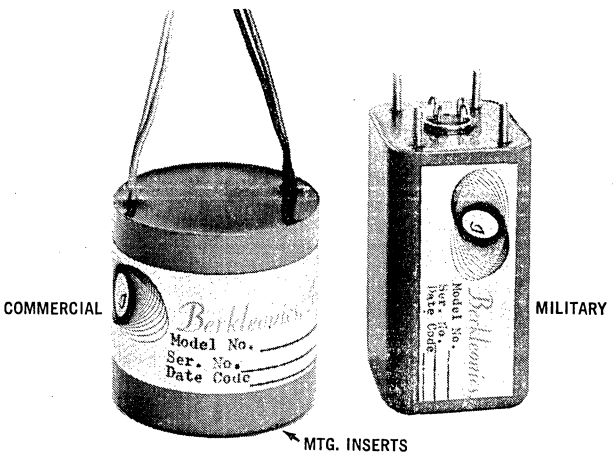
Variations of mechanical sizes and electrical specifications for every need are available on special request.

SPECIFICATIONS

INPUT: 115VAC, 60 Hz.

OUTPUT: DC current (rectified unfiltered AC) as indicated by table and curve below.





PART NUMBERS

Example: Commercial 12V, 400Ma charger; "C12.0-400"
YOUR SELECTION: Insert in the blanks as indicated.

- cell charge current in Ma @ 10 Hr rate from table
- nominal battery voltage @ 1.2 volts/cell, from table
- package type — LETTER CODE: below

"C" — Commercial grade (metal encased & potted with epoxy) unit has 2 threaded holes in end opposite lead exit.

"M" — Military (designed to satisfy MIL-T-27/TF 4 R X 02)
- Transformer
- Metal Encased & Hermetically Sealed
- 105°C
- 10,000 Hour Life
- Power Transformer Supplying Rectified Load

PRICE

Prices shown in the table are for type "C" chargers (commercial). When ordering type "M" chargers (military), increase the prices in the table by 100%.

Discount Schedule

Quantity	Discount
1-4	net
5-9	less 5%
10-24	less 10%
25-99	less 15%
100-	factory

TERMS

NET 30 days, F.O.B. San Luis Obispo, California.

DELIVERY

From stock to two weeks. Shipment will be as directed, United Parcel, where serviced, and Parcel Post for the remaining.

NOMINAL CHARGE CURRENT IN MA @ 10 HOUR RATE

NOMINAL BATTERY VOLTAGE (NUMBER OF CELLS @ 1.2 VOLTS CELL)	22	50	90	120	160	230	300	400	600	800	1100
1.2	$12.	$12.	$12.	$12.	$15.	$15.	$18.	$18.	$18.	$18.	$26.
2.4	$12.	$12.	$12.	$15.	$15.	$18.	$18.	$18.	$18.	$18.	$26.
3.6	$12.	$12.	$15.	$15.	$18.	$18.	$18.	$21.	$26.	$26.	$26.
4.8	$12.	$12.	$15.	$18.	$18.	$18.	$21.	$21.	$26.	$26.	$26.
6.0	$12.	$15.	$18.	$18.	$21.	$21.	$21.	$26.	$26.	$26.	$32.
7.2	$12.	$15.	$18.	$18.	$21.	$21.	$26.	$26.	$26.	$32.	$32.
8.4	$15.	$15.	$18.	$18.	$21.	$21.	$26.	$26.	$32.	$32.	$32.
9.6	$15.	$15.	$18.	$21.	$21.	$26.	$26.	$26.	$32.	$32.	$37.
10.8	$15.	$18.	$18.	$21.	$21.	$26.	$26.	$32.	$32.	$32.	$37.
12.0	$15.	$18.	$18.	$21.	$21.	$26.	$26.	$32.	$32.	$32.	$37.
13.2	$15.	$18.	$18.	$21.	$26.	$26.	$32.	$32.	$32.	$37.	$37.
14.4	$15.	$18.	$21.	$21.	$26.	$26.	$32.	$32.	$32.	$37.	$37.
15.6	$15.	$18.	$21.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$37.
16.8	$15.	$18.	$21.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$37.
18.0	$15.	$18.	$21.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$37.
19.2	$15.	$18.	$21.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$37.
20.4	$15.	$18.	$21.	$21.	$26.	$32.	$32.	$32.	$37.	$37.	$42.
21.6	$15.	$18.	$21.	$21.	$26.	$32.	$32.	$32.	$37.	$37.	$42.
22.8	$15.	$18.	$21.	$26.	$26.	$32.	$32.	$32.	$37.	$37.	$42.
24.0	$18.	$18.	$21.	$26.	$26.	$32.	$32.	$32.	$37.	$42.	$42.
25.2	$18.	$18.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$42.	$42.
26.4	$18.	$18.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$42.	$42.
27.6	$18.	$13.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$42.	$42.
28.8	$18.	$18.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$42.	$42.
30.0	$18.	$18.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$42.	$42.
31.2	$18.	$18.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$42.	$42.
32.4	$18.	$18.	$21.	$26.	$26.	$32.	$32.	$37.	$37.	$42.	$42.
33.6	$18.	$18.	$21.	$26.	$26.	$32.	$37.	$37.	$37.	$42.	$42.
34.8	$18.	$18.	$21.	$26.	$26.	$32.	$37.	$37.	$37.	$42.	$42.
36.0	$18.	$18.	$21.	$26.	$26.	$32.	$37.	$37.	$37.	$42.	$42.
	0.22	0.5	0.9	1.2	1.6	2.3	3	4	6	8	11

NOMINAL STORAGE CAPACITY IN AMPERE HOURS

MECHANICAL: Reference the photos. The shading in the table denotes one of four sizes as follows.

- $ — MIL T 27 Size AJ — 1⅝ x 1⅝ x 2⅜ Commercial Size — 1.52H x 1.32 Dia.
- $ — MIL T 27 Size EB — 1 1/16 x 1 1/16 x 2 1/16 Commercial Size — 1.77H x 1.82 Dia.
- $ — MIL T 27 Size FB — 2 1/16 x 2 1/16 x 2½ Commercial Size — 2.58H x 2.05 Dia.
- $ — MIL T 27 Size HB — 3 1/16 x 2⅝ x 3 3/16 Commercial Size — 3 1/16 x 2⅝ x 3 3/16

THERMAL DATA
THERMAL RADIATORS

CEA, *a division of Berkleonics, Inc.*
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

Heat flows from regions of high temperature to regions of low temperature by:
1. CONDUCTION — heat flow within a material without material motion required.
2. CONVECTION — heat flow by physical motion of a material; e.g., liquids and gases.
3. RADIATION — heat flow by radiant energy, materials for the flow path not required.

The heat conductivity of various substances are: Silver 1.0, Copper .9, Gold .7, Aluminum .5, Iron .15, Steel .1, Silica .0024, Mica .0018 (.5 conductivity corresponds to about 1°C per inch or a heat flow of 5.3 watts per square inch).

The conductivity of some aluminum alloys are three times better than others, 1100F and 6063T5 are two of the better alloys.

Convection by natural means can vary about 2 to 1 for flat surface up versus a flat surface down.

Forced convection (fan-driven air) is a common cooling procedure and has the effects shown in the curve below.

Radiation depends to a large extent on the roughness of the surface. The rougher the better (e.g., the emissivity of aluminum unoxidized is .02 vs .3 oxidized).

From the above it is clear that heat flow is complex and quite variable. THE DATA GIVEN BELOW IS PRESENTED NOT AS ABSOLUTE BUT RATHER AS A GUIDE.

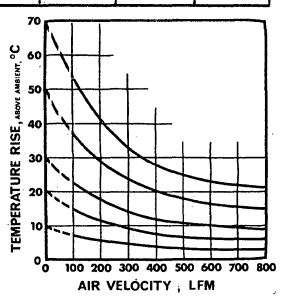
THERMAL DATA — Worst Case Condition: high input voltage, full load, no forced air.
(a) Power Dissipated Internally (watts) (b) Temp. Rise, chassis mounted (°C) (c) Temp. Rise, chassis & thermal radiator mounted (°C)

THERMAL NUMBERS	DATA	CASE SIZE FA	GA	HA	JA	KA	LA	MA	NA	PA	QA	RA	SA	TA
1	(a)	2.9	3.9	4.8	6.5	8.0	9.5	11	13	17	24	32	39	47
	(b)	2.9	3.9	4.8	6.5	8.0	9.5	8	9	12	11	14	17	20
	(c)	—	—	—	—	—	—	6	7	8	6	9	7	9
2	(a)	3.8	5.2	6.4	8.6	11	13	15	17	23	31	43	52	63
	(b)	3.8	5.2	6.4	8.6	11	13	10	12	15	13	18	22	26
	(c)	—	—	—	—	—	—	8	10	10	8	11	10	12
3	(a)	5.7	7.8	9.6	13	16	19	22	26	34	47	65	78	94
	(b)	5.7	7.8	9.6	13	15	18	14	17	22	20	27	31	37
	(c)	—	—	—	—	—	—	12	14	15	12	17	14	17
4	(a)	7.6	10	13	17	21	25	30	35	45	63	86	100	130
	(b)	7.6	10	13	16	20	23	20	22	28	26	34	38	46
	(c)	—	—	—	—	—	—	16	18	19	16	22	18	24
5	(a)	11	16	19	26	32	38	45	52	68	94	130	160	190
	(b)	11	15	18	24	29	34	29	32	40	37	46	53	58
	(c)	—	—	—	—	—	—	23	26	28	24	31	28	32
6	(a)	15	21	26	35	43	51	60	70	91	130	170	210	250
	(b)	14	20	24	32	38	42	36	41	49	46	55	62	67
	(c)	—	—	—	—	—	—	30	34	36	31	39	35	40
7	(a)	23	31	39	52	64	76	90	100	140	190	260	310	380
	(b)	22	28	35	43	49	55	49	52	63	58	69	75	—
	(c)	—	—	—	—	—	—	42	45	49	42	52	47	53
8	(a)	30	42	51	69	85	100	120	140	180	250	340	420	500
	(b)	27	37	42	52	59	64	58	63	71	67	78	—	—
	(c)	—	—	—	—	—	—	50	56	58	50	61	57	62
9	(a)	43	63	77	100	130	150	180	210	270	380	520	620	750
	(b)	38	49	55	64	73	78	71	77	—	—	—	—	—
	(c)	—	—	—	—	—	—	64	69	71	64	75	69	76
CHASSIS 3/32" x (In. x In.)		10x10	10x10	10x10	10x10	10x10	10x10	12x12	12x12	12x12	15x15	15x15	15x15	15x15
RADIATORS (Qty.) P/N		—	—	—	—	—	—	(1) CEATR1	(1) CEATR1	(2) CEATR1	(2) CEATR2	(2) CEATR2	(4) CEATR2	(4) CEATR2

Example: Thermal No. 5, Case SA may dissipate 160 watts, have a base temperature of 53°C above ambient for a 15" x 15" x 3/32" aluminum chassis mounting, reduce the 53°C to 28°C by adding four CEATR2 THERMAL RADIATORS (mounted thru chassis to base), and then have the 28°C decreased to 11°C by 400LFM air velocity to all surfaces.

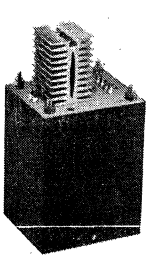
The base limitation to the life of your CEA Power Supply is the upper temperature of the internal components. As with most temperature-affected items, the cooler the unit the greater the life expectancy. Keeping the base temperature of your power supply under +80°C during normal operation will cause the internal components to be safe and give a good life.

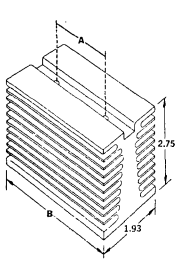
Temperature stability may require from 10 to 40 minutes after a change, e.g., turn-on. This can be an aid during intermittent duty, and should be remembered when performing a steady-state systems analysis.



THERMAL RADIATORS

Models CEATR1 and CEATR2 Thermal Radiators, designed for use with CEA Power Supplies, may be mounted directly into the module base or on the opposite side of the mounting body. The mounting hole configuration in the Thermal Radiators and the base of each Module are symmetrical so that the radiators may be mounted for airflow in either direction across the base of the Module. A coating of silicon grease should be applied on each mating surface of the Module, mounting body and Thermal Radiator. The mounting body must be a smooth, highly thermal conductive metallic surface.





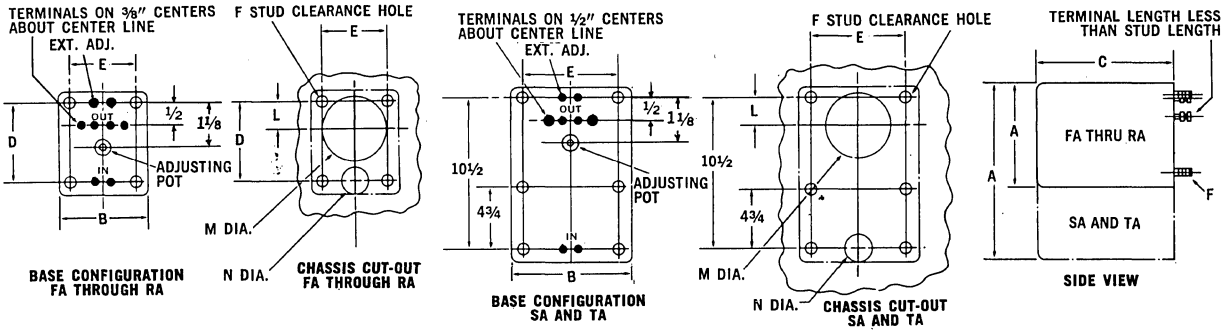
Thermal Radiator Model No.	Radiation Area (sq. in.)	Dimensions A	B	Weight (Pounds)	Price Each
CEATR1	75	1.000	1.93	0.75	$12.00
CEATR2	150	2.000	3.93	1.50	$18.00

CEA, a division of Berkleonics, Inc.
1 Aerovista Park, San Luis Obispo, Calif. 93401
Toll-Free: Phone 800-235-4150 • In Calif. 800-592-5910

MOUNTING and TERMINATIONS

MECHANICAL DATA

For convenience in mounting-handling, the entire CEA line of over 100,000 power supplies are packaged in only 13 different case sizes. The physical dimensions and chassis cutout dimensions are given below. Use adequate cooling to maintain base temperature below 80°C.



MODULE DIMENSIONS / CASE SIZES AND WEIGHTS

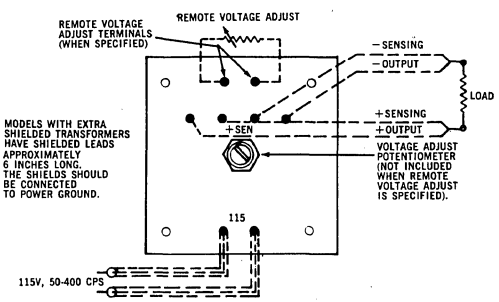
MIL-T-27A‡ Size	A	B	C	D	E	F	L	Chassis Clearance Holes† M	Chassis Clearance Holes† N	Standard* Wt. Lbs.	Potted Units Option W Lbs.	Base Area Sq. In.	Volume Cu. In.
FA	2 5/16	2 1/16	3 1/8	1 1/16	1 7/16	6-32 x 3/8	1 1/16	1 1/16	3/4	1	1 1/4	4.8	13
GA	2 3/4	2 3/8	3 13/16	2 1/8	1 3/4	6-32 x 3/8	1 1/16	1 1/16	3/4	1 3/4	2 1/4	6.5	25
HA	3 1/16	2 5/8	4 1/4	2 1/64	1 55/64	6-32 x 3/8	1 1/16	1 1/16	3/4	2 1/2	2 3/4	8.0	34
JA	3 3/16	3 1/16	4 7/8	2 5/8	2 1/8	8-32 x 3/8	1 1/16	1 1/16	3/4	3 1/2	4	10.8	53
KA	3 15/16	3 3/8	5 1/4	3	2 7/16	10-32 x 1/2	1 1/16	1 1/16	3/4	4 1/4	6 1/4	13.3	70
LA	4 5/16	3 11/16	5 5/16	3 5/16	2 11/16	10-32 x 1/2	1 1/16	1 1/16	3/4	5 1/2	7 3/4	15.9	88
MA	4 11/16	4	6	3 11/16	3	1/4-20 x 5/8	1 1/16	1 1/16	3/4	7	9 1/2	18.7	112
NA	5 1/16	4 5/16	6 13/16	4 1/16	3 5/16	1/4-20 x 5/8	1 1/16	1 1/16	3/4	9	12 1/2	21.8	149
PA	6 1/16	4 13/16	6 13/16	5 1/16	3 13/16	1/4-20 x 5/8	1 1/16	1 1/16	3/4	12	16 1/2	28.4	198
QA	7 1/16	5 5/16	7 1/16	6 1/16	4 5/16	5/16-18 x 21/32	1 1/16	1 1/16	3/4	17	23	39.2	277
RA	8 1/16	6 1/16	7 1/16	7 1/16	5 1/16	5/16-18 x 21/32	1 1/16	1 1/16	3/4	30	38	53.9	381
SA	11 1/16	5 5/16	7 1/16	—	4 7/16	5/16-18 x 7/8	1 1/16	2 1/4	3/4	35	45	63.0	463
TA	11 1/16	6 1/16	8 1/16	—	5 5/16	5/16-18 x 7/8	1 1/16	2 1/4	3/4	50	65	78.2	632

‡ MIL-T-27 tolerances apply.

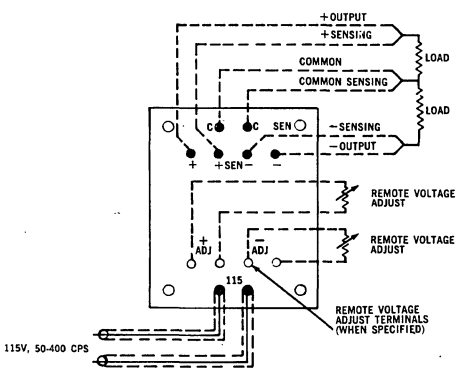
† Chassis cutout dimensions are typical for all single output supplies and fixed output dual units. For dual output units with terminals, omit "N" hole and substitute "M" diameter hole using "L" dimensions both ends.

* Weights shown are for 60 Hz supplies. CEA2 and CEA3 supplies are about 60 percent of these tabulated standard weight.

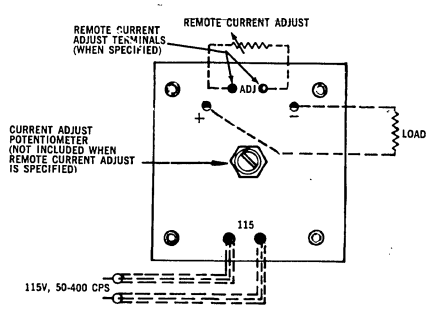
ELECTRICAL TERMINATION DATA



termination data single output units



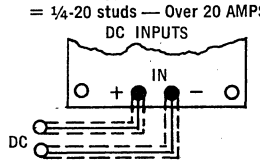
termination data dual output units



termination data constant current units

TERMINALS

Solder turret type — 20 AMPS and under
= 1/4-20 studs — Over 20 AMPS



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Immediately, our technical operators will tell you where you can find the products and services you need. They will provide you with the name of the supplier in your area, and direct you to the appropriate white pages of EEM for additional product catalog data.

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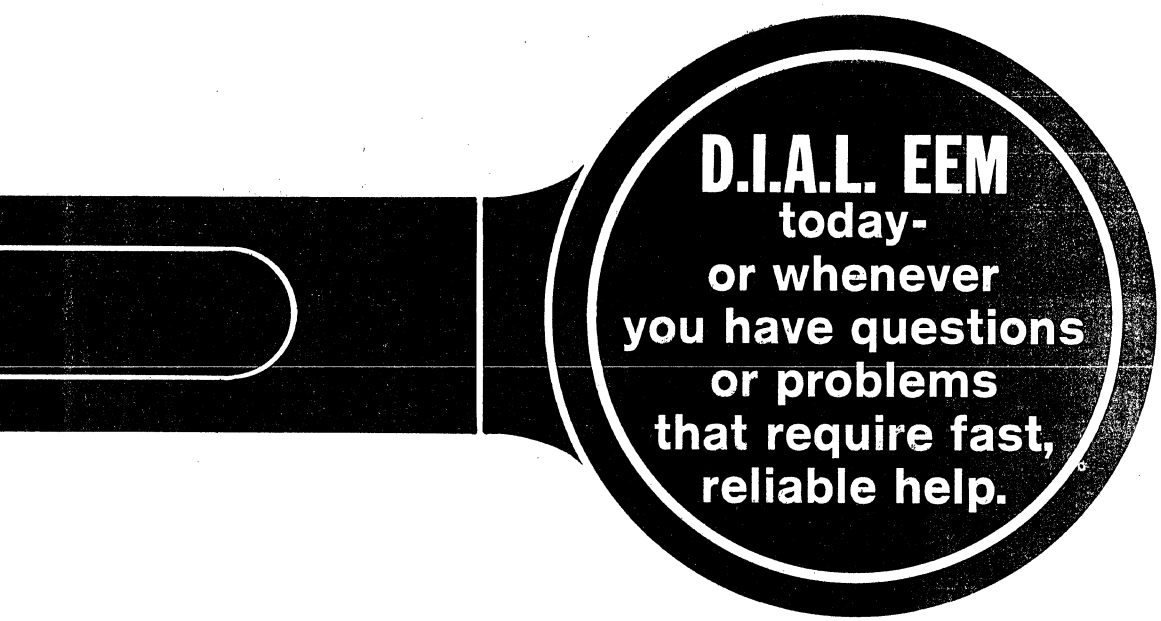

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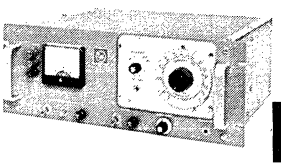
United Technical Publications
645 Stewart Ave., Garden City, N. Y. (516) 248-9700

CML MACARR, INC.

single phase AC power supplies

NS series 70VA to 350VA

OUTPUT VOLTAGE: Adjustable 0-125 Volts; full power available at output of 110-125 Volts.



MODEL NS175-7A-V

MODEL	OUTPUT POWER VOLT-AMPERES	*DIMENSIONS H x W x D	WEIGHT (APPROX.) LBS.
NS70	70	7″ x 19″ x 14″	53
NS120	120	7″ x 19″ x 14″	57
NS175	175	7″ x 19″ x 14″	60
NS350	350	8¾″ x 19″ x 20¾″	115

* Dimensions apply to standard rack mount models. Add ¾″ to height if bench adapters are included.

NS Series Oscillators**

	OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.001%
		SUFFIX #			
Fixed	400 Hz	—4A	—4B	—4E	—4G
Fixed	800 Hz	—8A	—8B	—8E	—8G
Fixed	50 Hz	—1A	—1B	—1E	Special
Fixed	60 Hz	—2A	—2B	—2E	Order
	Selectable 50/60/400/800 Hz	—9A	—9B	X	X
Adjustable	350-450 Hz	—5A	—5B	X	X
Adjustable	45-70 Hz	—3A	—3B	X	X
Adjustable	300-2,000 Hz	—6A	—6B	X	X
Adjustable	45-6,000 Hz	—7A	X	X	X

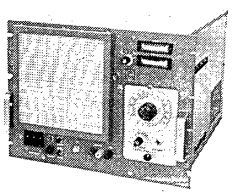
****AUDIO AMPLIFIER ONLY:** Each model is also available as an audio power amplifier only (without a built-in oscillator) with a full power range of 45-6,000 Hz. All standard models include an input signal jack for use with external signal source. Specify the Basic Power Supply Model and Suffix # (—JA) if oscillator is not required.

NA series 500VA to 15KVA

OUTPUT VOLTAGE: Adjustable 0-125 Volts; full power available at output of 110-125 Volts.

MODEL	OUTPUT POWER—VA	INPUT	*DIMENSIONS H x W x D	WT. APPROX. LBS.
N500A	500	115V, 1φ 47-65 Hz	8¾ 19 21	175
N750B	750	115V, 1φ 47-65 Hz	8¾ 19 21	180
N750A	750	208/230V, 3φ, 47-65 Hz	14 19 20½	260
N1000A	1,000	208/230V, 3φ, 57-65 Hz	14 19 20½	270
N1500A	1,500	208/230V, 3φ, 57-65 Hz	22¾ 19 17	315
N2000A	2,000	208/230V, 3φ, 57-65 Hz	22¾ 19 17	325
N5000A	5,000	208/230V, 3φ, 57-65 Hz	51 24 24	850
N15000A	15,000	208/230V, 3φ, 57-65 Hz	47 68 24	1600

* 500VA to 2000VA units are standard rack mount models. Add ¾″ to height if bench adapters are included. 5000VA and 15000VA units are cabinet models. Model N5000A includes casters.



MODEL N1000A
With SG-17A Plug-in Oscillator

NA Series Oscillators***

	OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.001%
		MODEL #			
Fixed	400 Hz	SG-14A	SG-14B	SG-14E	SG-14G
Fixed	800 Hz	SG-18A	SG-18B	SG-18E	SG-18G
Fixed	60 Hz	SG-12A	SG-12B	SG-12E	Special
Fixed	50 Hz	SG-11A	SG-11B	SG-11E	Order
	Selectable 50/60/400/800 Hz	SG-19A	SG-19B	X	X
Adjustable	350-450 Hz	SG-15A	SB-15B	X	X
Adjustable	45-70 Hz	SG-13A	SG-13B	X	X
Adjustable	300-2,000 Hz	SG-16A	SG-16B	X	X
Adjustable	45-6,000 Hz	SG-17A	X	X	X
	45-6,000 Hz	EXTERNAL SIGNAL ADAPTER Model SA-2			

***All Plug-in-Oscillators are provided with a jack for external signal drive.

- **Fixed or Adjustable Output Frequencies between 45 & 6000 Hz**
- **Each model can be operated either as a precision AC Power Supply or as Regulated Audio Power Amplifier**
- **Minimum package sizes . . . 2000 VA in 22¾″ rack height, 750 VA in 8¾″ rack height**
- **Instantaneous Overload Protection**
- **Interchangeable Plug-in Oscillators Frequency Stabilities to 0.001%**
- **Constant Voltage Output, 0.5% regulation — response time less than 50 microseconds**
- **Low Distortion Sinewave Output, less than 1% 300 to 1000 Hz, less than 3% 45 to 6000 Hz**
- **Full Rated Output into Load Power Factors of 0.7 Lead or Lag to Unity**

Write or Call for Complete Specifications

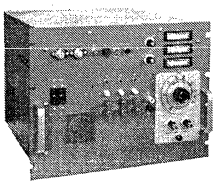
CML MACARR, INC.

167 National Road, Edison, New Jersey 08817 / (201) 287-2810 • TWX 710-998-0560 • FMC 00062

CML MACARR, INC. three phase AC power supplies

- **Minimum Package Sizes** . . . 2500 VA in 14" rack height.
- **Interchangeable Plug-in Oscillators** . . . 23 standard oscillators are available—to provide fixed or adjustable output frequencies between 45 and 6,000 Hz and stabilities to ±0.001%.
- **Instantaneous Overload Protection** . . . An overload of any one phase causes complete output shutdown, protecting 3 phase load.
- **Dual Output Voltage for △ or Y Loads** . . . Adjustable voltages 0-125 volts line-to-line as well as 0-217 volts line-to-line are presented at output terminals; output is isolated for maximum versatility.
- **Constant Voltage Output** . . . 0.5% regulation for no load to full load change.
- **Response time less than 50 microseconds.**
- **Output Voltage** unaffected by unbalanced loads.

TA series 300VA to 20KVA



Model T2500A with SG-36B oscillator

Three Phase Amplifiers

MODEL	3φ OUTPUT POWER—VA	INPUT	DIMENSIONS H x W x D			WT. APPROX. LBS.
T300B	300	115V, 1φ, 47-65 Hz	12¼	19	20	180
T500B	500	115V, 1φ, 47-65 Hz	12¼	19	20	190
T750A	750	208/230V, 3φ, 47-65 Hz	14	19	20½	275
T1200A	1,200	208/230V, 3φ, 57-65 Hz	14	19	20½	285
T1750A	1,750	208/230V, 3φ, 47-65 Hz	14	19	20½	365
T1750B	1,750	208/230V, 3φ, 57-65 Hz	14	19	20½	355
T2500A	2,500	208/230V, 3φ, 47-65 Hz	14	19	20½	365
T2500B	2,500	208/230V, 3φ, 57-65 Hz	14	19	20½	355
T5000A	5,000	208/230V, 3φ, 47-65 Hz	45	24	24	950
T15000A	15,000	208/230V, 3φ, 57-65 Hz	78	35	36	1700
T20000A	20,000	208/230V, 3φ, 57-65 Hz	78	35	36	1900

Single Phase & Two Phase Output

Standard 3 phase amplifiers may be used to provide a 2 phase output at ⅔ of rated output power. Special plug-in oscillators are available with selectable 90° or 120° phase separation for 2 phases or 3 phase operation respectively.
Standard 3 phase amplifiers may be used to provide a single phase output at 57% of rated output power over an adjustable voltage range of 110-125 volts.

Write or Call for Complete Specifications

Specifications

OUTPUT CONFIGURATION: Three Phase, 4 wire wye, neutral floating.

OUTPUT VOLTAGE: 0-125 Volts line-to-line and 0-217 Volts line-to-line; both sets of terminals are presented at output. Full power available at output of 110-125 volts and 190-217 volts. Master gain control and phase 2 and 3 trim controls provided on front panel.

OUTPUT POWER: Rated output power for each model is shown in chart. Maximum power per phase is ⅓ of 3φ output.

LOAD POWER FACTOR: 0.7 lead or lag to unity at rated output; wider power factor range with slight derating.

FREQUENCY RANGE: Each amplifier model is rated at full power 45-6,000 Hz except for the models T15000A and T20000A which have a 300-500 Hz full power range. The operating output frequency range is determined by the particular plug-in oscillator which is used.

HARMONIC DISTORTION: Less than 3% over the entire 45-6,000 Hz amplifier range; less than 1%, 300-1000 Hz.
HUM AND NOISE: 60 db below maximum output voltage.

OUTPUT PHASE SEPARATION: 120 ±1° for fixed frequency models as well as 350-450 Hz models. 120 ±2° for 45-70 and 300-2,000 Hz models. 120 ±3° for 45-6,000 Hz models.

CONSTRUCTION: Models rated 300VA to 2500VA are standard 19" rack mount units with full dust covers. Bench adapters available as accessories for these models; specify suffix (—C). Side support is recommended for rack mount models. Slides are available as optional accessories; specify suffix (—S). 5KVA-20KVA models are furnished complete in cabinet enclosure. 5KVA model includes casters.

Plug-in Oscillators

	3φ OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.001%
		MODEL #			
Fixed	400 Hz	SG-34A	SG-34B	SG-34E	SG-34G
Fixed	800 Hz	SG-38A	SG-38B	SG-38E	SG-38G
Fixed	60 Hz	SG-32A	SG-32B	SG-32E	Special Order
Fixed	50 Hz	SG-31A	SG-31B	SG-31E	Special Order
Adjustable	Selectable 50/60/400/800 Hz	SG-39A	SG-39B	X	X
Adjustable	350-450 Hz	SG-35A	SG-35B	X	X
Adjustable	45-70 Hz	SG-33A	SG-33B	X	X
Adjustable	300-2,000 Hz	SG-36A	SG-36B	X	X
Adjustable	45-6,000 Hz	SG-37A	X	X	X

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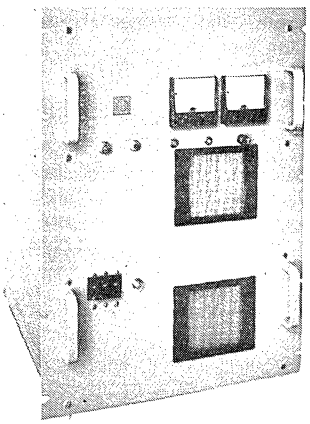
CML MACARR, INC.

solid state frequency converters
105-125 V RMS, 400 Hz single phase output



model CRS-2000A

MODEL	OUTPUT VA	45-65 Hz INPUT SINGLE ϕ VOLTS	DIMENSIONS H x W x D	WEIGHT (APPROX.) LBS.
CRS-50A	50	105-125	3½ x 19 x 14	24
CRS-100A	100	105-125	3½ x 19 x 14	26
CRS-150A	150	105-125	5¼ x 19 x 10	30
CRS-250A	250	105-125	5¼ x 19 x 15	65
CRS-500A	500	105-125	10½ x 19 x 16	88
CRS-1000A	1000	105-125	15¾ x 19 x 16	135
CRS-2000A	2000	200-240V 3ϕ	26¼ x 19 x 20	260

- 50 to 2000 VA — Single Phase Output
- 0.5% Frequency Regulation
- 1% Voltage Regulation
- Harmonic Distortion less than 1% at 400 Hz, less than 3% at 60 Hz
- High Efficiency Switched Mode Operation

solid state DC to AC power inverters

model MNS-100

DRS series 400 Hz

Output: 115 Volts rms. Single Phase.
Input: 22-30 Volts D.C. **Voltage & Frequency Regulation** 0.5%.

MODEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS.(APPROX.)
DRS-50	50	5x11x8	25
DRS-100	100	5x11x8	26
DRS-500	500	8x14x16	70
DRS-1000	1000	14x17x18	160

MNS series 60 Hz

Output: 105/115/125 Volt rms. Single Phase.
Input: 22-30 Volts D.C. **Frequency Regulation: 0.5%.**

MODEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS.(APPROX.)
MNS-50	50	5x11x11	28
MNS-100	100	5x11x11	28
MNS-500	500	8x14x14	80
MNS-1000	1000	14x17x19	162

MRS series 60 Hz

Output: 115 Volts rms. Single Phase.
Input: 22-30 Volts D.C. **Voltage & Frequency Regulation** 0.5%.

MODEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS.(APPROX.)
MRS-1000	1000	14x17x19	175
MRS-2000	2000	17x17x22	300

- 50 to 2000 VA — Single Phase Output
- 0.5% Frequency Regulation
- 0.5% Voltage Regulation (DRS & MRS Series)
- Harmonic Distortion less than 1% at 400 Hz, less than 3% at 60 Hz
- High Efficiency Switched Mode Operation

Write or Call for Complete Specifications

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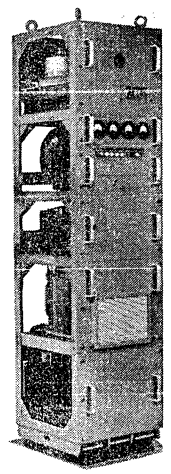
167 National Road, Edison, New Jersey 08817 / (201) 287-2810 • TWX 710-998-0560 • FMC 00062

CML MACARR, INC.

wide band power amplifiers for audio and ultrasonic testing

SPG series 1KVA to 200KVA



MODEL S5K PASSES THROUGH A STANDARD SUBMARINE HATCH

MODEL	OUTPUT POWER KVA	LOAD POWER FACTOR RANGE AT RATED KVA	STANDARD OUTPUT IMPEDANCE TAPS OHMS	DIMENSIONS* H x W x D (APPROX.) INCHES	WEIGHT (APPROX.) LBS.	TYPE OF COOLING
A1K	1	±0.4 to Unity	4/16/36/64/144/576	22¾x19x20½	345	FORCED AIR
A2K	2	±0.4 to Unity	4/16/36/64/144/576	22¾x19x17	400	
S2K	2	±0.4 to Unity	4/16/36/64/144/576	22¾x17x17	400	
A3K	3	±0.1 to Unity	4/16/36/64/144/576	53x27x26	750	
S5K	5	±0.4 to Unity	16/64/256	62x17x17	800	
B5K	5	±0.1 to Unity	8/32/72/128/288/1152	45x24x24	850	
A10K	10	±0.1 to Unity	16/64/144/256/576/2304	47x68x24	1,700	
A20K	20	±0.3 to Unity	16/64/144/256/576	47x68x24	2,100	
VA30K	30	±0.1 to Unity	16/64/144/256/576	72x72x36	3,000	WATER COOLED
VA50K	50	±0.4 to Unity	16/64/144/256/576	72x72x36	4,200	
VA100K	100	±0.1 to Unity	16/64/144/256	2 sections, ea.: 90x72x57	9,400	

*Model A1K and A2K are standard 19" rack mount units; bench adapters available on special order. All other models are furnished complete in cabinet enclosures. Models A3K, S5K and B5K include casters. Models S2K and S5K are designed to go through a 25" standard submarine hatch.

Specifications:

FREQUENCY RESPONSE: ±0.5 db, 100-10,000 Hz; model A3K ±0.5 db 200-15,000 Hz. Other frequency ranges between 5 Hz and 100 KHz available on a custom basis.

HARMONIC DISTORTION: Less than 3% over rated frequency range; less than 1.5% midband.

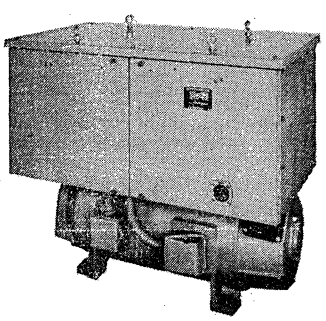
HUM & NOISE: At least 60 db below rated tap voltage.

- Full power into reactive loads.
- Low distortion.
- ±0.5 db frequency response.
- Ideal for CW and PULSED duty.
- Selectable output taps for matching wide range of load impedances.
- Rugged construction for marine or airborne installations.
- Applications: Sonar Testing; Vibration Testing; Industrial Process Control; High Intensity Acoustic Systems.

motor generator controllers 5KW to 200KW commercial and military

Complete Motor-Generator Power Systems Designed by CML-MACARR

- Meets Mil-M-19633, M-19097, M-19160 specifications.
- **Voltage Regulation:** ±0.5% — line and load variations ±2% with full load phase unbalance.
- **Frequency Regulation:** ±0.5% — line and load variation.



MODEL NO.	OUTPUT KW	INPUT	OUTPUT
MG 5004	5 KW	440 VAC, 3φ, 60 Hz	120 VAC, 3φ, 400 Hz, 3 wire
MG 10004	10 KW	440 VAC, 3φ, 60 Hz	120 VAC, 3φ, 400 Hz, 3 wire
MG 15004	15 KW	440 VAC, 3φ, 60 Hz	120 VAC, 3φ, 400 Hz, 3 wire
MG 30004	30 KW	440 VAC, 3φ, 60 Hz	450 VAC, 3φ, 400 Hz, 3 wire
MG 60004	60 KW	440 VAC, 3φ, 60 Hz	450 VAC, 3φ, 400 Hz, 3 wire
MG 100004	100 KW	440 VAC, 3φ, 60 Hz	450 VAC, 3φ, 400 Hz, 3 wire
MG 200004	200 KW	440 VAC, 3φ, 60 Hz	450 VAC, 3φ, 400 Hz, 3 wire
MG 5002 DC	5 KW	115 VDC	120 VAC, 1φ, 60 Hz
MG 15004 DC	15 KW	230 VDC	120 VAC, 3φ, 400 Hz, 4 wire

Write or Call for Complete Specifications

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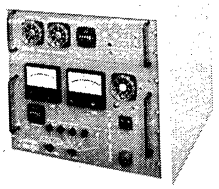
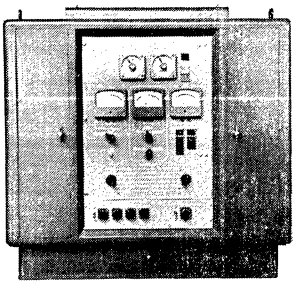
CML MACARR, INC.

battery service and analysis equipment

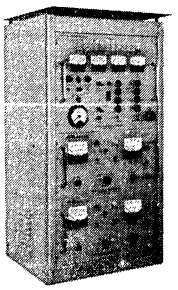
- CHARGER
- BATTERY • DISCHARGER
- ANALYZER



Model 12-30.1-101



Model 505-50



Model 403KA3A

Specifications

Input Power	115/230V, 1ϕ, 60 Hz	230V, 1ϕ, 60 Hz	115V, 1ϕ, 60 Hz
Output Charges	35A @ 35V	50A @ 6V/12V/24V	5A @ 50V per ch.
Output Discharge	35A @ 35V	40A @ 28.5V	45A @ 24V
Charge Channels	1	4	2
Discharge Channels	1	1	1
Type of Charge:			
Constant Current	Yes	No	Yes
Constant Potential	Yes	Yes	Yes
Modified Constant Potential	Yes	Yes	Yes
Pulse Charge	No	Yes	No
Analyzer	Yes	Yes	No
Size H x W x D (Approx.) Inches	21 x 27 x 15¼	42 x 22 x 18	43 x 22 x 18
Weight (Approx.)	225 lbs.	250 lbs.	235 lbs.

INDUSTRIAL BATTERY CHARGERS

Solid State

Input: 115V ± 10% 1ϕ 60 Hz or 224-440V ±10% 3ϕ 60 Hz **Regulation:** ±2% line and load

Charge Output: 12-88V **Mounting:** Standard units — wall / bulkhead mounted

CELLS	MODEL	NO. OF PHASES	OUTPUT AMPS	EST. SHIP. WT. LBS.
6	GBC6-60-1	1	60	240
	GBC6-75-1	1	75	240
	GBC6-90-1	1	90	240
	GBC6-125-1	1	125	275
	GBC6-125-3	3	125	355
	GBC6-175-3	3	175	405
12	GBC12-50-1	1	50	260
	GBC12-75-1	1	75	290
	GBC12-90-1	1	90	295
	GBC12-90-3	3	90	340
	GBC12-105-3	3	105	390
	GBC12-120-3	3	120	390
	GBC12-135-3	3	135	430
	GBC12-175-3	3	175	450

CELLS	MODEL	NO. OF PHASES	OUTPUT AMPS	EST. SHIP. WT. LBS.
18	GBC18-60-1	1	60	320
	GBC18-75-1	1	75	340
	GBC18-75-3	3	75	430
	GBC18-90-1	1	90	340
	GBC18-90-3	3	90	430
	GBC18-120-3	3	120	475
	GBC18-135-3	3	135	510
	GBC18-175-3	3	175	540
	GBC18-210-3	3	210	585
24	GBC24-75-3	3	75	460
	GBC24-120-3	3	120	495
	GBC24-135-3	3	135	540
	GBC24-175-3	3	175	575
36	GBC36-65-3	3	65	510
	GBC36-105-3	3	105	570

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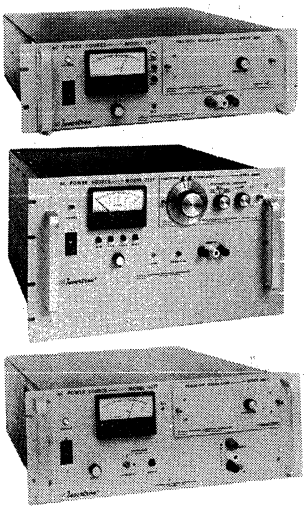
CALIFORNIA INSTRUMENTS

AC POWER SOURCES

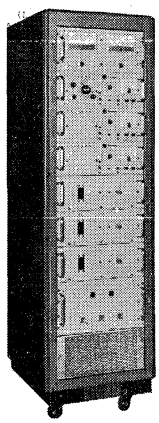


SOLID STATE *Invertron*®

THE MOST RESPECTED NAME IN AC POWER
ALL-SILICON SOLID-STATE POWER SOURCES

FEATURING

- 100 VA TO 6000 VA SINGLE-PHASE OUTPUT
- 100 VA 2ϕ TO 10,000 VA 3ϕ OUTPUT
- FREQUENCY RESPONSES FROM 45Hz TO 20KHz
- SINE-WAVE WITH LOW HARMONIC DISTORTION
- EXCELLENT LINE AND LOAD REGULATION TO .01%
- SWITCHABLE OUTPUT VOLTAGE RANGES FOR FULL POWER AT LOWER VOLTAGES
- BROAD CHOICE OF INTERCHANGEABLE PLUG-IN OSCILLATORS
- OVERLOAD AND SHORT-CIRCUIT PROTECTION
- OPTIONAL INPUT VOLTAGES: 117 V 1ϕ TO 460 V 3ϕ



Invertrons® have earned world-wide respect through their versatility, reliability, and outstanding performance. In addition to low distortion, high input stability and high power density, these silicon solid-state AC power sources use plug-in oscillators as frequency-determining elements and can be stacked electrically to provide one-, two-, or three-phase power. All Invertrons® fit a standard 19″ rack, or may be ordered with the appropriate cabinet for floor or bench use.

Output Power	ϕ*	Standard Output Voltage Ranges**	Frequency Range	Model Number
100VA	1	0-135 L to N	45Hz-10KHz	101T
100VA	2	0-30, 52, 130, 255 L-L	45Hz-20KHz	152T
150VA	3	0-30, 52, 130, 255 L-L	45Hz-20KHz	153T
200VA	2	0-135 L to N	45Hz-10KHz	200T/2-2
200VA	3D	0-135 L to N	45Hz-10KHz	200T/2-3D
250VA	1	0-30, 75, 135 L to N	45Hz-20KHz	251T
300VA	3	0-135 L to N	45Hz-10KHz	300T/3-3
500VA	1	0-30, 75, 130, 260 L-N	45Hz-10KHz	501T
500VA	2	0-30, 75, 135 L to N	45Hz-20KHz	500T/2-2
500VA	3D	0-30, 75, 135 L to N	45Hz-20KHz	500T/2-3D
500VA	3	0-30, 52, 130, 225 L-L	45Hz-10KHz	503T
750VA	1	0-30, 75, 130, 260 L-N	45Hz-10KHz	751T
1000VA	1	0-30, 75, 135, 270 L-N	45Hz-10KHz	1001T
1000VA	2	0-30, 75, 130, 260 L-N	45Hz-10KHz	1000T/2-2
1000VA	3D	0-30, 75, 130, 260 L-N	45Hz-10KHz	1000T/2-3D
1200VA	1	0-30, 75, 135, 270 L-N	45Hz-10KHz	1201T
1500VA	2	0-30, 75, 130, 260 L-N	45Hz-10KHz	1500T/2-2
1500VA	3D	0-30, 75, 130, 260 L-N	45Hz-10KHz	1500T/2-3D
1500VA	3	0-30, 75, 130, 260 L-N	45Hz-10KHz	1500T/3-3
1500VA	3	0-75, 135 L-N, 0-115, 208 L to L	45Hz- 5KHz	1503T

Output Power	ϕ*	Standard Output Voltage Ranges**	Frequency Range	Model Number
1750VA	3	0-75, 135 L-N, 0-115, 208 L to L	45Hz- 5KHz	1753T
2000VA	1	0-135 L to N	45Hz-10KHz	2000T/2-1
2000VA	2	0-135 L to N	45Hz-10KHz	2000T/2-2
2000VA	3D	0-135 L to N	45Hz-10KHz	2000T/2-3D
2400VA	1	0-135 L to N	45Hz-10KHz	2400T/2-1
2400VA	2	0-135 L to N	45Hz-10KHz	2400T/2-2
2400VA	3D	0-135 L to N	45Hz-10KHz	2400T/2-3D
3000VA	3	0-30, 75, 135, 270 L-N	45Hz-10KHz	3000T/3-3
3600VA	3	0-30, 75, 135, 270 L-N	45Hz-10KHz	3600T/3-3
5000VA	1	0-135 L to N	45Hz- 2KHz	5000T/5-1
6000VA	1	0-135 L to N	45Hz- 2KHz	6000T/5-1
6000VA	3	0-135 L to N	45Hz- 2KHz	6000T/6-3
7200VA	1	0-135 L to N	45Hz- 2KHz	7200T/6-1
7200VA	3	0-135 L to N	45Hz- 2KHz	7200T/6-3
9000VA	3	0-135 L to N	45Hz- 2KHz	9000T/9-3
10,800VA	3	0-135 L to N	45Hz- 2KHz	10800T/9-3

*Models designated "D" are open delta configuration; all others 4-wire wye.
**Other output ranges available on special order.

REMOTE-PROGRAMMABLE INVERTRONS®

Solid state Invertrons® combined with 830T-Series Programmable Oscillators provide the most advanced programmable AC power sources available on the market today. 830T-Series Programmable Oscillators feature simultaneous and independent programming of frequency, phase, and amplitude compatible with remote controllers such as a computer, punched tape, cards, etc. Models are available in single, two or three phase.

CALIFORNIA INSTRUMENTS COMPANY
A Division of Aiken Industries, Inc.
5150 Convoy Street • San Diego, California 92111 • (714) 279-8620 • Telex: 695047
Representatives in principal cities throughout the world.

SEE Vol.1•409 IN SECTION 2900 FOR OTHER CALIFORIIA INSTRUMENTS PRODUCTS

CALIFORNIA INSTRUMENTS

OSCILLATORS AC LINE CORRECTORS

800T-SERIES PLUG-IN OSCILLATORS

Companion Plug-in Oscillators are available in three types: (A) General-purpose, fixed-frequency; (B) Crystal-controlled, high-stability fixed-frequency; and (C) Continuously variable frequencies. All may be used with the Solid-State Invertrons® to create 1ϕ, 2ϕ, or 3ϕ custom AC power sources tailored to exact requirements. The fixed-frequency oscillators may be ordered with a servo-feedback option for systems requiring extremely high amplitude stabilities and accuracies. This feature provides overall regulation of up to 0.01% against line and load changes.

800T VARIABLE-FREQUENCY MODELS

Freq. Range	Freq. Accy. @ 25°C	Model Number
20Hz to 20KHz in three bands	±1.0%	(1ϕ) 800T-20/20K-1-1 (2ϕ) 800T-20/20K-1-2 (3ϕ) 800T-20/20K-1-3 (3ϕ) 800T-20/20K-1-3D
45Hz to 75Hz in one band	±0.25%	(1ϕ) 800T-45/75-.25-1 (2ϕ) 800T-45/75-.25-2 (3ϕ) 800T-45/75-.25-3 (3ϕ) 800T-45/75-.25-3D
300Hz to 500Hz in one band	±0.25%	(1ϕ) 800T-300/500-.25-1 (2ϕ) 800T-300/500-.25-2 (3ϕ) 800T-300/500-.25-3 (3ϕ) 800T-300/500-.25-3D

810T FIXED-FREQUENCY GENERAL-PURPOSE MODELS

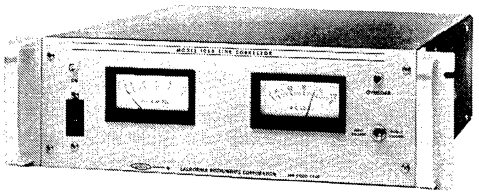
Any Single Freq. 45Hz to 10KHz	±0.1%	(1ϕ) 810T-Freq.-1.1 (2ϕ) 810T-Freq.-.1-2 (3ϕ) 810T-Freq.-.1-3 (3ϕ) 810T-Freq.-.1-3D
Any Single Freq. 45Hz to 10KHz	±0.1%	(1ϕ only) System-Servo oscillator with servo feedback set to maintain power source output at 115 VAC. Provides 0.01% line and load regulation from power source.
Any Single Freq. 45Hz to 10KHz	±0.1%	(1ϕ only) System-Servo oscillator with servo feedback adjustable to produce power source output of 105 to 135 VAC. Provides 0.01% line and load regulation from power source.

820T FIXED-FREQUENCY CRYSTAL-CONTROLLED MODELS

400Hz	±0.01%	(1ϕ) 820T-400-.01-1 (2ϕ) 820T-400-.01-2 (3ϕ) 820T-400-.0001-3
400Hz	±0.0001%	(1ϕ) 820T-400-.01-1 (2ϕ) 820T-400-.0001-2 (3ϕ) 820T-400-.0001-3
Any Single Freq. 45Hz to 10KHz	±0.01%	(1ϕ) 820T-Freq.-.01-1 (2ϕ) 820T-Freq.-.01-2 (3ϕ) 820T-Freq.-.01-3 (3ϕ) 820T-Freq.-.01-3D
Any Single Freq. 45Hz to 10KHz	±0.0001%	(1ϕ) 820T-Freq.-.0001-1 (2ϕ) 820T-Freq.-.0001-2 (3ϕ) 820T-Freq.-.0001-3 (3ϕ) 820T-Freq.-.0001-3D

SERIES 1000 DYNAMIC AC LINE CORRECTORS

For Precision AC Power Independent of Powerline Disturbances



- PEAK INSTANTANEOUS POWER TO FIVE TIMES RATING
- 3.5-TO-1 CREST FACTOR
- REDUCES 500 VOLT 10 μSEC TRANSIENTS BY 100-TO-1
- PURE SINE WAVE POWER
- HARMONIC DISTORTION REDUCTION OF 50:1
- SUPER REGULATION
  LINE — 0.025%
  LOAD — 0.025%
- PEAK AMPLITUDE STABILITY: ±0.01% CYCLE-TO-CYCLE
- IMPULSE SETTLING TIME LESS THAN 50 MICROSECONDS
- PEAK AMPLITUDE INSTABILITY LESS THAN 0.01%
- LOW OUTPUT TEMPERATURE COEFFICIENT — 0.005%/°C
- 100 DB COMMON MODE ISOLATION
- HIGH STABILITY — 0.05%/24 HOURS
- AUTOMATICALLY RECOVERS FROM OVERLOAD IN LESS THAN ONE CYCLE
- SIMULTANEOUS MONITORING OF VOLTAGE AND CURRENT OUTPUT
- SELF-CONTAINED AIR COOLING
- ALL-SILICON SOLID STATE

115 VOLT OUTPUT MODELS

Model	Input Voltage Range	Freq. Hz	Output Power (VA) Continuous	Output Power (VA) Max. Inst. Peak	Exact Output Volts
1040 1050 1060	95-115, 105-125, 115-135 (selectable by tap switch)	380-420 47-53 57-63	1000	5000	115V RMS ±0.15% Setable to 0.01% (±0.25% 400Hz Models)
1340 1350 1360		380-420 47-53 57-63	3000	15,000	
1361	180-264 in three ranges	57-63			

230 VOLT OUTPUT MODELS

1052 1062	180-220, 198-244, 216-264 (selectable by tap switch)	47-53 57-63	1000	5000	220,230 or 240V RMS ±0.15% Setable to 0.01% (Single Output voltage only; specify on order)
1352 1362		47-53 57-63	3000	15,000	

*At power factors of 1.0 to ±0.7.

MECHANICAL

	1000 VA Models	3000 VA Models
Dimensions:	19" x 5¼"H x 17½"D	19"W x 14"H x 20¼"D
Net Wt.:	55 lbs.	175 lbs.
Shipping Wt.:	70 lbs.	235 lbs.

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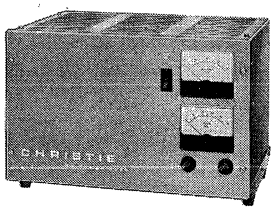
CHRISTIE GENERAL PURPOSE HIGH CURRENT DC POWER SUPPLIES

1-PHASE

SCO (SCR)

- **0.25% Voltage Regulation**
- **25 msec Response Time**
- **1% rms Ripple**
- **Wide Voltage Range**

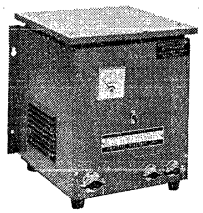


Volts	Amps	Model No.
2-15	0-100	SCO15-100-12S
2-37	0-50	SCO36-50-12S
2-48	0-40	SCO48-40-12S

1-PHASE

LRG (MAGNETIC)

- **Low Cost**
- **1% Line Regulation**
- **High Power Factor**

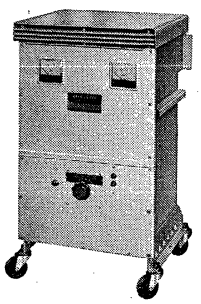


Volts	Amps	Model No.
12	50	LRG1250-01U-S
24	25	LRG2425-01U-S
	50	LRG2450-01U-S
48	25	LRG4825-01U-S
120	10	LRG12010-01U-S

3-PHASE

A (UNREGULATED)

- **1% rms Ripple**

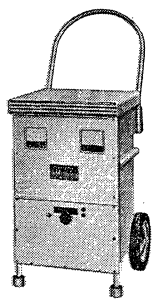


Volts	Amps	Model No.
120	0-20	MH120-20A2S
	0-40	MH120-40A2S
	0-60	MH120-60A2S
	0-80	MH120-80A2S
	0-125	MH120-125A2S
	0-200	H120-200A4S
	0-400	1C120-400A4S
120/240	0-200	1C240-200A4S

3-PHASE

RA (RECTODYNE)

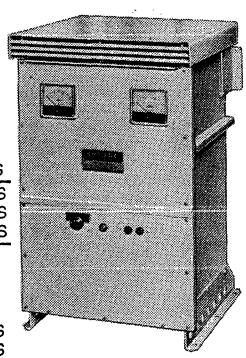
- **Most Economical**
- **2% Load Regulation**
- **1% rms Ripple**
- **600% Intermittent Current Rating**
- **Mobile**



Volts	Amps	Model No.
12/24	0-50	QRA24-50
28	0-100	MH28-100RA2M
	0-200	MH28-200RA2M
	0-300	MH28-300RA2M
	0-400	MH28-400RA2M
	0-600	MH28-600RA2M
	0-1000	MH28-1000TJA2M

K (MAGAMP)

- **0.25% Voltage Regulation**
- **50 msec Response Time**
- **1% rms Ripple**
- **6v Dynamic Reg.**
- **500% Intermittent Current Rating**



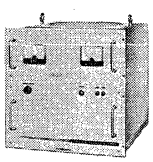
Volts	Amps	Model No.
12-15	0-1000	1C15-1000K4S
22-32	0-100	MH32-100K24S
	0-200	MH32-200K24S
	0-300	MH32-300K24S
26-36	0-400	1C36-400K4S
	0-500	1C36-500K4S
	0-600	1C36-600K4S
	0-800	2C36-800K4S
	0-1000	2C36-1000K4S
	0-1200	2C36-1200K4S
26-32	0-1500	2C32-1500K4S
110-135	0-40	MH135-40K2S
	0-60	MH135-60K2S
	0-100	1C135-100K4S
	0-200	1C135-200K4S
	0-300	2C135-300K4S
220-280	0-100	2C260-100K4S

This scale charts economy against sophistication. The darker the scale, the more sophisticated; the lighter, the more economical.

EE & M (SCR)

EE (SCR)
- **Precision Power**
- **0.1% Voltage Reg.**
- **0.1 to 0.01% Cur. Reg.**
- **0.1% rms Ripple**

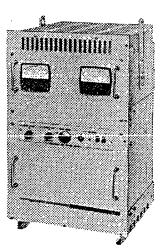
M (SCR)
- **Economical**
- **0.1% Volt. and Current Regulation**
- **1% rms Ripple**



Volts	Amps	EE Model No.	Amps	M Model No.
0-40	0-150	1R040-150EE24S	0-125	1R040-125M02-S
	0-300	3R040-300EE24S	0-250	1R040-250M02-S
	0-600	3R040-600EE24S	0-500	3R040-500M04-S
0-80			0-125	3R080-125M02-S
0-135	0-150	1CO135-150EE4S	0-75	3R0135-75M02-S
	0-300	2CO135-300EE4S		

KKGG (TRANSISTOR)

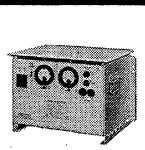
- **Ultra - Precision Power**
- **0.01% Voltage Regulation**
- **50 microsec Response Time**
- **1 mv rms Ripple**



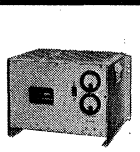
Volts	Amps	Model No.
15-36	0-100	MH36-100KKGG24L
	0-200	MH36-200KKGG24L
26-36	0-400	2C36-400KGG24S
	0-600	2C36-600KGG24S

CHRISTIE MILITARY POWER SUPPLIES AND BATTERY CHARGERS

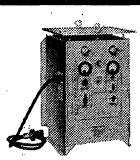
Typical Special Army, Navy, Air Force, A.E.C. and NASA Units



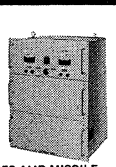
30 AMP AUTOMATIC BATTERY CHARGER



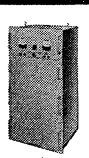
50 AMP RADIO POWER



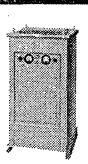
75 AMP MISSILE TESTING SUPPLY



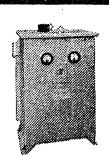
250 AMP MISSILE GROUND POWER



500 AMP MISSILE GROUND POWER



HELICOPTER STARTING POWER SUPPLY



175 AMP FORKLIFT TRUCK CHARGER

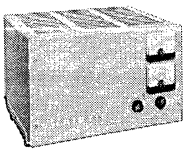
SINCE 1929
CHRISTIE ELECTRIC CORP.

DC POWER SUPPLIES
BATTERY CHARGERS AND TESTERS
ELECTRO-OPTICAL SYSTEMS

BATTERY CHARGERS CHRISTIE

REV FOR LEAD–ACID

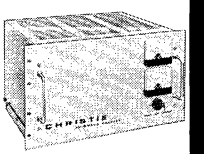
- 0.25% Voltage Regulation
- Emergency Stand-By Float Service
- General Purpose Charging



Nom. DC Volts	Rated DC Amps	Basic Model No.	1-Ph or 3-Ph
6/12/24	25	BCA30-25-01-S	1-Ph
	50	BCA30-50-12-S	1-Ph
	150	2FCB30-150-02-S	3-Ph
36/40/48	12	BCA50-12-01-S	1-Ph
	25	BCA50-25-12-S	1-Ph
	50	FCA50-50-02-S	1-Ph
	60	1FCB50-60-02-S	3-Ph
	130	1FCB50-130-02-S	3-Ph
120	12	BCA126-12-12-S	1-Ph
	25	FCA126-25-02-S	1-Ph
	30	1FCB126-30-02-S	3-Ph
	50	1FCA126-50-02-S	1-Ph
	60	1FCB126-60-02-S	3-Ph
	100	2FCB126-100-02-S	3-Ph

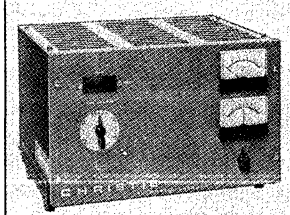
REV FOR SILVER–ZINC

- 0.25% Regulation
- 0.5% Accurate voltage controlled shutoff



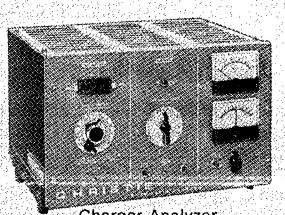
Nom. DC Volts	Rated DC Amps	Basic Model No.	1-Ph or 3-Ph
6/12/24	25	BCA30-25-01H-S	1-Ph
	50	BCA30-50-12H-S	1-Ph
	150	2FCB30-150-02H-S	3-Ph
36/40/48	12	BCA50-12-01H-S	1-Ph
	25	BCA50-25-12H-S	1-Ph
	50	FCA50-50-02H-S	1-Ph
	60	1FCB50-60-02H-S	3-Ph
	130	1FCB50-130-02H-S	3-Ph
120	12	BCA126-12-12H-S	1-Ph
	25	FCA126-25-02H-S	1-Ph
	30	1FCB126-30-02H-S	3-Ph
	50	1FCA126-50-02H-S	1-Ph
	60	1FCB126-60-02H-S	3-Ph
	100	2FCB126-100-02H-S	3-Ph

REFLEX FOR NICKEL-CADMIUM AN ENTIRELY NEW & UNIQUE PRINCIPLE • 1-HOUR CHARGING



Revolutionizes battery charging of nickel-cadmium batteries —

- **Complete** (to higher than rated capacity) automatic recharge in only ½ to 1 hour.
- Virtually eliminates battery "memory"
- 95% charging efficiency, therefore virtually no battery heating or gassing.

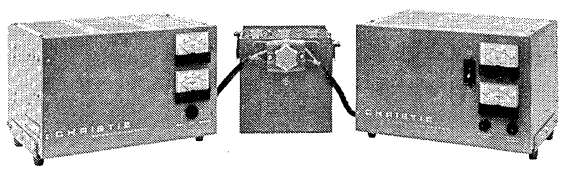


Charger-Analyzer
Model BCA30-80-12ABBDU6-S

3 Choices in Various Ratings —

- **CHARGER-ANALYZER:** Automatically programmed charge-discharge-charge cycle to charge battery and test its capacity. "GO"-"NO/GO" as well as ampere-hour readout.
- **CHARGER ONLY:** Same unit without analyzer.
- **ANALYZER ONLY:** Same discharge tester as above — continuously variable, constant current regulated.

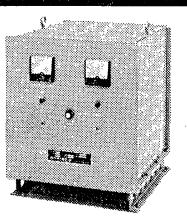
CHRISTIE UNINTERRUPTABLE POWER SYSTEMS STATIC INVERTERS



UNINTERRUPTIBLE POWER SYSTEMS provide AC current to a critical load in event of a commercial power failure. They consist of a battery charger (shown at top of page), battery, and inverter (shown to the right).

INVERTERS

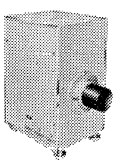
- **Sine Wave or Quasi-Sine Wave**
- **2% Voltage Regulation**
- **1% Frequency Regulation**
- **Static Synchronous Switch (optional)**



OUTPUT	NOMINAL OUTPUT VOLTAGE	MODEL	NOMINAL INPUT
0.5 KVA	115 vac, 1-phase, 60 Hz	1RIA120-05-24-S	24 volts DC
1.0 KVA	115 vac, 1-phase, 60 Hz	1RIA120-10-24-S	24 volts DC
2.0 KVA	115 vac, 1-phase, 60 Hz	3RIA120-20-24-S	24 volts DC
3.0 KVA	115 vac, 1-phase, 60 Hz	3RIA120-30-48-S	48 volts DC

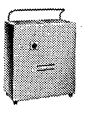
CHRISTIE XENOLITE® ELECTRO-OPTICAL SYSTEMS

XENON & MERCURY High intensity light applications for science and industry — daylight, infrared, ultraviolet.



LAMPHOUSES
XENOLITE LAMPHOUSES, from 300 to 4000 watts, for horizontal and vertical bulbs.

BULBS
Horizontal and vertical short arc xenon bulbs up to 4000 watts. Short arc, high-pressure mercury bulbs up to 1000 watts.



POWER SUPPLIES
XENOLITE POWER SUPPLIES assure reliable lamp starting, longer lamp life, a more stable arc and greater dependability.

IGNITERS
XENOLITE IGNITERS feature automation, dependable ignition, safety, longer lamp life, power supply protection.

FILM PROJECTION EQUIPMENT Audio-visual and theatre: up to 7 times more light with XENOLITE slide and motion picture projectors.

3404A WEST 67TH STREET,
LOS ANGELES, CALIFORNIA 90060
PHONE: (213) 750-1151 • TWX: 910-321-3867

SINCE 1929
CHRISTIE ELECTRIC CORP.

ONLY COMPUMOD OFFERS 2420 STANDARD DC/DC CONVERTERS

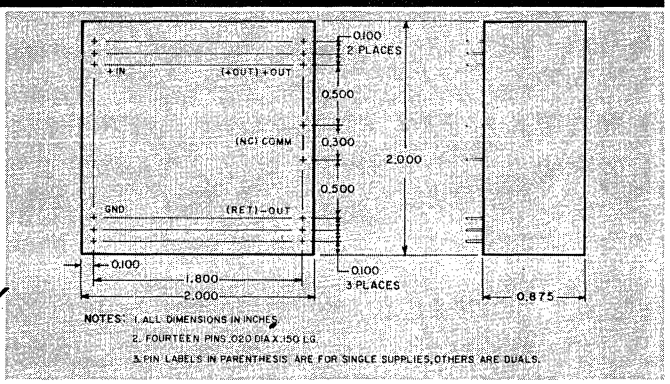
INPUT VOLTAGE ..... 5 – 28Vdc
OUTPUT VOLTAGE ..... 5 – ±30Vdc
OUTPUT CURRENT ..... .015 – 2A
OUTPUT POWER ..... .9 – 10W
VOLUME ..... 1.2 – 10.9 in³
LOW PRICE (1-9) ..... $32 – $119

Send for complete details or see our standard line of DC/DC converters in **EEM** — Vol. IV, pages 452 and 453

PREMIUM SERIES "50C" CONVERTERS

From **$89** (1-9)

EFFICIENCY to 60%



FEATURES

- HIGHLY REGULATED FLOATING OUTPUTS
- SHORT CIRCUIT PROTECTION
- HIGH EFFICIENCY
- REVERSE VOLTAGE PROTECTION
- GOLD PLATED PINS ON 0.100" CENTERS ALLOW DIRECT INSERTION INTO STANDARD LOGIC PANELS
- 0.875" x 2" x 2" METAL CASE PERMITS MOUNTING ON P.C. CARDS WITH 1.0" SEPARATION
- π – SECTION INPUT FILTER PREVENTS DISRUPTIVE TRANSIENTS
- NO TEMPERATURE DERATING
- HIGH PERFORMANCE TRACKING OF DUAL SUPPLIES

SPECIFICATIONS

OUTPUT VOLTAGE: Factory set to ± 1% accuracy
OUTPUT LOAD REGULATION: 0.02% NL to FL nominal (see table)
OUTPUT LINE REGULATION: 0.02% LL to HL nominal (see table)
OPERATING TEMPERATURE RANGE: $-25^{o}C$ to $+71^{o}C$
STORAGE TEMPERATURE RANGE: $-55^{o}C$ to $+85^{o}C$
TEMPERATURE COEFFICIENT: 100 ppm/^{o}C typ, 200 ppm/^{o}C max
DIFFERENTIAL TRACKING: 10 ppm/^{o}C typ, (duals only)
INPUT-OUTPUT ISOLATION: 300 Vdc min, 10^{8} Ω min
REFLECTED INPUT RIPPLE: 1% of E_{in} max
OSCILLATOR FREQUENCY: 3 KHz
SHORT CIRCUIT CURRENT: 150% of FL current max
EFFICIENCY: 50%-60% min at nom line and full load (see table)

Select input requirement (Center Table) and output requirement (Outside Tables). Join Prefix with Suffix.
EXAMPLE: Model 50C12-5S1000 represents 5.OW unit having 12 Vdc input and 5 Vdc @ 1000 mA outputs.

SINGLE OUTPUT MODELS

MODEL SUFFIX	OUTPUT Vdc	OUTPUT mA	REGULATION mV Load	REGULATION mV Line	NOISE mV rms	PRICE 1-9
5S1000	5	1000	3	1	1	$89
6S800	6	800	3	1	1	$89
9S550	9	550	3	1	1	$89
10S500	10	500	3	1	1	$89
12S420	12	420	3	1	1	$89
15S330	15	330	3	1	1	$89
18S280	18	280	4	2	2	$89
20S250	20	250	4	2	2	$89
24S210	24	210	5	2	2	$89
28S180	28	180	6	2	2	$89
30S165	30	165	6	2	2	$89

INPUTS

MODEL PREFIX	INPUT VOLTAGE and CURRENT nom	Vdc min	Vdc max	mA NL	mA FL	EFF. %
50C5	5	4.5	5.5	200	2000	50
50C6	6	5.4	7.5	165	1670	50
50C8	8	7.2	10.0	125	1250	50
50C10	10	9.0	12.5	100	910	55
50C11	11	9.7	13.7	90	825	55
50C12	12	10.8	15.0	80	760	55
50C15	15	13.5	18.7	65	605	55
50C18	18	16.2	22.5	55	505	55
50C20	20	18	25	50	420	60
50C24	24	21.6	30	40	350	60
50C28	28	25.2	35	35	300	60

DUAL OUTPUT MODELS

MODEL SUFFIX	OUTPUT Vdc	OUTPUT mA	REGULATION mV Load	REGULATION mV Line	NOISE mV rms	PRICE 1-9
5D500	± 5	500	3	1	1	$95
6D400	± 6	400	3	1	1	$95
9D275	± 9	275	3	1	1	$89
10D250	±10	250	3	1	1	$89
12D210	±12	210	3	1	1	$89
15D165	±15	165	3	1	1	$89
18D140	±18	140	4	2	2	$89
20D125	±20	125	4	2	2	$89
24D105	±24	105	5	2	2	$89
28D90	±28	90	6	2	2	$89
30D85	±30	85	6	2	2	$89

For current source data and local representatives **DIAL EEM** toll free — (800) 645-9200 (in New York State call collect 516-294-0990)

COMPUMOD INC.
306 RIVER STREET ■ HAVERHILL, MASSACHUSETTS 01830
TELEPHONE (617) 374-0541

MINIATURE P.C. CARD MOUNTED POWER MODULES

FAMOUS SINGLES MODULES

Part No.	Voltage	Current	Case Size	Maximum Regulation Line	Maximum Regulation Load	Ripple & Noise	List* Price
PM544	3.6 volts	250mA	2	±0.05%	±0.05%	0.5V RMS	$40.00
PM508	5.0 volts	125mA	2	±0.05%	±0.05%	0.5V RMS	$30.00
PM522	6.0 volts	200mA	2	±0.05%	±0.05%	0.5mV RMS	$40.00
PM587	10.0 volts	120mA	1	±0.02%	±0.02%	0.5mV RMS	$25.00
PM563	12.0 volts	100mA	1	±0.02%	±0.02%	0.5mV RMS	$25.00
PM576	15.0 volts	100mA	1	±0.02%	±0.02%	0.5mV RMS	$25.00
PM560	18.0 volts	65mA	1	±0.02%	±0.02%	1.0mV RMS	$25.00
PM574	20.0 volts	60mA	1	±0.02%	±0.02%	1.0mV RMS	$25.00
PM585	24.0 volts	50mA	1	±0.02%	±0.02%	1.0mV RMS	$25.00
PM562	28.0 volts	40mA	1	±0.02%	±0.02%	1.0mV RMS	$25.00

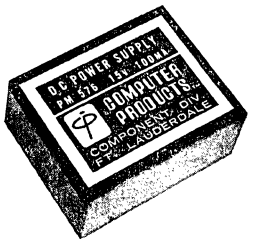
DUAL POWER MODULES

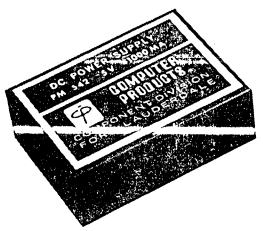
PM537	±12.0 volts	240mA	4	±0.02%	±0.02%	0.5mV RMS	$65.00
PM536	±12.0 volts	120mA	3	±0.02%	±0.02%	0.5mV RMS	$45.00
PM526	±12.0 volts	100mA	5	±0.02%	±0.02%	0.5mV RMS	$50.00
PM565	±15.0 volts	200mA	4	±0.02%	±0.02%	0.5mV RMS	$65.00
PM559	±15.0 volts	200mA	6	±0.02%	±0.02%	0.5mV RMS	$65.00
PM505	±15.0 volts	100mA	3	±0.02%	±0.02%	0.5mV RMS	$45.00
PM502	±15.0 volts	100mA	4	±0.02%	±0.02%	0.5mV RMS	$48.00
PM552	±15.0 volts	100mA	5	±0.02%	±0.02%	0.5mV RMS	$50.00
PM553	±15.0 volts	65mA	3	±0.02%	±0.02%	0.5mV RMS	$42.00
PM538	±15.0 volts	25mA	3	±0.2%	±0.2%	2.0mV RMS	$28.00

LOGIC POWER MODULES

PM532	5.0 volts	1000mA	6	±0.02%	±0.04%	1.0mV RMS	$65.00
PM542	5.0 volts	1000mA	4	±0.02%	±0.04%	1.0mV RMS	$65.00
PM534	5.0 volts	500mA	3	±0.02%	±0.04%	1.0mV RMS	$45.00
PM524	5.0 volts	500mA	7	±0.02%	±0.04%	1.0mV RMS	$45.00
PM533	5.0 volts	250mA	3	±0.02%	±0.04%	1.0mV RMS	$38.00
PM529	5.0 volts	250mA	2	±0.02%	±0.04%	1.0mV RMS	$35.00

*For higher quantity pricing, consult factory.





STOCKING DISTRIBUTION CENTERS:

Gordon V. Peck Co.	B. J. Wolfe Ent.	Powermart Assoc.	Pen-Stock Inc.
Garland, Texas	N. Hollywood, Cal.	Hartford, Conn.	Las Altos, Cal.
(214) 341-8311	(213) 877-5518	(203) 525-8592	(415) 948-6533

SPECIFICATIONS

Specifications common to all listed power modules include:

OUTPUT SET	±2%
OPERATING TEMPERATURE	−25°C to 71°C**
INPUT VOLTAGE	115±10 VAC
FREQUENCY	50 to 400 Hz
TEMPERATURE COEFFICIENT	0.02% C
INPUT ISOLATION	50 Megohms
IMPEDANCE @ 10KHz	200 Milliohms
STORAGE TEMPERATURE	−25°C to 85°C

**Operation at elevated temperatures may require derating. Consult factory.

OPTIONS

1. 230VAC operation available. Add prefix "E" to model number and $5.00 to unit price.
2. Different voltage and current levels are available on a standard modification basis. Consult factory for price and delivery.
3. The above units are the most popular in our series of over 200 modules.
4. Many units are available with "plug in" octal socket and "bench case" configurations. Consult factory for model, price and delivery.
5. Mating sockets $4.95 each.

SHORT CIRCUIT CAPABILITY

The PM Series power supplies are ruggedly constructed, and designed with the capability of withstanding substantial overload for reasonable periods of time. The output can be shorted without causing damage to the supply. Prolonged operation with the supply overloaded or shorted is not recommended.

WARRANTY

Computer Products PM Series power supplies are warranted against defects in materials and workmanship for a period of two (2) years from date of purchase from Computer Products. Any defective unit will be replaced under the terms of this warranty provided that the unit has not been operated other than in accordance with its specifications and/or has not been mishandled or physically damaged. No other warranty is expressed or implied.

TERMS AND DELIVERY

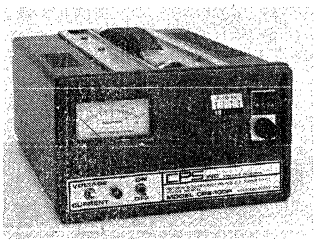
Standard terms are net 30 days. Prices shown are f.o.b. Computer Products, Fort Lauderdale, Florida and are exclusive of any applicable use or sales taxes. Shipment will be made 1 - 5 days after receipt of order.

COMPUTER PRODUCTS®

(305)974-5500 • 1400 NW 70 ST. • FT. LAUDERDALE, FLA. 33307

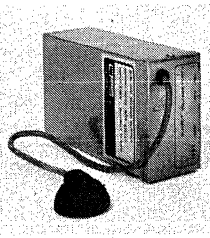
CPS INC.
722 East Evelyn Avenue
Sunnyvale, California 94086
(408) 738-0530, Ext. 26: Sales Dept. — Telex 357450

HIGH VOLTAGE SYSTEM AND BENCH SUPPLIES TO 50 KV DC



MODEL 100P

MODEL 132P



MODEL 4008

MODEL 5001

GENERAL SPECIFICATIONS

OUTPUT — Fixed with ±5% vernier or programmable over any range between 0 and full output by series RPA or alternatively a 0 to 10 V voltage (applicable to series 100 system supplies and series 1000, and 5000).

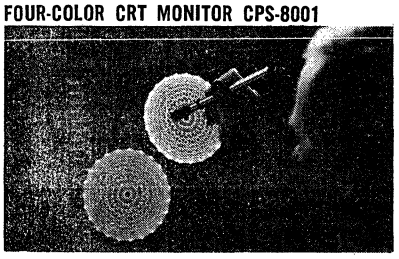
INPUT — 105-125 volts; or 210-230 47-63 Hz (440 Hz most models).

OUTPUT PROTECTION — Completely short-circuit proof. Self restoring after short removal.

TEMPERATURE RANGE — Operating 0°-50°C.

Feature	Specifications Apply Between (kV)	Current (mA)	Load or Line Regulation (%)	Ripple (Volts p-p)	T.C. (ppm/°C)	1 Hour Stability (%)	8-Hour Stability (%)	Size (Inches) Height x Width x Depth	Model	Price
PMT SPECIAL	0.5 - 2	5.0	0.01	.005	100	.01	.02	3.5 x 8.25 x 10.5	5003	$ 199
CRT SPECIAL 3 OUTPUTS (DC INPUT)	10 - 15 0.1 - 1.0 −(.05 - 0.2)	0.2 1.0 1.0	.05/0.1 1.0/0.1 1.0/0.1	15 1 0.2	200 1000 1000		.2 .2 .2	1.9 x 4.0 x 5.5	4008	135
0.001% REGULATION LINE OR LOAD	10 - 20	0.25	0.001	.2	25	.005	.01	4.7 x 4.5 x 9.0	1200	850
	20 - 30	0.125	0.001	.3	25	.005	.01	4.7 x 4.5 x 9.0	1300	1250
	1 - 30	0.25	0.001	.2	25	.005	.01	4.7 x 8.0 x 9.0	135	1350
	1 - 30	0.5	0.001	.2	25	.005	.01	4.7 x 8.0 x 9.0	130	1550
	1 - 30	0.5	0.001	.2	25	.005	.01	4.7 x 8.0 x 12.6	100	1725
	1 - 30	1.0	0.001	.2	25	.005	.01	4.7 x 8.0 x 12.6	100A	1825
	±(1 - 30)	1.0	0.001	.2	25	.005	.01	5.3 x 19.0 x 13.6	100R	2495
	10 - 50	0.5	0.001	.5	25	.005	.01	5.3 x 19.0 x 13.6	131	2550
	10 - 50	0.5	0.001	.5	25	.005	.01	5.3 x 19.0 x 13.6	101	2895
	10 - 50	0.75	0.001	.5	25	.005	.01	5.3 x 19.0 x 13.6	101A	2995
0.01% REGULATION LINE OR LOAD	2 - 5	2.0	0.01	0.5	250	.01	.02	2.7 x 5.5 x 9.0	5001	350
	10 - 20	0.25	0.01	2.0	250	.01	.02	2.7 x 5.5 x 9.0	5001	550
	1 - 30	0.5	0.01	3.0	250	.05	.1	4.7 x 8.0 x 9.0	132	995
	10 - 50	0.5	0.01	5.0	250	.05	.1	5.3 x 19.0 x 13.6	133	1650
SEM & PROBE GUN SUPPLY	1 - 30	0.5		.2	Total Stability for 10 min. is 10 ppm			5.3 x 19.0 x 16.0	6001	3840
	10 - 50	0.5		.5	Total Stability for 10 min. is 10 ppm			5.3 x 19.0 x 16.0	6002	4990
PRECISION STABILITY	20 - 30	0.25	0.0002	.200	10	.002 | .005		4.7 x 8.0 x 9.0	134	1800
	20 - 30	0.5	0.0002	.060	5	.0002% per 10 min.		5.3 x 19.0 x 13.6	136	3900

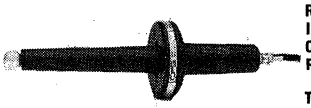
FOUR-COLOR CRT MONITOR CPS-8001



FEATURES

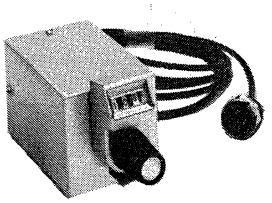
Four colors:	Red, orange, yellow & green
High resolution:	.015" to .025" depending on intensity
High light output:	28 foot lamberts (worst case)
High speed:	1.5 μsec per inch, 15 μsec color change
High contrast faceplate:	HEA coated
Low power dissipation:	High voltage switches are 90% efficient
High reliability:	All solid state
CRT size:	21" diagonal

HIGH VOLTAGE DIVIDER PROBE HVP-250



INPUT .....Up to 50 KV DC
RATIO .....1000:1 50 KV IN = 50 V OUT
INPUT .....250 MΩ
OUTPUT .....250 KΩ
RATIO ACCURACY .....0.01% up to 30 KV, 20-30°C
TEMPERATURE COEFFICIENT....10 PPM/°C
LENGTH .....12 inches
PRICE $395

REMOTE PROGRAMMING ASSEMBLIES



RPA-6: 22 turn panel mounted pot with screwdriver adjustment **$45.00**

RPA-7: Small encased 10 turn pot with digital dial **$150.00**

Prices subject to change.

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

DC to DC Converters

MODEL NUMBERS

REGULATED UNITS WITH CASE

Basic Model No.	Output Pwr. Watts	Case Depth	Mounting
PS 205	3	1.2"	X 1.2
PS 206	10	1.5"	.7 X 1.2
PS 207	20	2.3"	1.5 X 1.2
PS 208	40	3.8"	2.5 X 1.2

UNREGULATED UNITS WITH CASE

Basic Model No.	Input Current	Case Depth	Mounting
PS 210	1.0	1.30	X 1.2
PS 211	2.0	2.00	.7 X 1.2
PS 212	3.0	2.90	1.7 X 1.2

UNREGULATED PC CARDS

Basic Model No.	Input Current	Case Size	Mounting
PS 225	1.0	1.30 X 4	.6"
PS 226	2.0	2.00 X 4	.6"
PS 227	4.0	2.90 X 4	1.7"

All cased units: 1½" wide x 3" high

UNIT PRICE SCHEDULE

	Rectifier	OUTPUT VOLTS 5-9	10-30	31-500	501-1500	1501-3000	3001-6000
PS 205	AC	$165.00	165.00	165.00	165.00		
	FW	189.00	180.00				
	B			180.00	189.00		
	BCT		198.00				
PS 215	VD				198.00	206.00	
	BVD				234.00	243.00	
	VQ						234.00
PS 206	AC	$165.00	165.00	165.00	165.00		
	FW	189.00	180.00				
	B			180.00	189.00		
	BCT		198.00				
PS 216	VD				198.00	206.00	
	BVD				234.00	243.00	
	VQ						234.00
PS 207	AC	$180.00	180.00	180.00	180.00		
	FW	205.00	195.00				
	B			195.00	205.00		
	BCT		215.00				
PS 217	VD				215.00	224.00	
	BVD				253.00	263.00	
	VQ						253.00
PS 208	AC	$190.00	190.00	190.00	190.00		
	FW	220.00	210.00				
	B			210.00	220.00		
	BCT		231.00				
PS 218	VD				231.00	241.00	
	BVD				273.00	283.00	
	VQ						273.00
PS 210	AC	$ 81.00	81.00	81.00	81.00		
	FW	97.00	92.00				
	B			92.00	97.00		
	BCT		101.00				
PS 220	VD				101.00	106.00	
	BVD				120.00	124.00	
	VQ						120.00
PS 211	AC	$ 94.00	94.00	94.00	94.00		
	FW	112.00	107.00				
	B			107.00	112.00		
	BCT		116.00				
PS 221	VD				116.00	123.00	
	BVD				139.00	144.00	
	VQ						139.00
PS 212	AC	$115.00	115.00	115.00	115.00		
	FW	136.00	130.00				
	B			130.00	136.00		
	BCT		142.00				
PS 222	VD				142.00	150.00	
	BVD				169.00	175.00	
	VQ						169.00
PS 225	AC	$ 42.00	42.00	42.00	42.00		
	FW	56.00	53.00				
	B			53.00	56.00		
	BCT		58.00				
	VD				58.00	61.00	
	BVD				69.00	72.00	
	VQ						69.00
PS 226	AC	$ 50.00	50.00	50.00	50.00		
	FW	65.00	62.00				
	B			62.00	65.00		
	BCT		68.00				
	VD				68.00	71.00	
	BVD				81.00	84.00	
	VQ						81.00
PS 227	AC	$ 82.00	82.00	82.00	82.00		
	FW	102.00	97.00				
	B			97.00	102.00		
	BCT		106.00				
	VD				106.00	111.00	
	BVD				126.00	131.00	
	VQ						126.00

"E" Modification Add 10% to Price
"R" Modification Add 10% to Price
"P" Modification Add 10% to Price

ORDERING INFORMATION

PS 207 — 22 — 3000 — VQ — +F — P

1 2 3 4 5 6

1. Basic Model Number Determines Wattage, Size and Mounting.
2. Input Voltage: This number indicates $E_{IN\ MIN.}$ on the regulated units and E_{IN} Nom. on the unregulated units.
3. Output Voltage: May be any voltage between 2 volts and 1500 volts AC or between 2 volts and 6000 volts DC.
4. Rectifier System: Select for applicable output voltage, refer to unit pricing column.
5. When a positive ground is required add +F after rectifier system. Nothing is added for negative ground.
6. Modifications:
   —P for program connection.
   —E for enable operation.

Reliability

Short Circuit Protected

Filtered Input

Crestronics Inc. DC to DC Converters are designed as a power supply for electronic circuits with a minimum of interference in the audio and rf ranges. The 20 KHz conversion employed eliminates all audio range problems and an internal input filter reduces the rfi conductance noise to a level of less than 30 mv P-P across a one ohm resistor in series with the input.

OUTPUT INFORMATION

POWER

On regulated units the power is specified with an input differential of 4 volts and an $E_{IN\ MIN.}$ of 22 volts.

For an input differential of greater than 4 volts, derate output to:

$$\text{Watts derated} = 18\ \frac{.5\ \text{Watts rated}}{\Delta E_{IN} + 3.7}$$

For a minimum input voltage of less than 22 volts, derate output power to:

$$\text{Watts derated} = \text{Watts rated}\ \frac{E_{IN\ MIN.}}{22}$$

On unregulated units the output power will be expressed as:

$$\text{Watts} = .8\ E_{IN}\ I_{IN}$$

With output voltages lower than 15 volts, derate output power to:

$$\text{Watts derated} = \text{Watts rated}\ \frac{\text{Output Volts} + 15}{30}$$

Temperature = Derate 1%/°C over 70°C

VOLTAGE

Regulated units: The nominal output voltage is specified in the model number and may be screwdriver adjusted from +5% to —30%.

Unregulated units: The output voltage will be proportional to the input voltage. The input/output voltage ratio will be specified in the model number.

ISOLATION

All outputs greater than 100 VDC will be isolated to 6000 VDC. All outputs less than 99 VDC will be isolated to 100 VDC. Isolation resistance will be greater than 10K Meg. For special isolation requirements call our engineering department.

ELECTRICAL SPECIFICATIONS

REGULATION:

REGULATED UNITS

LINE .... .01%/ △ Input Volt.
TEMP. ..... .02%/°C+2Mv/°C
LOAD 10% to FULL:
2 to 9 VOLTS 7%
10 to 24 VOLTS 5%
30 to 6000 VOLTS 3%

UNREGULATED UNITS

LINE .... Proportional to Input
LOAD 10% to FULL:
2 to 9 VOLTS 10%
10 to 24 VOLTS 6%
25 to 6000 VOLTS 4%

RIPPLE ALL SYSTEMS

VD., VQ. 5%
ALL OTHERS 3%

1. On output voltages less than 20 volts the switching spikes will be about 100 mv p-p. These can be easily reduced by adding a capacitor on the output terminals.
2. Because of common mode ripple it is necessary to know when a positive ground system is used (see ordering information).
3. The conversion frequency will be approximately 18KHz at nominal input and output voltages.

Crestronics Inc. Engineering staff will design to your mechanical and/or electrical specifications

Crestronics Inc.

P. O. BOX S
CRESTLINE, CALIF. 92325

23539 CREST FOREST DRIVE
PHONE (714) 338-1722

Quantity Discounts: 1 to 4, Unit Price — 5 to 19 Less 10%
20 to 49, Less 20% — 50 to 99, Less 30%

HIGH VOLTAGE EQUIPMENT

HIGHLY REGULATED ADJUSTABLE HIGH VOLTAGE MODULES SERIES "HRM"

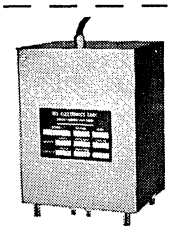
SPECIFICATIONS

Input: 115V ±10% 60 cps
Output: Regulation for 10% line change .03% max. Regulation for NL to FL .03% max
Ripple: .03% RMS max
Temp. Range: −54°C to +65°C operating
Temp. Coefficient: 0.02%/°C

- No voltage overshoot
- Adjustable output
- Short circuit proof (no fuses)
- Meet environmental and transient requirements of MIL-E-16400

Model No. Pos. Output	Model No. Neg. Output	Output Voltage	Max. Current	Dimensions Inches	Net Wt. (Lbs.)
.6HRM5P1	.6HRM5N1	300-600V	5MA	4⅜ x 3⅜ x 4¾	7
1.2HRM5P1	1.2HRM5N1	600-1.2KV	5MA	4⅜ x 3¾ x 4¾	7½
1.7HRM5P1	1.7HRM5N1	900-1.7KV	5MA	4⅜ x 3¾ x 4¾	9
2.5HRM4P1	2.5HRM4N1	1.3-2.5KV	4MA	4⅜ x 3¾ x 4¾	9
3.5HRM3P1	3.5HRM3N1	1.7-3.5KV	3MA	4 11/16 x 4 x 4 13/16	10
5HRM2P1	5HRM2N1	2.5-5.0KV	2MA	4 11/16 x 4 x 4 13/16	10
7HRM1.5P1	7HRM1.5N1	3.5-7.0KV	1.5MA	5½ x 4½ x 6	15
10HRM1P1	10HRM1N1	5.0-10KV	1MA	5½ x 4½ x 6	15
15HRM1.5P1	15HRM1.5N1	7.5-15KV	1.5MA	7¼ x 4 5/16 x 7½	20
20HRM1P1	20HRM1N1	10-20KV	1MA	7¼ x 4 5/16 x 8	20
25HRM2P1	25HRM2N1	12-25KV	2MA	9¼ x 5½ x 9⅝	35
30HRM.75P1	30HRM.75N1	15-30KV	0.75MA	8¼ x 5 5/16 x 7⅞	37
40HRM.5P1	40HRM.5N1	20-40KV	0.5MA	6¼ x 8¼ x 8	42
50HRM.5P1	50HRM.5N1	25-50KV	0.5MA	10 x 8 x 10	60

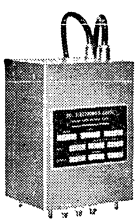
REGULATED MODULES TRANSISTORIZED SERIES "TRHV"



The TRHV series of regulated power supplies are all solid state units. Reference and regulating circuitry is accomplished at low voltage. The units are completely self-contained and require only 115 Volt AC 60/400 cycle excitation to be operative. These supplies are rugged and feature good line, load and thermal stability. The operating temperature range is −20°C to +55°C. Regulation better than 0.25% for 10% line change & NL to FL. Ripple 0.5% RMS at max current.

Model No. Positive Output	Model No. Negative Output	Voltage Output	Max. Current	Dimensions (Inches)	Net Weight (Lbs.)
1RP5-1	1RN5-1	1 KV	5 MA	4¼x3¾x5½	8½
2.5RP4-1	2.5RN4-1	2.5 KV	4 MA	4¼x3¾x5½	8½
5RP2-1	5RN2-1	5 KV	2 MA	4¼x3¾x5½	8½
7.5RP1.5-1	7.5RN1.5-1	7.5 KV	1.5 MA	4¾x4x6	10
10RP1-1	10RN1-1	10 KV	1 MA	4¾x4x6	10½
10RP2-1	10RN2-1	10 KV	2 MA	6¾x4¼x7½	18½
15RP1.5-1	15RN1.5-1	15 KV	1.5 MA	6¾x4¼x7½	18
20RP1-1	20RN1-1	20 KV	1 MA	7¼x4¼x7½	19

UNREGULATED MODULES COMPACT HIGH VOLTAGE SERIES "S"



These power supplies are designed for operation from either a 0-115 volt or 0-125 volt line at 60/400 cycles. Three input terminals are provided to permit proper line connection. The output is available from shielded polyethylene cables and may be varied over the full range by varying the input AC line. The two output cables are insulated for the full output voltage, so that either the positive or negative terminal may be grounded.* All units have selenium rectifiers and are hermetically sealed in an epoxy, vacuum filled, metal case.

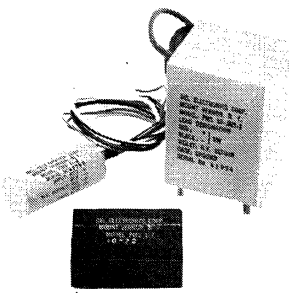
Units for 50 cycle operation at various line voltages are available on request.

*Model 40-2-4 is designed with one output cable for single polarity operation. When ordering, please specify polarity.

Model No.	Max. Output Voltage	Max. Rated Current	**Ripple at Full Load %RMS/MA at 60 CPS	Dimensions (Inches)	Net Weight (Lbs.)
2.5-2-6	0-2.5 KV	2 MA	0.25	3 x 2⅝ x 4¼	3¼
5-2-4	0-5.0 KV	2 MA	0.25	3 x 3½ x 3⅞	4¼
10-1-12	0-10 KV	1.25 MA	0.30	3 x 3½ x 4⅞	5½
15-1-8	0-15 KV	1.25 MA	0.25	4¼ x 5 x 5¾	11½
20-1-4	0-20 KV	1.25 MA	0.25	4¼ x 5⅛ x 6¾	14
25-1-3	0-25 KV	1.25 MA	0.30	4¾ x 6 x 7¼	20¼
30-1-5	0-30 KV	1.25 MA	0.20	5 x 6½ x 8	24½
40-1-1	0-40 KV	1 MA	0.25	6¼ x 8¼ x 7	26
40-2-4*	0-40 KV	2 MA	0.30	6¼ x 8¼ x 7	30
50-1-5	0-50 KV	1 MA	0.25	9⅞ x 7¾ x 9⅜	52
60-1.5-1	0-60 KV	1.5 MA	0.35	12¼x9¼x11¼	87
1-5-2	1 KV	5 MA	.20	3 x 2¾ x 4¼	3½
2.5-5-3	2.5 KV	5 MA	.20	3½ x 3 x 5	5
5-5-4	5 KV	5 MA	.25	4 x 3⅜ x 5¼	7½
7.5-5-1	7.5 KV	5 MA	.20	4⅜ x 3¾ x 5½	8½
10-5-1	10 KV	5 MA	.25	4⅜ x 3¾ x 5½	10
15-5-1	15 KV	5 MA	.30	5¾ x 5 x 6¾	19½
20-5-3	20 KV	5 MA	.25	6⅛ x 6⅛ x 6½	21
25-5-1	25 KV	5 MA	.25	6¾ x 6¼ x 7¼	27¼
30-5-8	30 KV	5 MA	.30	7¼ x 6½ x 7¾	38
1-10-1	1 KV	10 MA	.10	3½ x 3 x 5	5
2.5-10-1	2.5 KV	10 MA	.10	4 x 3⅜ x 5¼	6½
5-10-2	5 KV	10 MA	.12	4⅜ x 3¾ x 5½	9
7.5-10-1	7.5 KV	10 MA	.10	4¾ x 4 x 7¼	13½
10-10-3	10 KV	10 MA	.10	5 x 4⅜ x 6¾	14½
15-10-2	15 KV	10 MA	.15	6⅛ x 6⅛ x 6½	22½
20-10-3	20 KV	10 MA	.15	6¾ x 6¼ x 7¼	27½
25-10-2	25 KV	10 MA	.10	7½ x 6½ x 8½	38
30-10-3	30 KV	10 MA	.15	8 x 7¾ x 8¾	50
40-15-1	40 KV	15 MA	.3	8¼ x 9½ x 11¼	95

*Single polarity unit, state positive or negative output.
**Ripple at 400 cycles is 15% of ripple at 60 cycles, shown above.

PHOTOMULTIPLIER POWER SUPPLIES PMS SERIES

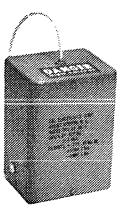


The PMS Series is a family of extremely compact, rugged design DC to DC proportional converters for use as power sources for photomultiplier and other tube applications. They feature reverse polarity protection, output isolated from the input, and are momentary short circuit protected.

SPECIFICATIONS

Model	Input DC	Output Voltage	Output Load	Ripple P-P	Capacity Mfd.	Size D x L
PMS 1-1	3 - 15V	300-1500V	1.5 Meg	1.5V	.02	1 x 2¼
PMS 1-2	3 - 10V	300-1000V	800 K	1.0V	.02	1 x 2⅝
PMS 1-3A	3 - 15V	300-1500V Negative	1.0 Meg	1.0V	.02	1¼ x 2½
PMS 1-4	3 - 19V	300-2000V	2.0 Meg	7.0V	.002	1 x 2¼
PMS 1-5	3 - 10V	300-1000V	3.0 Meg	.5V	.02	1 x 2½
PMS 1-6	3 - 15V	400-2500V	5 Meg	30V	.003	1 x 2¼
PMS 1-7	4 - 12V	500-1500V	1.0 Meg	6.0V	.005	2.4 x 1.5 x .812
PMS B2-.025	3 - 10V 12MA @ 1.8KV & 180 Meg	300-2000V	80 Meg MIN.	3.0V	.002	1 x 2¼
PMS 3-.5	3 - 15V	300-3000V	6 Meg	7.5V	.005	1¼ x 2⅜
PMS 5-.5	3 - 15V	500-5000V	10 Meg	5.0V	.01	1¼ x 3.0
PMS 10-.025	3 - 10V	3KV - 10KV	25 ua	50V	.002	2.07 x 2.32 x 3.13

CATHODE RAY TUBE POWER SUPPLIES SERIES ARD & DRD



The ARD and DRD Series Power Supplies are designed for operation of cathode ray tubes in commercial displays. Capable of withstanding output short circuits and flashovers, they feature automatic shut down of the output voltage and their low energy storage offers maximum protection for the tube. High regulation, low ripple content and noiseless operation provide optimum image resolution.

DRD SERIES INPUT: 28 VDC			ARD SERIES INPUT: 115V ±10% 50/60 Hz		
Model	Output KV	Output Current	Model	Output KV	Output Current
1DRD2-1	1	2MA	1ARD2-1	1	2MA
1DRD5-1	1	5MA	1ARD5-1	1	5MA
1DRD10-1	1	10MA	1ARD10-1	1	10MA
1DRD20-1	1	20MA	1ARD20-1	1	20MA
2DRD1-1	2	1MA	1.8ARD2N-1	−1.8	2MA
2DRD10-1	2	10MA	2ARD1-1	2	1MA
5DRD4-1	5	4MA	2ARD10-1	2	10MA
7DRD.25-2	7	.25MA	5ARD4-1	5	4MA
10DRD2-1	10	2MA	10ARD2-1	10	2MA
12DRD.25-1	12	.25MA	20ARD.025-1	20	.025MA
16DRD.25-1	16	.25MA	20ARD.75-1	20	.75MA
20DRD1-1	20	1MA	40ARD.5-1	40	.5MA
40DRD.5-2	40	.5MA	60ARD.2-1	60	.2MA
60DRD.2-1	60	.2MA			

TYPICAL PERFORMANCE

Line Regulation: ±.1%
Load Regulation: ±.05% ½ L to F.L.
Ripple: .1% RMS

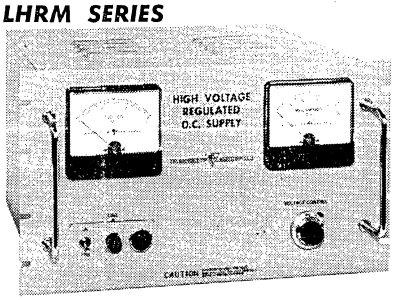
Other models are available for various input and output voltages, auxiliary outputs, regulation and ripple. Check factory for detailed specifications.

All units short circuit proof and flashover protected.

DEL ELECTRONICS HAS MANY OTHER CATHODE RAY TUBE AND PHOTOMULTIPLIER POWER SUPPLIES TO OPERATE FROM EITHER AC OR DC INPUT VOLTAGES TO MEET CUSTOM REQUIREMENTS, MILITARY SPECIFICATIONS OR UNUSUAL PACKAGING CONFIGURATIONS. CONSULT FACTORY FOR DETAILS.

HIGH VOLTAGE EQUIPMENT

LHRM SERIES



The Del LHRM Series of High Voltage Power Supplies offer the HRM module power supply with its high regulation, low ripple, short circuit protection and other desirable features in a lab. type rack mountable supply.

Full voltage control by ten-turn potentiometer, ammeter and voltmeter, line switch, etc., make this unit essential in lab. development and testing of high voltage equipment such as high resolution CRT displays, and other applications requiring a precision high voltage power supply. It offers the great advantage in that the characteristics are identical to the HRM modules which can be then utilized in the final equipment.

FEATURES

- Short Circuit Proof
- Full Adjustable Output
- Excellent Thermal Stability
- No Voltage Overshoot on Turn On or Turn Off
- Single Shielded Output Cable
- Fast Response
- No Warm-up Required
- All Silicon Transistors
- No r.f.i., Chopper or Hhigh Frequency Oscillator
- Automatic Resetting Thermal Cutout

Enhances selection of final power supply module.
Ten Turn Potentiometer with 0.15% Linearity.

SPECIFICATIONS — ALL MODELS

INPUT: 115V ±10% 60 to 400 Hz. single phase for units up to 10 KV.
115V ±10% 60 or 400 Hz. for units 15 KV and above.

OUTPUT: See table

REGULATION:

LINE: Less than 0.03% from 50% to 100% of max. rated output voltage increasing to 0.5% at 10% of max. rated output voltage for a ±10% line votlage change.

LOAD: Same as line regulation above from no load to full load.

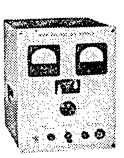
RIPPLE: Less than 0.03% rms of max. rated output voltage.

LINEARITY: Better than 0.15" with a ten turn potentiometer. Models marked (*) 0.7%.

MODEL NUMBER		Output Voltage	Output Current	19" Rack Panel Mount	(Lbs.) Approx.
Pos. Output	Neg. Output	KV	MA	(W.x D.x H.)	Wgt.
1.2LHRM5P1	1.2LHRM5N1	0-1.2	5		10
1.7LHRM5P1	1.7LHRM5N1	0-1.7	5		10
2.5LHRM4P1	2.5LHRM4N1	0-2.5	4		10
3.5LHRM3P1	3.5LHRM3N1	0-3.5	3	21¾x15¼x10½	11
5LHRM2P1	5LHRM2N1	0-5	2		11
7LHRM1.5P1	7LHRM1.5N1	0-7	1.5		18
10LHRM1P1	10LHRM1N1	0-10	1		18
12LHRM5P1*	12LHRM5N1*	0-12	5		23
15LHRM1.5P1	15LHRM1.5N1	0-15	1.5		23
15LHRM5P1*	15LHRM5N1*	0-15	5		23
20LHRM1P1	20LHRM1N1	0-20	1		23
20LHRM5P1*	20LHRM5N1*	0-20	5	21¾x15¼x12¼	23
25LHRM5P1*	25LHRM5N1*	0-25	5		23
25LHRM10P1*	25LHRM10N1*	0-25	10		23
30LHRM.75P1	30LHRM.75N1	0-30	.75		42
30LHRM5P1	30LHRM5N1*	0-30	5		47
40LHRM.5P1	40LHRM.5N1	0-30	.5	21¾x15¼x14	47
50LHRM.5P1	50LHRM.5P1	0-50	.5		66

NOTE: All Models Available with Digital Voltmeter Readout Grounding Switches Ripple Reducers Upon Special Request.

"HI-POT" TESTERS



Del D.C. "HI-POT" supplies are fully instrumented and fully protected units providing output voltages up to 160,000 volts D.C. Supplies are well designed to provide conservative ratings.

Thirteen models offer a wide selection to meet all applications. Portable units as well as floor type with rack mountable control panels* are available

Input 115 VAC - 60 cycle.

Model No.	Voltage Range Full Load	Current Range MA	Ripple at Full Load % RMS/MA	Size	Polarity
2.5 HPT-2-1	0-2,500	2	0.30	9½" x 11" x 12"	Reversible
5 HPT-2-1	0-5,000	2	0.20	9½" x 11" x 12"	Reversible
10 HPT-1-1	0-10,000	1.25	0.45	9½" x 11" x 12"	Reversible
15 HPT-1-1	0-15,000	1.25	0.30	9½" x 11" x 12"	Reversible
20 HPT-1-1	0-20,000	1.25	0.30	9½" x 11" x 12"	Reversible
20 HPT-5-1	0-20,000	5	0.50	9½" x 11" x 12"	Reversible
30 HPT-3-1	0-30,000	3	0.50	9½" x 11" x 12"	Reversible
40 HPT-1-1	0-40,000	1	0.30	9½" x 11" x 12"	Reversible
40 HPT-2-1	0-40,000	2	0.30	20" x 12" x 14"	Positive
50 HPT-1-1	0-50,000	1	0.50	20" x 12" x 14"	Positive
60 HPT-1-1	0-60,000	1	0.50	20" x 12" x 14"	Positive
*100 HPT-2-1	0-100,000	2	0.50	20¾" x 17½" x 25½" Tank Only	Reversible
*130 HPT-2-1	0-130,000	2	0.50	29¼" x 19" x 27" Tank Only	Reversible
*160 HPT-2-1	0-160,000	2	0.50	29¼" x 19" x 33½" Tank Only	Reversible

Rack Mountable Hi-Pot Testers also available from stock.

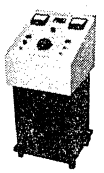
RACK MOUNT POWER SUPPLIES
"RHPT" SERIES HIGH POT TESTER

The Del RHPT series of rack mounted Hi Pot Testers are general-purpose power supplies which are fully instrumented, completely enclosed, and fully protected. These units are designed for standard 19-inch racks and have light gray panels. They are recommended for all cmmercial, industrial, and laboratory uses where reliable dc high-voltage sources are required.

Model No.	Output Voltage Range (kv)	Max. Current (ma)
1RHPT-5-1	0-1	5
1RHPT-10-1	0-1	10
1RHPT-25-1	0-1	25
1RHPT-50-1	0-1	50
1RHPT-100-1	0-1	100
1RHPT-500-1	0-1	500
1RHPT-1000-1	0-1	1000
1RHPT-1500-1	0-1	1500
2.5RHPT-2-1	0-2.5	2
2.5RHPT-5-1	0-2.5	5
2.5RHPT-10-1	0-2.5	10
2.5RHPT-25-1	0-2.5	25
2.5RHPT-50-1	0-2.5	50
2.5RHPT-100-1	0-2.5	100
2.5RHPT-200-1	0-2.5	200
2.5RHPT-400-1	0-2.5	400
2.5RHPT-600-1	0-2.5	600
5RHPT-2-1	0-5	2
5RHPT-5-1	0-5	5
5RHPT-10-1	0-5	10
5RHPT-25-1	0-5	25
5RHPT-50-1	0-5	50
5RHPT-100-1	0-5	100
5RHPT-200-1	0-5	200
5RHPT-300-1	0-5	300
7.5RHPT-5-1	0-7.5	5
7.5RHPT-10-1	0-7.5	10
7.5RHPT-25-1	0-7.5	25
7.5RHPT-50-1	0-7.5	50
7.5RHPT-100-1	0-7.5	100

Model No.	Output Voltage Range (kv)	Max. Current (ma)
10RHPT-1.25-1	0-10	1.25
10RHPT-5-1	0-10	5
10RHPT-10-1	0-10	10
10RHPT-25-1	0-10	25
10RHPT-50-1	0-10	50
10RHPT-100-1	0-10	100
10RHPT-150-1	0-10	150
15RHPT-1.25-1	0-15	1.25
15RHPT-5-1	0-15	5
15RHPT-10-1	0-15	10
15RHPT-25-1	0-15	25
15RHPT-50-1	0-15	50
15RHPT-75-1	0-15	75
20RHPT-1.25-1	0-20	1.25
20RHPT-5-1	0-20	5
20RHPT-10-1	0-20	10
20RHPT-25-1	0-20	25
20RHPT-50-1	0-20	50
20RHPT-75-1	0-20	75
25RHPT-1.25-1	0-25	1.25
25RHPT-5-1	0-25	5
25RHPT-10-1	0-25	10
25RHPT-25-1	0-25	25
30RHPT-1.25-1	0-30	1.25
30RHPT-5-1	0-30	5
30RHPT-10-1	0-30	10
30RHPT-25-1	0-30	25
40RHPT-2-1†	0-40	2
50RHPT-1-1	0-50	1
60RHPT-1-1	0-60	1

"HIGH POT" TESTERS
"TC" SERIES POWER SUPPLIES



DEL TC Series multi-purpose D.C. Power Supplies are compact, fully instrumented and fully protected units providing ratings up to 80,000 volts D.C. continuously variable.

Seleninum Rectifiers used throughout to provide long life and instantaneous operation. No filament warm up time required.

All high voltage components immersed in special high grade insulating oil. This assures LONG trouble-free LIFE.

STANDARD MODELS

Model No.	Full Load Voltage Range (kv)	Current Range (ma)	Ripple* (% rms/ma at 60 Hz)	Dimensions** Complete Unit (in., w x d x h)	Dimensions** Tank Only (in., w x d x h)
30TC-5-1	0-30	0-5	0.4	14½ x 13½ x 25¾	14 x 13 x 16½
40TC-5-1	0-40	0-5	0.5		
50TC-5-1	0-50	0-5	0.4		
60TC-5-1	0-60	0-5	0.4		
30TC-20-1	0-30	0-20	0.4	17 x 17 x 32	16½ x 16½ x 21½
40TC-20-1	0-40	0-20	0.4		
50TC-10-1	0-50	0-10	0.4		
60TC-10-1	0-60	0-10	0.4		
70TC-5-1	0-70	0-5	0.4		
80TC-5-1	0-80	0-5	0.4		

*%/ma is specified at maximum voltage and current. Percentage shown is also accurate for lower currents down to less than 15% of the maximum ma rating.

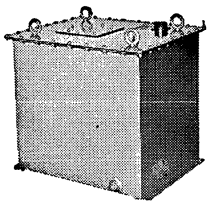
**Dimensions are nominal. Outline drawings available on request.

ALSO AVAILABLE FOR OTHER INPUT AND OUTPUT VOLTAGES

DEL ELECTRONICS CORP. MOUNT VERNON, N.Y.
250 E. Sandford Blvd. 914 - 699-2000 TWX: 710-562-0130

HIGH VOLTAGE EQUIPMENT

SERIES "O" OIL INSULATED TANK UNITS



DEL SERIES "O", oil insulated, High Voltage Power Supplies offers one of the most comprehensive lines of basic high voltage units available to industry and laboratories. These D.C. supplies are designed to provide long, reliable service in such applications as dielectric testing, capacitor chargers, electrostatic precipitators, electron microscopes, image intensifiers, plasma research and accelerators. Series "O" supplies feature reversible polarity on most units, shielded polyethylene output cables, high quality insulating oil in dust free tank, quiet, long life operation with low corona.

STANDARD MODELS

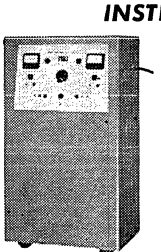
Model No.	Output Voltage (kv)	Output Current (ma)	Model No.	Output Voltage (kv)	Output Current (ma)	Model No.	Output Voltage (kv)	Output Current (ma)
PSO20-200-3	20	200	PSO50-50-8	50	50	PSO100-300-1	100	300
PSO20-300-2	20	300	PSO50-75-1	50	75	PSO100-500-1	100	500
PSO25-50-2	25	50	PSO50-100-4	50	100	PSO120-5-3	120	5
PSO25-200-11	25	200	PSO50-200-5	50	200	PSO120-10-1	120	10
PSO25-400-1	25	400	PSO50-220-2	50	220	PSO120-30-1	120	30
PSO25-500-6	25	500	PSO50-300-1	50	300	PSO130-2-3	130	2
PSO30-3-2	30	3	PSO50-500-3	50	500	PSO150-5-5	150	5
PSO30-5-4	30	5	PSO60-1-1A†	60	1	PSO150-10-1	150	10
PSO30-5-16	30	5	PSO60-5-2	60	5	PSO150-20-1	150	20
PSO30-20-9	30	20	PSO60-10-1	60	10	PSO150-50-3	150	50
PSO30-30-5	30	30	PSO60-100-2	60	100	PSO150-100-1	150	100
PSO30-75-1	30	75	PSO70-5-1	70	5	PSO150-150-1	150	150
PSO30-150-4	30	150	PSO70-5-3	70	5	PSO150-200-1	150	200
PSO30-200-2	30	200	PSO75-30-1	75	30	PSO150-300-1	150	300
PSO30-500-1	30	500	PSO75-60-1	75	60	PSO160-2-1	160	2
PSO40-5-6	40	5	PSO80-5-1	80	5	PSO200-10-1	200	10
PSO40-10-4	40	10	PSO80-5-4	80	5	PSO200-150-1	200	150
PSO40-20-1	40	20	PSO80-10-1B	80	10	PSO200-250-1	200	250
PSO40-220-1	40	220	PSO80-60-1	80	60	PSO250-1-2	250	1
PSO50-1-2†	50	1	PSO100-2-1	100	2	PSO250-3-2	250	3
PSO50-5-6	50	5	PSO100-30-6	100	30	PSO250-10-2	250	10
PSO50-5-9	50	5	PSO100-50-1	100	50	PSO300-10-1	300	10
PSO50-10-2	50	10	PSO100-100-1	100	100	PSO300-50-2	300	50
PSO50-20-2	50	20	PSO100-150-1	100	150			
PSO50-30-4	50	30	PSO100-200-3	100	200			

† Polarity — All units feature reversible polarity except Models PSO 40-2-3, PSO 50-1-2, and PSO 60-1-1A which supply positive outputs only.

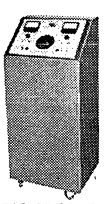
NOTE: Larger units are shipped without oil to reduce transportation costs. See notations on price list.

COMPLETE LINE OF CONTROL PANELS AND REGULATED CONTROLS AVAILABLE FOR ALL SERIES "O" POWER SUPPLIES.

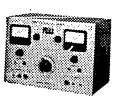
INSTRUMENTED POWER SUPPLIES



PSC 120-5-2



PSC 25-200-2



PSC 30-5-1

DEL Series "PSC" Instrumented, High Voltage Power Supplies provides a broad selection of units designed for reliable and dependable use in research and industry.

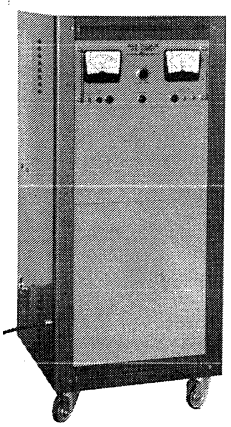
All units: Input 115V, 60 cps unless noted otherwise.
All units up to 20KV are air insulated and utilize epoxy components.
All other units have high voltage section immersed in high grade insulating oil to insure freedom from electrical noise.

STANDARD MODELS

Model No.	Output Voltage Range (kv)	Max. Output Current (ma)	Model No.	Output Voltage Range (kv)	Max. Output Current (ma)	Model No.	Output Voltage Range (kv)	Max. Output Current (ma)
PSC.5-1000-1	0-0.5	1000	PSC20-25-1	0-20	25	PSC80-10-1B	0-80	10
PSC1-150-1	0-1 5	150	PSC20-150-1	0-20	150	PSC100-30-2	0-100	30
PSC1-5000-1	0-1	5000	PSC20-300-1	0-20	300	PSC100-50-1	0-100	50
PSC2-100-1	0-2	100	PSC25-200-2	0-25	200	PSC100-100-1	0-100	100
PSC2.5-750-1	0-2.5	750	PSC25-400-1	0-25	400	PSC120-5-2A	0-120	5
PSC2.5-1000-1	0-2.5	1000	PSC30-5-1	0-30	5	PSC120-10-1	0-120	10
PSC2.5-2000-1	0-2.5	2000		0-35	1	PSC120-30-1	0-120	30
PSC5-50-4	0-5	50	PSC30-5-7	0-30	5	PSC150-5-1	0-150	5
PSC5-500-1	0-5	500	PSC30-75-1	0-30	75	PSC150-10-1	0-150	10
PSC5-1000-3	0-5	1000	PSC30-150-1	0-30	150	PSC150-20-1	0-150	20
PSC10-10-8	0-10	10	PSC30-200-1	0-30	200	PSC150-50-1	0-150	50
PSC10-250-1	0-10	250	PSC50-30-3	0-50	30	PSC200-10-1	0-200	10
PSC10-500-10	0-10	500	PSC50-50-1	0-50	50	PSC250-1-1A	0-250	1
PSC10-750-1	0-10	750	PSC50-75-3	0-50	75	PSC250-3-1	0-250	3
PSC15-10-1	0-15	10	PSC50-100-2	0-50	100	PSC250-10-1	0-250	10
PSC15-200-1	0-15	200	PSC50-200-3	0-50	200	PSC300-10-1	0-300	10
PSC15-300-1	0-15	300	PSC75-30-1	0-75	30	PSC300-50-1	0-300	50
PSC20-10-1	0-20	10	PSC75-60-1	0-75	60			

NOTE: Some units are shipped without oil to reduce transportation charges. See notations on price lists.

HEAVY DUTY POWER SUPPLIES HPS SERIES



The HPS Series provide reliable high voltage DC outputs at high kilowatt levels. These units are recommended for all applications requiring heavy load currents. Power outputs from 5 to 75 KW are available. Units of high power are available on special order.

All units are solid state with rugged electrical and mechanical construction and include complete overload and overvoltage protection, surge limiting and other protective devices.

SPECIFICATIONS

Input: See Table.

Static Load Regulation: Less than 8% at max. rated voltage for a NL to FL change.

Dynamic Load Regulation: Within static regulation for a 25% step load change.

Line Regulation: Output is directly proportional to line variations.

Ripple: Less than 4.5% RMS.

Polarity: Reversible.

SINGLE CABINET CONSTRUCTION

Model No.	Output Voltage Range (kv)	Max. Current (ma)	Input Power (approx. kva)	Input Voltage (nom)
HPS 2.5-2000	0-2.5	2,000	5.5	208
HPS 2.5-4000	0-2.5	4,000	11.0	208
HPS 5-1000	0-5	1,000	5.5	208
HPS 5-2000	0-5	2,000	11.0	208
HPS-10-500	0-10	500	5.5	208
HPS 10-1000	0-10	1,000	11.0	208
HPS 15-300	0-15	300	5.5	208
HPS 15-600	0-15	600	11.0	208
HPS 20-250	0-20	250	5.5	208
HPS 20-500	0-20	500	11.0	208

TWO SECTION CONSTRUCTION

HPS 2.5-6000	0-2.5	6,000	16.5	208
HPS 2.5-12000	0-2.5	12,000	33.0	208
HPS 2.5-20000	0-2.5	20,000	55.0	440
HPS 5-3000	0-5.0	3,000	16.5	208
HPS 5-6000	0-5.0	6,000	33.0	208
HPS 5-10000	0-5.0	10,000	55.0	440
HPS 5-15000	0-5.0	15,000	80.0	440
HPS 10-1500	0-10.0	1,500	16.5	208
HPS 10-3000	0-10.0	3,000	33.0	208
HPS 10-5000	0-10.0	5,000	55.0	440
HPS 10-7500	0-10.0	7,500	80.0	440
HPS 15-1000	0-15.0	1,000	16.5	208
HPS 15-2000	0-15.0	2,000	33.0	208
HPS 15-3000	0-15.0	3,000	48.0	440
HPS 15-5000	0-15.0	5,000	80.0	440
HPS 20-750	0-20.0	750	16.5	208
HPS 20-1500	0-20.0	1,500	33.0	208
HPS 20-2500	0-20.0	2,500	55.0	440
HPS 20-3500	0-20.0	3,500	75.0	440
HPS 30-500	30.0	500	16.5	208
HPS 30-1000	30.0	1,000	33.0	208
HPS 30-1500	30.0	1,500	50.0	440
HPS 30-2500	30.0	2,500	80.0	440
HPS 50-300	0-50.0	300	16.5	208
HPS 50-500	0-50.0	500	30.0	208
HPS 50-1000	0-50.0	1,000	55.0	440
HPS 50-1500	0-50.0	1,500	80.0	440
HPS 100-150	0-100.0	150	16.5	208
HPS 100-300	0-100.0	300	33.0	208
HPS 100-500	0-100.0	500	55.0	440
HPS 100-750	0-100.0	750	80.0	440
HPS 150-100	0-150.0	100	16.5	208
HPS 150-200	0-150.0	200	33.0	208
HPS 150-300	0-150.0	300	48.0	440
HPS 150-500	0-150.0	500	80.0	440
HPS 200-150	0-200.0	150	33.0	208
HPS 200-250	0-200.0	250	55.0	480

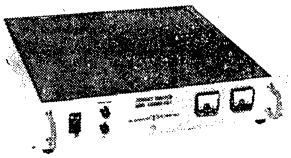
Regulator and Ripple Suppression Options Also Available.

CUSTOM DESIGNED AND MIL SPEC HEAVY DUTY POWER SUPPLIES AND TRANSFORMERS UP TO 300 KV AND 250 KVA ARE AVAILABLE UPON REQUEST

SEND FOR COMPLETE CATALOG COVERING ALL HIGH VOLTAGE EQUIPMENT

AUXILIARY EQUIPMENT DEL TRANSFORMERS

TRANSISTORIZED FREQUENCY CONVERTERS



ATA SERIES

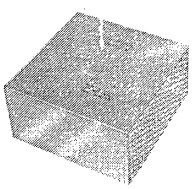
The ATA Series of frequency converters is a source of stable 400 cycle power which operates directly from a standard 50 to 60 cycle line. These units feature excellent frequency characteristics, waveform purity, voltage regulation and low dynamic impedance.

SPECIFICATIONS

INPUT VOLTAGE	105-125 VAC, 50-70 cps
OUTPUT VOLTAGE	Adj. 105-125 VAC
OUTPUT FREQ.	400 cps, adjustable, 398 to 402 cps.
DISTORTION	0.8%, Max.
POWER FACTOR	±0.7 to Unity
VOLTAGE REG.	
LOAD	Within 0.5% for no load to full load.
LINE	±0.5% for 105-125 V
METERS	Output voltage and current.
CONSTRUCTION	Designed for rack mounting.

MODEL	OUTPUT V.A.	SIZE W x D x H (in.)	TYPE
ATA 400RS-100	100	19 x 16 x 3½	Regulated
ATA 400RS-500	500	19 x 16 x 8¾	Regulated
ATA 400RS-1000	1000	19 x 16 x 14	Regulated

TRANSISTORIED DC/AC INVERTERS



DTA 60 SERIES

The DTA 60 Series of DC to 60 cycle AC and the DTA 400 Series of DC to 400 cycle AC inverters include regulated units, for those applications requiring precise output voltage, and unregulated units where the output voltage is not critical. All units operate from a 22 to 30 volt DC source, are capable of frequency synchronization to an external source, and are protected against overvoltage, reverse polarity, overload and over-temperature.

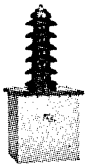
SPECIFICATIONS

INPUT VOLTAGE: 22-30 VDC
OUTPUT VOLTAGE: 115 VAC for regulated units; 115 VAC Nom. with ±10% taps for unregulated units.
POWER FACTOR: ±0.7 to unity.
DISTORTION: 2½% for DTA 60 Series
0.8% for DTA 400 Series.
VOLTAGE REG. LOAD: Approx. 6% for 50% load change, unregualted units.
0.5% no load to full load for regulated units.
LINE: Output proportional to input for unregulated units.
0.5% for 22 to 30 VDC for regulated units.
FREQUENCY REG. 60 SERIES: 0.5% for 22 to 30 VDC
0.5% for no load to full load.
400 SERIES: 0.2% for 22 to 30 VDC.
0.2% for no load to full load.
ISOLATION: Between input, output, gnd.
HOUSING: Modular, with heat radiating finish.
MOUNTING: Tapped inserts in base.
TERMINATIONS: Input, output, ground and synchronization signal, all available under removable access plate.

UNREGULATED MODEL	OUTPUT V.A.	SIZE W x D x H (in.)	WEIGHT LBS.	TYPE
DTA 60RS_100	100	10 x 10 x 5	25	Regulated
DTA 60RS-500	500	12 x 14 x 12	95	Regulated
DTA 60RS-1000	1000	17 x 18 x 14	180	Regulated
DTA 60RS-2500	2500	17 x 17 x 19	280	Regulated
DTA 60S-100	100	10 x 10 x 5	30	Unregulated
DTA 60S-500	500	12 x 14 x 12	85	Unregulated
DTA 60S-1000	1000	14 x 14 x 14	165	Unregulated
DTA 60S-2500	2500	17 x 17 x 19	275	Unregulated

REGULATED MODEL	OUTPUT V.A.	SIZE W x D x H (in.)	WEIGHT LBS.	TYPE
DTA 400RS-100	100	10 x 10 x 5	21	Regulated
DTA 400RS-500	500	12 x 14 x 12	65	Regulated
DTA 400RS-1000	1000	17 x 18 x 4	145	Regulated
DTA 400S-100	100	10 x 10 x 5	25	Unregulated
DTA 400S-500	500	12 x 14 x 12	75	Unregulated
DTA 400S-1000	1000	14 x 14 x 14	165	Unregulated

METER MULTIPLIERS

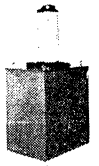


Del Electronics' line of multipliers is designed and built to provide high voltage DC measurements with safety and minimum ccrona at reasonable cost. Each unit consists of resistors immersed in high grade insulating oil and hermetically sealed grounded case. All units are designed for use with 100 ua full scale meter. Can be furnished with panel type 4½" rectangular 100 ua meter (2% accuracy), with KV scale to match.

Type	Maximum Kilivolts	Case Dimension (Max.) W	D	H	Insulator Height
M-5	5	2 5/16"	2 1/16"	2½"	1"
M-10	10	2 5/16"	2 1/16"	2½"	1¾"
M-15	15	2 5/16"	2 1/16"	3⅛"	1¾"
M-20	20	2¾"	2½"	4"	2½"
M-30	30	4¼"	3¾"	5½"	3"
M-50	50	4¾"	4"	8"	8⅛"
M-100	100	9½"	9½"	9½"	14"
M-150	150	11"	11"	12"	20"
M-250	250	16½"	16½"	22"	28¾"

ALSO AVAILABLE FOR OTHER INPUT AND OUTPUT VOLTAGES

ISOLATION TRANSFORMERS

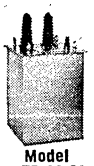


Model 2-TR-250-21

DEL ELECTRONICS' line of High Voltage Isolation Transformers are designed and manufactured for use in industry and in research and development laboratories.

These DEL High Quality Transformers have the following features:

- Complete vacuum varnish impregnation
- Immersed in high grade insulating oil
- Electrostatic shield between primary and secondary
- Good regulation



Model 3-TR-60-22

STANDARD 60 HZ TYPE ISOLATION TRANSFORMERS

Model No.	Max Kva	Kvdc Insulation	Tank Size (in., w x d x h)	Insulator Height (in.) ††
1-TR-30-XX†	1	30	10 x 12 x 11	6
1.5-TR-30-XX†	1.5	30	10 x 12 x 11	6
1-TR-50-XX†	1	50	13 x 13⅞ x 16⅜	8½
3-TR-50-XX†	3	50		
1-TR-60-XX†	1	60	9¾ x 12⅜ x 13⅜	11
2-TR-60-XX†	2	60	9¾ x 12⅜ x 13⅜	11
3-TR-60-XX†	3	60	16½ x 16½ x 21⅜	11
5-TR-60-XX†	5	60		
3-TR-75-XX†	3	75	16½ x 16½ x 22	11
1-TR-100-XX†	1	100	20¾ x 17½ x 17 13/16	14
3-TR-100-XX†	3	100		
3-TR-150-XX†	3	150	29¼ x 19 x 27	19½
5-TR-150-XX†	5	150		
2-TR-250-XX†	2	250	25 x 33 x 37 5/16	28¾
3-TR-250-XX†	3	250	29¾ x 29¾ x 36⅜	28¾
5-TR-250-XX†	5	250	25 x 33 x 37¼	28¾
4-TR-300-XX†	4	300	39½ x 47½ x 50½	35

* Dimensions are nominal. Outline drawings available on request.

† NOTE — Add the following suffix in place of XX.

FOR	SUFFIX	FOR	SUFFIX
120/120	11	240/120	21
120/240	12	240/240	22

†† If shielded polyethylene output cables are desired in place of porcelain insulator, designate by a C prefix; e.g., 1-CTR-30-XX.

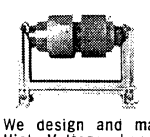
HIGH VOLTAGE ISOLATION TRANSFORMERS

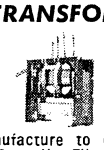
OPEN TYPE CONSTRUCTION — EPOXY COATED

Primaries: 115 V, 230 V — 60 cps • Secondaries: 115 V

Type	KVA	Insulation KVDC Working	Size
AD 1640	.200	10	6⅛ x 4 x 5⅛
AD 1641	.500	10	7⅝ x 5⅞ x 7¾
AD 1642	.750	10	9½ x 6 5/16 x 8¼
AD 1643	1.000	10	8½ x 8 x 9¾
AD 1644	.200	20	8½ x 4 x 5⅝
AD 1645	.500	20	10¼ x 5⅝ x 7½
AD 1646	.750	20	9¾ x 6¾ x 8
AD 1647	1.000	20	11¼ x 6⅝ x 8¾
AD 3060	.250	30	8½ x 7¼ x 6½
AD 3061	.500	30	9¾ x 7 x 8¾
AD 3062	.750	30	10½ x 7½ x 9½
AD 3063	1.000	30	11 x 9 x 9½
AD 3064	.250	40	10 x 7 x 6½
AD 3065	.500	40	11¼ x 7¼ x 8¾
AD 3066	.750	40	12½ x 7½ x 9½
AD 3067	1.000	40	12¾ x 9 x 9½
AD 3068	.250	50	13¼ x 7¼ x 6½
AD 3069	.500	50	13¼ x 7¼ x 8¾
AD 3070	.750	50	14½ x 7½ x 9½
AD 3071	1.000	50	14¾ x 9 x 9½

TRANSFORMER REACTORS





SPECIAL PURPOSE TRANSFORMERS

We design and manufacture to customers' specifications a wide variety of High Voltage. Low Capacity Filament Transformers, and Hermetically Sealed units

OVER 3500 PROVEN AND TESTED TRANSFORMER DESIGNS AVAILABLE

SEND FOR DEL ELECTRONICS NEW CATALOG ON

CAPACITORS

SILVERCAP® • HERMETIC SEALED • PRECISION CERAMIC & BAKELITE CASED • ENERGY STORAGE ○ DELMICA ○ DELPLATE

MULTISYN® — INDUCTOSYN®

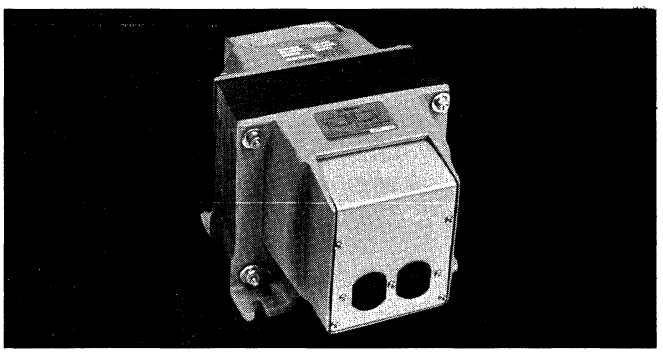
PRECISION ANGLE SENSING, CONTROL, AND DIGITIZING COMPONENTS. ACCURACIES TO 0.5 SECOND OF ARC.

DEL ELECTRONICS CORP.
250 E. Sandford Blvd.
MOUNT VERNON, N.Y.
914 - 699-2000 TWX: 710-562-0130

DELTEC CORPORATION

POWER CONVERSION
DC MOTOR CONTROLS
MEDICAL ISOLATORS

SUPER-ISOLATION TRANSFORMERS



- STOP LINE NOISE
- ELIMINATE POWER AND SYSTEM GROUND LOOPS
- REMOVE ELECTROMAGNETIC NOISE

COMMON-MODE REJECTION: >140 dB
LOAD REGULATION: ±5%
POWER FACTOR: +.75 to -.75

60 Hz SINGLE PHASE MODELS

Model Number	Interwinding Capacitance	Power (VA)	Input/Output	Price Each
DT25R1 & DT25T1	.001 pf	250	120/120	95.00
DT25R5 & DT25T5	.0005 pf	250	120/120	125.00
DT50R1 & DT50T1	.001 pf	500	120/120	100.00
DT50R5 & DT50T5	.0005 pf	500	120/120	140.00
DT100R1 & DT100T1	.001 pf	1000	120/120	170.00
DT100R5 & DT100T5	.0005 pf	1000	120/120	205.00
DT250R1 & DT250T1	.001 pf	2500	120/120	240.00
DT250R5 & DT250T5	.0005 pf	2500	120/120	300.00
DT251R1 & DT251T1	.001 pf	2500	240/120	265.00
DT251R5 & DT251T5	.0005 pf	2500	240/120	330.00
DT500T1	.001 pf	5000	120/120	395.00
DT500T5	.0005 pf	5000	120/120	490.00
DT501T1	.001 pf	5000	240/120	435.00
DT501T5	.0005 pf	5000	240/120	540.00

ISOLATED AC LINE CONDITIONERS

IVACON®

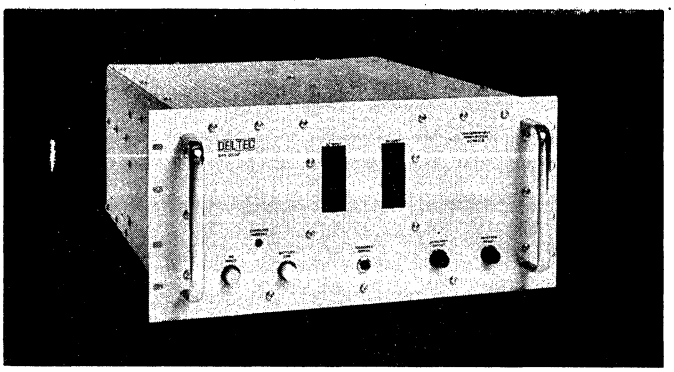
The Deltec IVACON® LINE CONDITIONERS have been designed as economical means to deliver REGULATED, TRANSIENT-FREE power with maximum COMMON-MODE ISOLATION to computer and instrumentation systems. The IVACON® eliminates BROWNOUT problems and reduces LINE TRANSIENTS caused by down-line equipment such as SCR's, solenoids, arc welders, elevators, fluorescent lamps, and other switching devices.

REGULATION: ±5% LINE AND LOAD
ISOLATION: >120 dB; .005 pf
NOISE SUPPRESSION: >120 dB, 10 kHz AND ABOVE

	Input		Output					
Model	Volts AC	Freq. Hz	Volts AC	Power VA	H In.	W In.	D In.	Price $
DLC-1260	90-135	58-62	115	1200	7	17	12	625.00
DLC-1262	190-270	58-62	230	1200	7	17	12	650.00
DLC-1860	90-135	58-62	115	1800	8¾	17	14	865.00
DLC-1862	190-270	58-62	230	1800	8¾	17	14	890.00
DLC-3060	90-135	58-62	115	3000	14	17	19	1175.00
DLC-3062	190-270	58-62	230	3000	14	17	19	1225.00
DLC-5060	90-135	58-62	115	5000	24½	17	19	1685.00
DLC-5062	190-270	58-62	230	5000	24½	17	19	1735.00

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)
2775 KURTZ STREET SAN DIEGO, CALIFORNIA 92110 TELEPHONE (714) 297-4466

UNINTERRUPTIBLE POWER SYSTEMS



MODEL DSU-710

- NO-BREAK POWER
- LOAD ISOLATION
- REGULATED STABLE POWER
- SELF-CONTAINED
- MAINTENANCE-FREE
- AUTOMATIC TRANSFER SWITCH
- MONITOR AND ALARM INDICATORS

	DSU-710	DSU-1210	DSU-1810
INPUT			
Volts	120 VAC ±10%	120 VAC ±10%	120 VAC ±10%
Current (max)	15	26	38
Frequency	47-63	47-63	47-63
OUTPUT			
Volts	120 VAC ±5%	120 VAC ±5%	120 VAC ±5%
Frequency	60 Hz ± .25%	60 Hz ± .25%	60 Hz ± .25%
Distortion (max)	5%	5%	5%
Power (VA)	700	1200	1800
BATTERIES			
Backup Time	5 min	10 min	10 min
Recharge Time	2 hrs 50%, 6 hrs 100%	2 hrs 50%, 6 hrs 100%	2 hrs 50%, 6 hrs 100%
PACKAGE	8¾ x 17 x 19	14 x 17 x 19	24½ x 17 x 19
PRICE EACH	1350.00	1975.00	2995.00

DC TO AC INVERTERS

- SILICON SOLID STATE
- INPUT/OUTPUT PROTECTION
- 30,000 Hr MTBF

- REGULATION: ±5% LINE AND LOAD
- FREQUENCY STABILITY: ±.25%
- THD: <5%
- OPERATING TEMPERATURE: -10°C TO 55°C

Model Number	Input VDC	Power VA	Output VAC/Hz	Price Each
DT 301	12/24	300	115/60	450
DT 302	48	300	115/60	435
DT 303	125	300	115/60	450
DT 701	12/24	700	115/60	615
DT 702	48	700	115/60	595
DT 703	125	700	115/60	615
DT 1201	12/24	1200	115/60	995

Model Number	Input VDC	Power VA	Output VAC/Hz	Price Each
DT 1202	48	1200	115/60	925
DT 1203	125	1200	115/60	950
DT 1802	48	1800	115/60	1650
DT 1803	125	1800	115/60	1675
DT 3002	48	3000	115/60	2995
DT 3003	125	3000	115/60	2995
DT 5003	125	5000	115/60	3450

Note: Special input/output voltage, frequency and power are available on request.

DELTEC CORPORATION

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200
(IN N. Y. STATE CALL COLLECT (516) 294-0990)
2775 KURTZ STREET SAN DIEGO, CALIFORNIA 92110 TELEPHONE (714) 297-4466

DYNAGE OPEN FRAME POWER SUPPLIES

WHERE QUALITY IS NOT EXPENSIVE

Dynage single, dual, triple output M Series Power Supplies featuring:

- Integrated circuit control
- High power per dollar ratio
- High MTBF. Few components
- Construction:
  Anodized aluminum chassis
  Glass-Epoxy FR-4 PC boards
  Computer — grade electrolytics
  Teflon wiring

Specifications:

Input:
105-125 VAC-47 to 420 Hz.
Optional: 210-250 VAC.

Output:
See models and ratings.

Adjust Range:
± 5% at ratings listed.

Regulation:
Line only ± .05% (10 VAC change from nominal).
Load only ± .2% (0 to full load).
+ .1% (50% load change).

Remote Sense:
Optional.

Ripple and Noise (PARD):
5 + 15 volt outputs — 1 mv rms max.
5 mv P-P max.
24 volt sections — 3 mv rms max.
15 mv P-P max.

Temperature:
- Operating 0°C to 71°C with ratings at:
  0° to + 40°C — full rating.
  + 50°C — 75% rating.
  + 60°C — 50% rating.
  + 71°C — 35% rating.
- Storage −20°C to + 85°C.

Temperature Coefficient:
± 0.02% per degree C maximum.

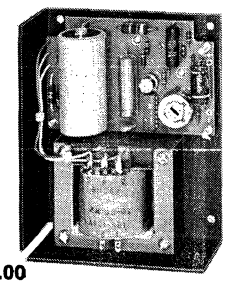
Stability:
0.1% for 8 hours after warm-up.

Short Circuit and Overhead Protection:
Standard.

Transient Response:
10 microseconds for 25% load change, typical.

Type MA

Single Output

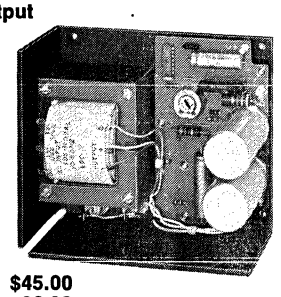


Price 1-9 $29.00
100 23.20

Model No.	DC Volts	Output AMPS
MA5-3	5	3
	6	2.5
MA15-1.3	12	1.5
	15	1.3
MA24-1	18	1.0
	20	1.0
	24	1.0

Type MB

Single Output

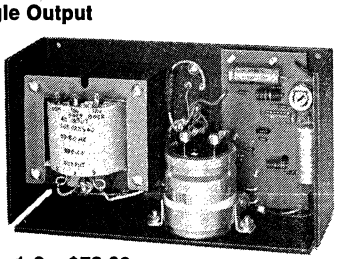


Price 1-9 $45.00
100 36.00

Model No.	DC Volts	Output AMPS
MB5-6	5	6
	6	5
MB15-2.8	12	3.0
	15	2.8
MB24-2.3	18	2.0
	20	2.3
	24	2.3

Type MC

Single Output

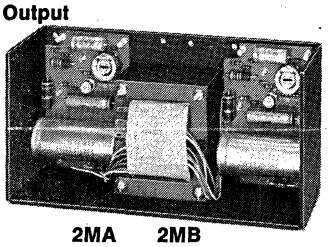


Price 1-9 $72.00
100 36.00

Model No.	DC Volts	Output AMPS
MC5-12	5	12
	6	10
MC15-6	12	6.5
	15	6.0
MC24-5	18	4.5
	20	5.0
	24	5.0

Type 2M

Dual Output

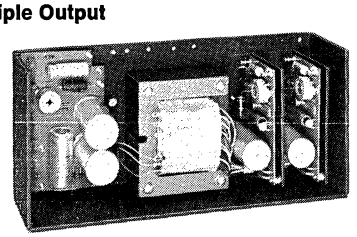


	2MA	2MB
Price 1-9	$48.00	$85.00
100	38.40	68.00

Model No.	DC Volts	Output AMPS
2MA12	± 12	1.5
2MA15	± 15	1.3
2MB12	± 12	3.0
2MB15	± 15	2.8

Type 3M

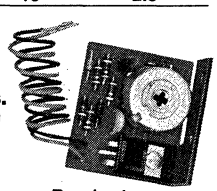
Triple Output



	3MA	3MB	3MC
Price 1-9	$90.00	$130.00	$155.00
100	72.00	104.00	124.00

Model No.	DC Volts	Output AMPS
3MA5-12	5	6
	± 12	1.5
3MA5-15	5	6
	± 15	1.3
3MB5-12	5	12
	± 12	1.5
3MB5-15	5	12
	± 15	1.3
3MC5-12	5	12
	± 12	3
3MC5-15	5	12
	± 15	2.8

Overvoltage Protectors fit all M Series models.
Price 1-9 $8.00
Model MVP-1



Other quality Dynage Products:

System power supplies and voltage references. Write for Catalog 73-1.

Solid State logic systems for industrial controls. Write for Bulletin PB2-72.

DYNAGE

Dynage Inc., 1331 Blue Hills Ave.
Bloomfield, Connecticut 06002
Telephone (203) 243-0315
TWX 710-425-6063

It's your move. Don't be checkmated.

Your selection of a power supply source is a crucial one. Make sure you know who you are doing business with.

We engineer custom power supplies to some of the highest standards in the industry. We do this by combining our wealth of systems and power experience with a determination to produce reliable and cost effective design.

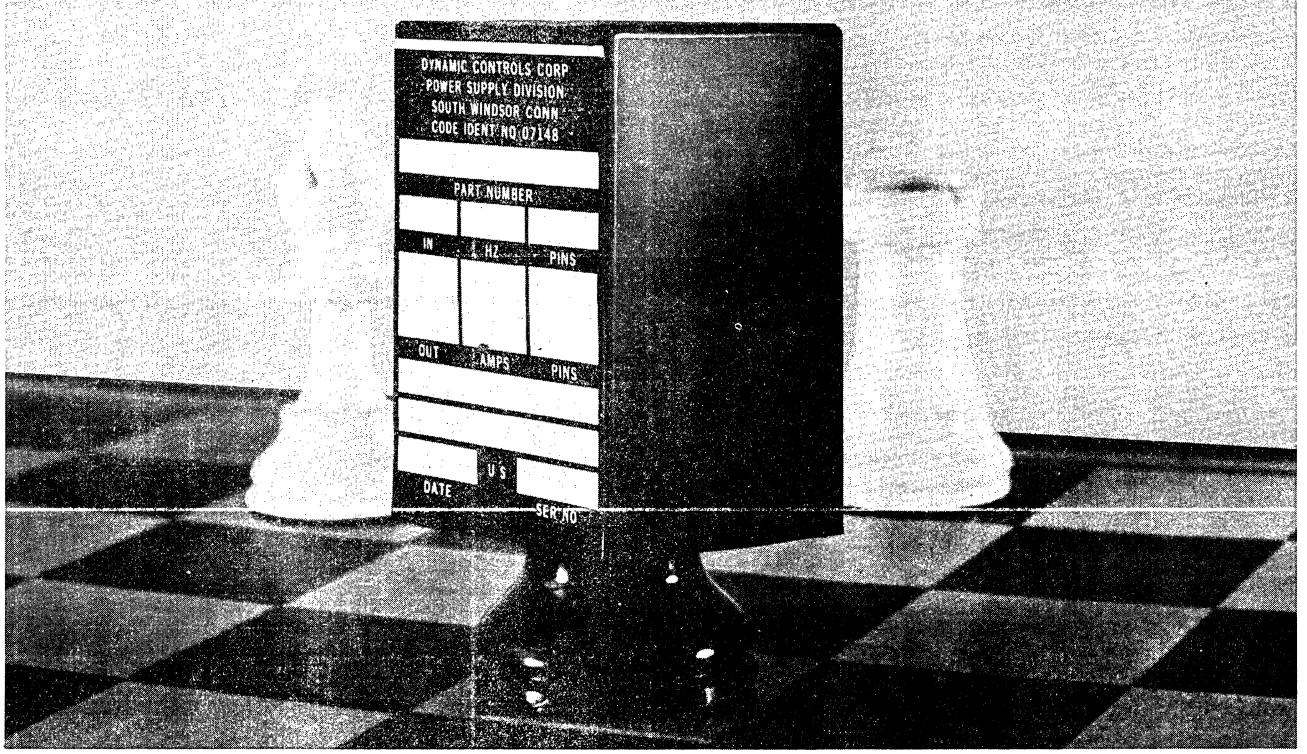
Dynamic Controls Corporation's power supplies are found throughout the world in both commercial and fully qualified military applications.

Our production facilities are amongst the most modern and up-to-date in the industry and are geared to meet your delivery requirements. Our Quality Assurance system meets the requirements of MIL-Q-9858A and is continually audited by the government.

Custom power supplies are standard with Dynamic Controls.

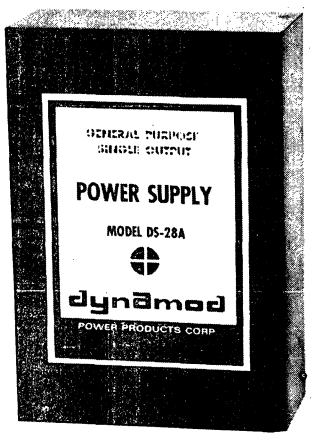
DYNAMIC CONTROLS CORPORATION

8 Nutmeg Road
South Windsor, Ct. 06074
(203) 289-6807



dynamod
POWER PRODUCTS CORP.

MINIATURE MODULAR ENCAPSULATED DC POWER SUPPIES



ULTRA-RELIABLE, COMPACT, RUGGED, LOW COST AND OFF THE SHELF DELIVERY

DESCRIPTION

The Dynamod Corp. modular miniaturized encapsulated power supplies are a series of regulated DC power supplies which, in addition to their high performance qualities, are ultra-reliable, compact, rugged and moderate in price.

All Dynamod encapsulated power supplies are "potted" with an aluminum oxide filled epoxy. This is among one of the many superior construction techniques which allow higher heat conduction to insure highly reliable operation and virtually any environmental condition.

The Dynamod power supplies are available with either single or dual outputs. The output voltage and current ranges of the Dynamod power supplies provide the user with maximum versatility. Over 56 models are available in voltages from 3.6 VDC to 28 VDC with currents to 2 amp. These modules are particularly appropriate for use in todays modern applications. Common uses are to power Operational Amplifiers, Digital Logic, Shift Registers, ROM's, RAM's A to D converters, D to A converters, and other signal conditioning instrumentation.

The Dynamod encapsulated series are packaged in the standard rectangular case to save PC board area for more compact designs.

Whatever your choice, single output or dual output, each one of these miniature DC power supplies is backed by Dynamod's standard of excellence.

IC LOGIC SINGLE OUTPUT POWER SUPPLIES

Model	Output Voltage	Current (MA)	Case (FIG)	Price
DS-3.6B	3.6	250	4	$39.75
DS-5AL	5	125	4	29.75
DS-5BL	5	250	4	37.75
DS-5CL	5	250	2	37.75
DS-5H-OV	5	500	2	43.75
DS-5J-OV	5	1000	3	63.75
DS-5M-OV	5	1500	3	89.75
DS-5P-OV	5	2000	5	99.75
DS-6B	6	200	4	39.75

GENERAL PURPOSE SINGLE OUTPUT POWER SUPPLIES

Model	Output Voltage	Current (MA)	Case (FIG)	Price
DS-10A	10	120	1	$26.75
DS-12A	12	100	1	26.75
DS-15A	15	100	1	26.75
DS-18T	18	65	1	26.75
DS-20A	20	60	1	26.75
DS-24A	24	50	1	26.75
DS-28A	28	40	1	26.75

DUAL OUTPUT OP AMP POWER SUPPLIES

Model	Output Voltage	Current Each Side (MA)	Case (FIG)	Price
DT-12D	±10	120	2	$54.75
DT-10D	±10	240	3	59.75
DT-12D	±12	120	2	54.75
DT-12E	±12	240	3	72.75
DT-15J	±15	25	2	26.75
DT-15B	±15	65	2	39.75
DT-15A	±15	100	2	43.75
DT-15W	±15	150	3	54.75
DT-15N	±15	200	3	69.75
DT-15P	±15	300	5	96.75
DT-18C	±18	65	3	59.75

All Dynamod Models stocked in depth for **Same Day Shipment.**

BOX 152 · LITTLE FERRY, NEW JERSEY 07643 · PHONE: (201) 440-9112

SPECIFICATIONS

INPUT VOLTAGE: 115 ±10 VAC, 50-400 cps.

OUTPUT VOLTAGE: Up to 200 VDC. (See charts).

OUTPUT CURRENT: Up to 2 Amps. (See charts).

LOAD REGULATION: ±0.015% (NL-FL) above 10 VDC. ±0.035% (NL-FL) up to 10 VDC.

LINE REGULATION: ±0.015% (NL-FL) above 10 VDC. ±0.02% (NL-FL) up to 10 VDC.

RIPPLE: Less than 500 microvolts up to 15 VDC. Less than 1.0 mv above 15 VDC.

OPERATING TEMPERATURE RANGE: 0-71°C.

STORAGE TEMPERATURE: −25°C to +85°C.

OUTPUT IMPEDANCE: 0.2 ohms @ 10 KHz.

TEMPERATURE COEFFICIENT: 0.02%/°C Max.

OUTPUT CURRENT VC TEMPERATURE: Each output is rated for full current at temperatures between −20°C and +50°C and is linearly derated from +50° to 70% of the full output at +71°C.

SHORT CIRCUIT PROTECTION: The Dynamod Series power supplies are ruggedly constructed, and designed with built-in short circuit protection to withstand substantial overloads for reasonable periods of time. The output can be shorted without causing damage to the power supply. However, prolonged operation with the supply overload or shorted is not recommended.

PRECISION OUTPUT ADJUST: The output voltage of each supply is factory set to within ±2% of the specified voltage. The TRIM connection, where provided, allows a means of externally adjusting the output voltage precisely to the labeled voltage.

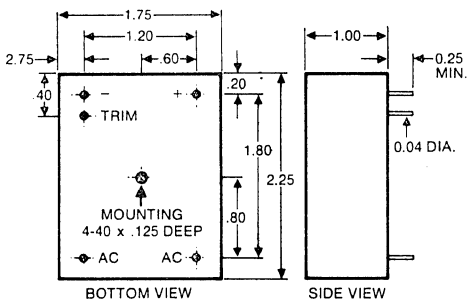


Fig. 1

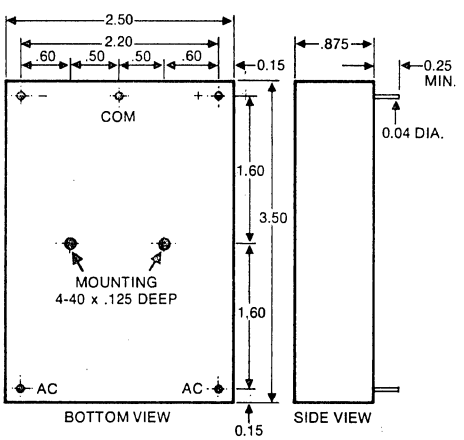


Fig. 2

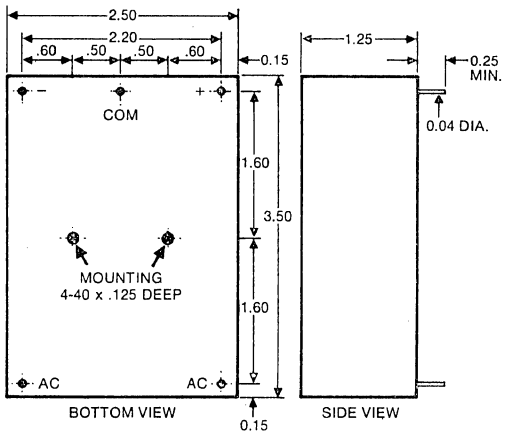


Fig. 3

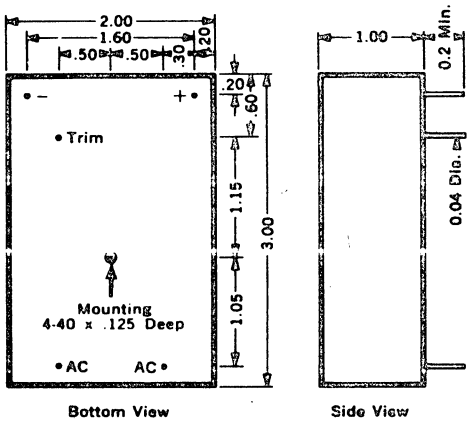


Fig. 4

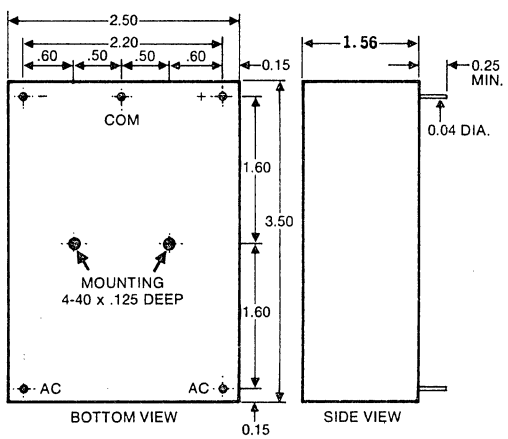


Fig. 5

Introducing
D.I.A.L. EEM:

Your Instant Source of Product Information

One swift, toll-free call is all it takes.

Dial 800-645-9200

Or, in N. Y. State, call 516 - 294-0990 collect.

Immediately, our technical operators will tell you where you can find the products and services you need. They will provide you with the name of the supplier in your area, and direct you to the appropriate white pages of EEM for additional product catalog data.

This vital information is yours, at absolutely no cost.

It's a service of the EEM System:
Keeping you better informed.

United Technical Publications
645 Stewart Ave., Garden City, N. Y. (516) 248-9700

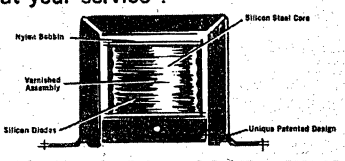
WALL PLUG-IN LOW VOLTAGE

CONVERTERS/INVERTERS/CHARGERS

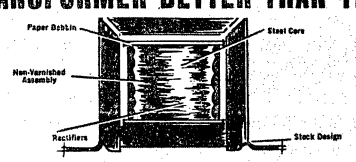
To insure high quality and top performance in our plug-in power supplies and chargers, we make our own low voltage

TRANSFORMERS

using superior materials in a smaller sized unit. The years of successfully satisfying the unique needs of the industry with specialty transformers is "at your service".



WHY IS THIS LOW COST DYNAMIC TRANSFORMER BETTER THAN THIS



STOCK TRANSFORMER COSTING MORE.

In addition to those advantages already pointed out, DYNAMIC TRANSFORMERS can be made to your SPECIFICATIONS in days and in most cases with NO COST for prototypes.

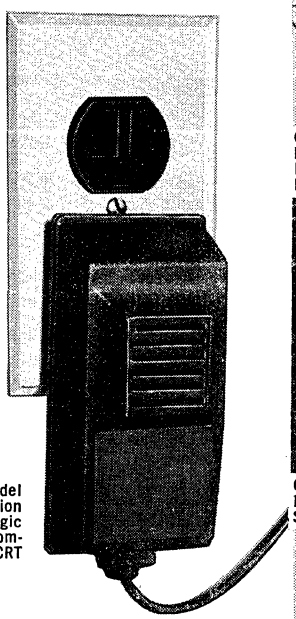
TRANSFORMERS FOR ALL REASONS

- ☐ Patented, U/L listed
- ☐ Internal or External
- ☐ Wall-mounted
- ☐ Fast-charging
- ☐ Power conversion
- ☐ Conversion/charging
- ☐ Printed circuit
- ☐ Sub-miniature
- ☐ Ferro-resonant
- ☐ Multi-input
- ☐ Multi-output

THE TRANSFORMATION OF POWER

A unique brochure explaining the many advantages and application possibilities of Dynamic's patented U/L listed transformers, converters, chargers and power supplies, technical data sheets and bulletins, are available on specific products. A request on your letterhead or phone our Sales Engineering Department WPX-1.

Designed to be listed under the U/L • CSA SPECIFICATIONS



Illustrated at right is the Model 3-1743 presently in production for use with a keyboard logic circuit. Suitable for minicomputers, calculators, remote CRT terminals, etc.

Dynamic Instrument Corp. has designed, developed and patented a complete range of low-voltage, filtered, transistor-regulated power supplies and chargers designed to supply the necessary power to a vast variety of Electronic equipment.

Utilizing a wall plug-in type unit eliminates or greatly reduces the problems involved with UL listing your product. They also remove the major heat source, reduce size and weight, and also greatly increase your design flexibility. The latest design applications of the Dynamic wall plug-in supplies are in conjunction with such sophisticated equipment as mini-computers, calculators, keyboard logic circuits, and remote CRT Terminals.

Just call or write: Dept. WPX-1.

Dynamic's product range and capabilities also cover:

POWER CONVERSION
AC-AC for products requiring low-level AC voltage. AC-DC for small electric motor driven products that do not use batteries.

SECONDARY BATTERY CHARGING
Dynamic Chargers for charging Nickel-Cadmium; Lead-Acid and Manganese-Alkaline Batteries.

AC-DC CONVERSION/CHARGING
Dynamic Converter-Chargers providing rechargeability or instant use of battery operated products.

FAST CHARGING SYSTEMS
Dynamic design and production capability relative to Fast Charging Systems.

TRANSFORMERS
Internal, External and Wall-Mounted Dynamic Transformers.

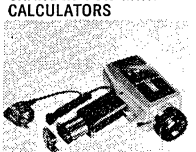
SPECIALTY TRANSFORMERS
Dynamic Plug-In, Printed Circuit Transformers; Sub-Miniature Transformers; Ferro-resonant Transformers; Multi-Input Voltage and Multi-Output Voltage Transformers.

CONVERTER/CHARGER FOR PORTABLE MEDICAL-ELECTRONIC EQUIPMENT

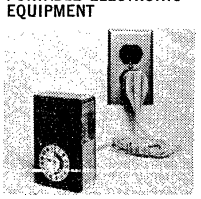
CHARGER FOR BATTERY ELECTRIC-STARTER SYSTEMS

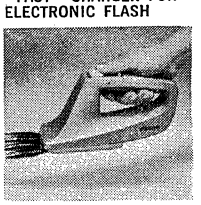
CHARGER FOR BATTERY OPERATED TOYS

CONVERTER/"FAST" CHARGER FOR MINI-CALCULATORS


CONVERTER/CHARGER FOR MOTER DRIVEN CAMERAS

AC CONVERTER FOR PORTABLE ELECTRONIC EQUIPMENT


"FAST" CHARGER FOR ELECTRONIC FLASH



DYNAMIC INSTRUMENT CORP.

TWX 510-224-6482 CABLE ADDRESS "DYNINST" PLAINVIEW, N. Y.

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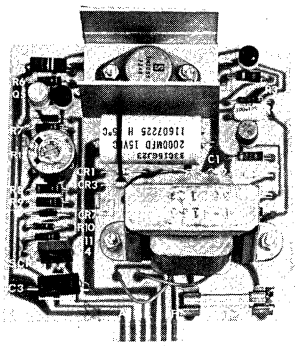
Plainview, N. Y. 11803
516 - 694-6000

elasco
oem power supplies

OEM 5 WATT SERIES PLUG-IN CARD MODULES



1 to 9 $29.00 ea.

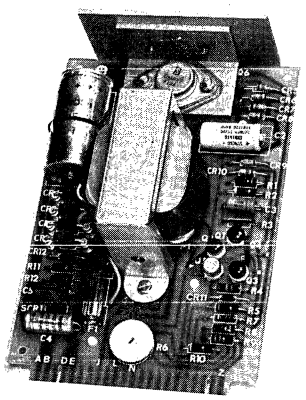
SPECIFICATIONS:

Input:	115 VAC 60-400Hz
Output:	See chart
Line Regulation:	0.1% Max.
Load Regulation:	0.1% Max.
Ripple:	3MV. RMS Max.
Stability:	±0.1% after warm up
Response time:	50μ Sec. Typical
Temp. Coefficient:	0.02%°C
Operating Temp:	—20°C to +50°C
Storage Temp:	—20°C to +85°C
Overload Proctection:	Current limit/fold back
Over Voltage Option:	SCR-Crowbar
Remote Sensing:	
Recommended Connectors:	
Chassis Mount — Cinch Jones #50-6A-20	
Basket Mount — Cinch Jones #50-22A-20	
Dimensions: 4½"x4½"x1¾".	

MODEL	VOLTAGE	CURRENT
Lic 5 - 1A	4.75 - 5.25	1.0 AMP
Lic 6 - 1A	5.75 - 6.25	1.0 AMP
Lic 10 - .5A	9.5 - 10.5	0.5 AMP
Lic 12 - .5A	11.5 - 12.5	0.5 AMP
Lic 15 - .4A	14.5 - 15.5	0.4 AMP
Lic 18 - .35A	17.5 - 18.5	0.35 AMP
Lic 20 - .30A	19.5 - 20.5	0.30 AMP
Lic 24 - .25A	23.5 - 24.5	0.25 AMP
Lic 28 - .2A	27.5 - 28.5	0.2 AMP

NOTE:
For over voltage option add suffix "B" to Model No. and $4.00 to base price.
For 230 VAC 50 Hz input Add suffix "F" to Model No. and $2.00 to base price.

OEM 15 WATT SERIES PLUG-IN CARD MODULES



1 to 9 $43.00 ea.

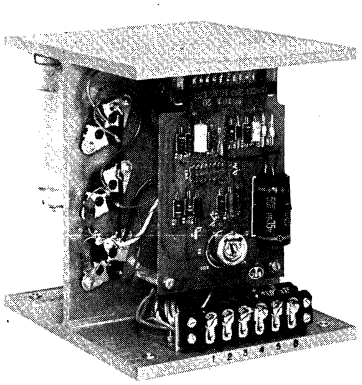
SPECIFICATIONS

Input:	115 VAC, 50 to 400 Hz
Line Regulation:	.05% Max.
Load Regulation:	.05% Max.
Ripple & Noise:	3MV. RMS Max.
Stability:	±0.1% after warm up
Temp. Coefficient:	.02%°C
Operating Temp:	—20°C to +50°C
Storage Temp:	—20°C to +85°C
Overload Protection:	Current limit/fold back
Over Voltage Option:	SCR-Crowbar
Remote Sensing:	
Recommended Connector:	
Cinch Jones #50-22A-20 or equal.	
Dimensions: 4½"x6⅝"x2 13/16".	

MODEL	VOLTAGE	CURRENT
Lic 5 - 3A	4.5 - 5.5	3.0 AMP
Lic 6 - 3A	5.5 - 6.5	3.0 AMP
Lic 10 - 1.5A	9.5 - 10.5	1.5 AMP
Lic 12 - 1.25A	11.5 - 12.5	1.25 AMP
Lic 15 - 1A	14.5 - 15.5	1.0 AMP
Lic 18 - 0.85A	17.5 - 18.5	0.85 AMP
Lic 20 - 0.75A	19.5 - 20.5	0.75 AMP
Lic 24 - 0.65A	23.5 - 24.5	0.65 AMP
Lic 28 - 0.5A	27.5 - 28.5	0.5 AMP

NOTE: For over voltage option add suffix "B" to Model No. and $7.00 to base price.
For 230 VAC 50 Hz input add suffix "F" to Model No. and $2.00 to base price.
For 115/230 VAC 50 Hz input add suffix "SP" to Model No. and $4.00 to base

OEM 35/50 WATT SERIES H-BEAM MODULES



1 to 9 from $55.00 ea.

SPECIFICATIONS

Input:	115 VAC, 50 to 400 Hz
Output:	See chart
Line Regulation:	0.1% Max.
Load Regulation:	0.1% Max.
Ripple:	3MV. RMS Max
Stability:	±0.1% after warm up
Response time:	50μ Sec. Typical
Temp. Coefficient:	0.02%°C
Operating Temp:	—20°C to +50°C
Storage Temp:	—20°C to +85°C
Overload Protection:	Current limit/fold back
Over Voltage Option:	SCR-Crowbar
Remote Sensing:	
Dimensions: 5"x6"x6".	

MODEL	VOLTAGE	CURRENT
Lic 3.6 - 7A	3.3 - 4.0	7 AMP
Lic 5 - 7A	4.75 - 5.25	7 AMP
Lic 6 - 7A	5.5 - 6.5	7 AMP
Lic 10 - 4A	9.5 - 10.5	4 AMP
Lic 12 - 4A	11.5 - 12.5	4 AMP
Lic 15 - 3A	14.5 - 15.5	3 AMP
Lic 18 - 3A	17.5 - 18.5	3 AMP
Lic 20 - 2.5A	19.5 - 20.5	2.5 AMP
Lic 24 - 2A	23.5 - 24.5	2 AMP
Lic 28 - 2A	27.5 - 28.5	2 AMP

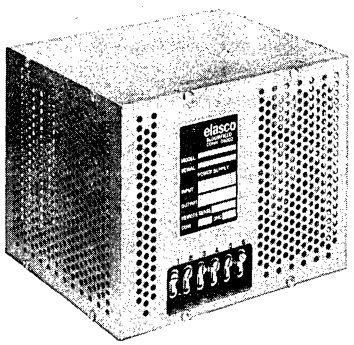
NOTE: For over voltage option add suffix "B" to Model No. and $9.00 to base price.
For 230 VAC 50 Hz input add suffix "F" to Model No. and $2.00 to base price.
For 115/230 VAC 50 Hz input add suffix "SP" to Model No. and $4.00 to base

NOTE: If the voltage you require is not listed above, send us your specifications and we will build a power supply to meet your needs.

NOTE: Quantity prices, consult factory.

Elasco Division of Buchbinder Corp. Box 276 Bloomfield, Connecticut 06002 203/242-0708

elasco
guaranteed 10 years



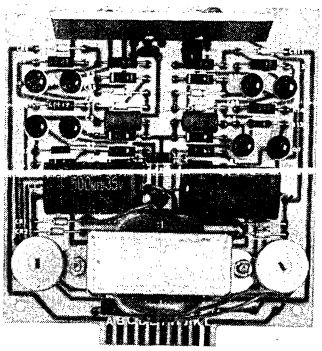
OEM 100/150 WATT SERIES H-BEAM MODULES

1 to 9 from $100.00 ea.

SPECIFICATIONS	
Input:	115 VAC, 50 to 400 Hz
Output:	See Chart
Line Regulation:	0.1% Max.
Load Regulation:	0.1% Max.
Ripple:	3MV. RMS Max.
Stability:	±0.1% after warm up
Response time:	50μ Sec. Typical
Temp. Coefficient:	0.02% °C
Operating Temp:	—20°C to +50°C
Storage Temp:	—20°C to +85°C
Overload Protection:	Current limit/fold back
Over Voltage Option:	SCR-Crowbar
Remote Sensing:	
Dimensions: 7½″x6″x6″.	

MODEL	VOLTAGE	CURRENT
Lic 3.6 - 20A	3.3 - 4.0	20 AMP
Lic 5 - 20A	4.75 - 5.25	20 AMP
Lic 6 - 20A	5.5 - 6.5	20 AMP
Lic 10 - 14A	9.5 - 10.5	14 AMP
Lic 12 - 12A	11.5 - 12.5	12 AMP
Lic 15 - 10A	14.5 - 15.5	10 AMP
Lic 18 - 8A	17.5 - 18.5	8 AMP
Lic 20 - 7A	19.5 - 20.5	7 AMP
Lic 24 - 6A	23.5 - 24.5	6 AMP
Lic 28 - 5A	27.5 - 28.5	5 AMP

NOTE: For over voltage option add suffix "B" to Model No. and $14.00 to base price.
For 230 VAC 50 Hz input add suffix "F" to Model No. and $2.00 to base price.
For 115/230 VAC 50 Hz input add suffix "SP" to Model No. and $4.00 to base.



DUAL OUTPUT PLUG-IN CARD MODULES

1 to 9 from $36.00 ea.

SPECIFICATIONS	
Input:	115 VAC, 60 to 400 Hz
Line Regulation:	0.1% Max.
Load Regulation:	0.1% Max.
Ripple & Noise:	2MV. RMS Max.
Stability:	±0.1% after warm up
Temp. Coefficient:	.02% °C
Operating Temp:	—20°C to +50°C
Storage Temp:	—20°C to +85°C
Short Circuit Proof:	
Tracking Outputs:	

NOTE: For 230 VAC 50 Hz input add suffix "F" to Model No. and $2.00 to base price.

MODEL	VOLTAGE	CURRENT
2Q 12 - 100 PC	±11 - 13 V	100MA/Output
2Q 12 - 250 PC	±11 - 13 V	250MA/Output
2Q 15 - 100 PC	±14 - 16 V	100MA/Output
2Q 15 - 250 PC	±14 - 16 V	250MA/Output
2Q 18 - 200 PC	±17 - 19 V	200MA/Output

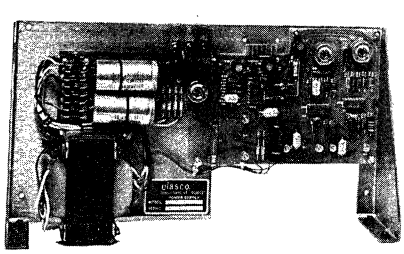
DIMENSIONS:

4½″x4½″x1½″	2Q 12 - 100 PC
4½″x4½″x1¾″	2Q 12 - 250 PC
4½″x4½″x1½″	2Q 15 - 100 PC
4½″x4½″x1¾″	2Q 15 - 250 PC
4½″x4½″x1¾″	2Q 18 - 200 PC

NOTE: If the voltage you require is not listed above, send us your specifications and we will build a power supply to meet your needs.

NOTE: Quantity prices, consult factory.

We also build Custom Power Supplies....



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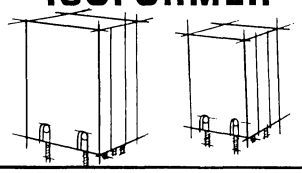
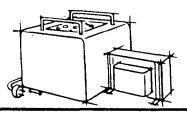
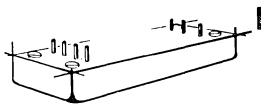
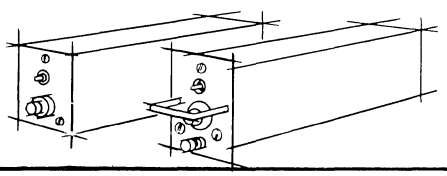
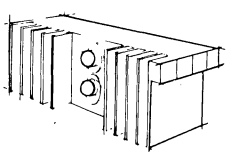
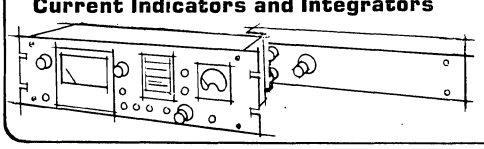
Elcor ISOLATION*...LOW NOISE
DC POWER AND TRANSFORMER MODULES

PRODUCT	FEATURES	USES
ISOLATION TRANSFORMERS		
ISOFORMER® 	■ High degree of direct capacitive and conductive isolation. ■ Efficient transfer of energy. ■ Low leakage current. ■ Low primary to secondary capacitance. ■ Line isolation to secondary <.001 pF. ■ Leakage resistance—$10^{12}\Omega$. ■ 6.3 to 600 volt output for 4 and 25 watt models. ■ Unique air-gap construction eliminates primary-to-secondary shorts.	■ Low-noise power supplies. ■ Bridge circuits. ■ Medical instrumentation. ■ Systems ground loop elimination. ■ Electrometer circuits, tube filament supplies.
POWER Isolation Transformers 	■ Eliminate unwanted noise in ground circuits. ■ Provide low leakage currents. ■ Isolate measurement circuits from common-mode noise. ■ Available up to 6 KVA.	■ Hospital safety programs. ■ Low noise applications. ■ Instrument isolation.
FLATPACK Isolation Transformers 	■ Small—1.25 in. x 2.5 in. x 3.5 in. ■ Low leakage current. ■ Interwinding capacitance <.05 pfd. ■ PC board pins—cables optional. ■ Dual output—5 to 60 volts—combined for 10 to 120 volts. ■ 7.5 VA Series available.	■ Medical instrumentation. ■ Compact low-noise power supplies. ■ Bridge circuit supplies.
DC POWER MODULES		
ISOPLY® Power Modules 	■ Highly isolated dc supplies. ■ Input to output coupling <.05 pfd. ■ From 1 to 300 vdc, 2 to 800 ma output. ■ Ripple less than 0.005%. ■ Regulation to 0.02%. ■ Low temperature coefficient. ■ Remote sensing. ■ Plug-in, chassis, or rack mounted. ■ 1.5 and 8 watt Series available.	■ Battery substitutes. ■ Precision measurement circuits. ■ Bridge circuits. ■ Low-level measurements. ■ Ungrounded amplifiers. ■ Hall effect power isolation. ■ Ground loop decoupling. ■ Voltage references.
SPECIAL POWER SUPPLIES 	■ Designed and produced to your specifications. ■ Isolated, floating or grounded. ■ Multiple or single outputs. ■ From 1 to 100 watts. ■ Convection, conduction or forced air cooling. ■ Fast response for prototypes.	■ OEM power supplies. ■ System or instrument power. ■ Laboratory or field environment supplies.
MEDICAL INSTRUMENT LOW-LEAKAGE POWER PACKS		
OPTION "H" **ISOFORMER®** Isolation Transformers **ISOPLY®** Power Modules **POWER** Isolation Transformers	This modification, available on all ELCOR Isolation units, has been developed to meet the requirements of the Medical Electronics industry which requires low leakage current between the power primary and ground, as well as between the primary and all secondary circuits. ■ Low Noise ■ Low Leakage ■ Protection against primary to secondary shorts.	■ Design and mfr. of devices to meet UL Subject 544 and AAMI Safe Current Limit Std. ■ Testing of devices to these specifications. ■ Mfr. or modification of any "safe" electrical equipment.
INSTRUMENTS		
Current Indicators and Integrators 	■ Integrates any proportional current or voltage. ■ Sensitive and accurate current meter (to 3×10^{-10} amp sensitivity.) ■ Internal calibration. ■ Developed for use with high voltage particle accelerators. ■ Pulsed current filter also available.	■ Precision measurement. ■ Integration of proportional current or voltage, such as radiation, temperature, etc. ■ Automatic process control. ■ Ion-Implantation Systems.

*Power modules with output circuitry highly isolated conductively and capacitively from ground (case) and ac input. Battery equivalent with variable voltage.

Elcor 2431 Linden Lane, P.O. Box 986, Silver Spring, Maryland 20910/(301) 589-6614
Products by Welex Electronics,
A Halliburton Company

EDC ADVANCED TECHNOLOGY

EDC is engaged in the custom design and manufacture of miniature, high efficiency power supplies for systems requirements. EDC's total resources have provided a 10-year history of field-proven performance and reliability, even in the most stringent environments.

EDC's advanced research, design and production facilities include in-house transformer manufacture, machine and metal shops and automated electronic assembly areas. All electronic products and systems are manufactured under the highest standards of excellence, MIL-Q-9858-A.

Some Facts About EDC:

- 17-years operation
- New 80,000 sq. ft. facility
- Annual sales volume exceeds $10 million
- 400 employees
- Extensive investment in modern test equipment for testing EMI, temperature, humidity, shock, vibration, etc.

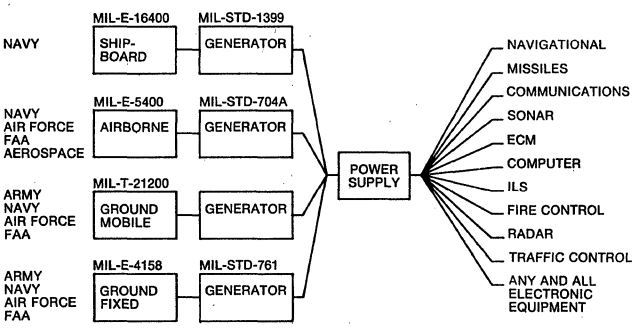
Low Voltage Power Supplies

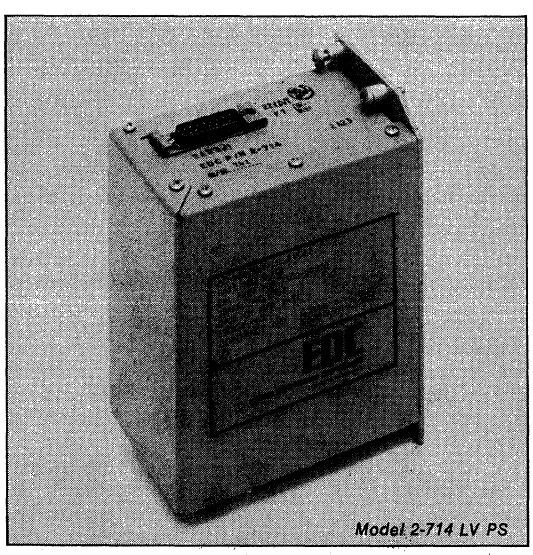
EDC continues to advance the state of the art in switching regulator power supply technology, thus enabling us to supply the smallest size and lowest weight power supplies available, with no sacrifice in reliability.

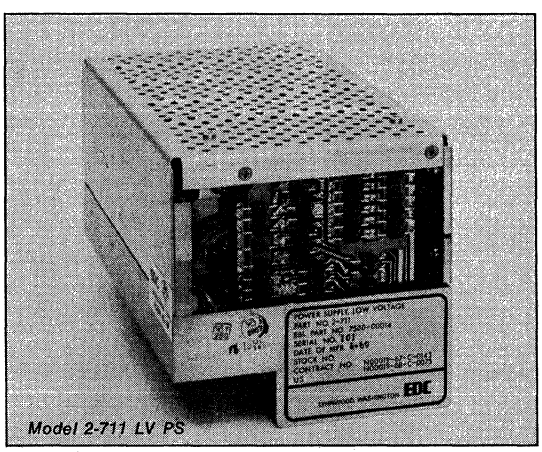
Features:

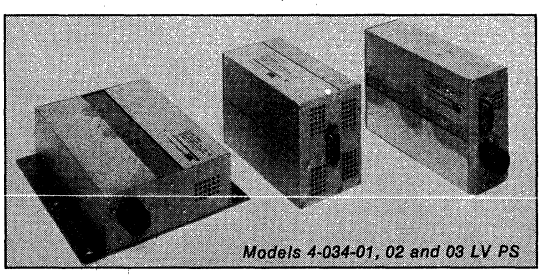
- **Multi-output switching regulator supplies**
- **Densities to four watts/cubic inch**
- **Efficiencies to 90%**
- **Proven reliability**
- **MIL-STD-461 EMI proofed**
- **Compliant with all airborne, shipboard and ground-use military specifications**

Typical applications:




Model 2-714 LV PS


Model 2-711 LV PS


Models 4-034-01, 02 and 03 LV PS

POWER SUPPLIES

High Voltage Power Supplies

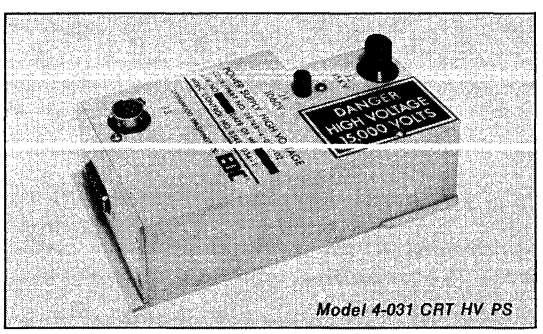
Features:

- **Multiple outputs**
- **Small size; light weight**
- **Reverse polarity and short circuit protected**
- **Low ripple and noise**
- **Monitor outputs**
- **Adjustable and programmable outputs**

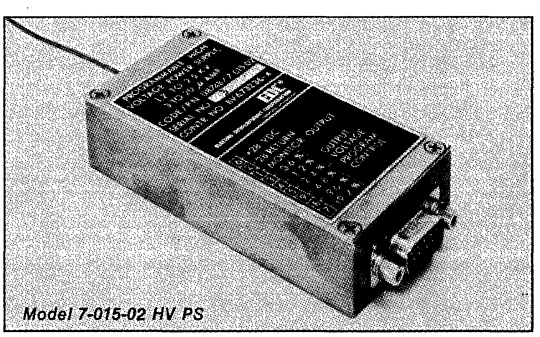
EDC custom designs and manufactures high reliability high voltage power supplies for display and TWT systems. Continued research has enabled EDC to overcome the reliability problems normally associated with other HV power supplies.

Typical applications include:

- Military and commercial display systems
- Traveling wave tube applications
- Color displays



Model 4-031 CRT HV PS

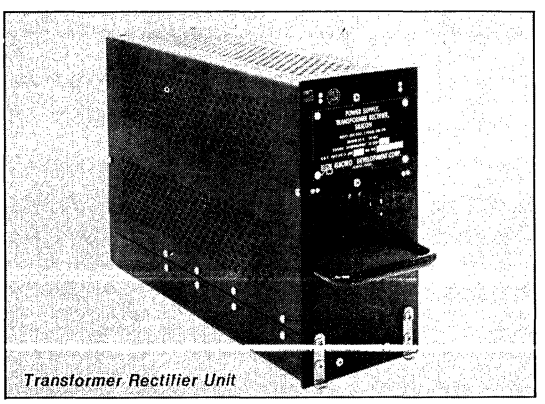

Model 7-015-02 HV PS

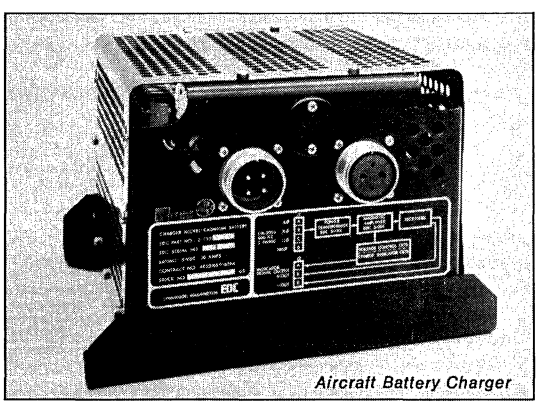
Battery Chargers and Power Converters

EDC designs and manufactures battery chargers and transformer rectifier units for many US-produced commercial and military jet aircraft, including the 707, 727, 737, 747; L-1011; DC-10; A-7D; CH-53; F-15; and B-1.

Features:

- **Field proven high reliability**
- **Meet all FAA and MIL-SPEC requirements**
- **Automatic, fail-safe performance**
- **Small size; low weight**


Transformer Rectifier Unit


Aircraft Battery Charger

For detailed specifications, delivery or price information contact:

Kevin Hall
Marketing Manager-Power Conversion
Electro Development Corporation
P.O. Box 100, Lynnwood, Washington 98036
Telephone: (206) 743-1313
TWX: 910-449-2855
TELEX: 032-526

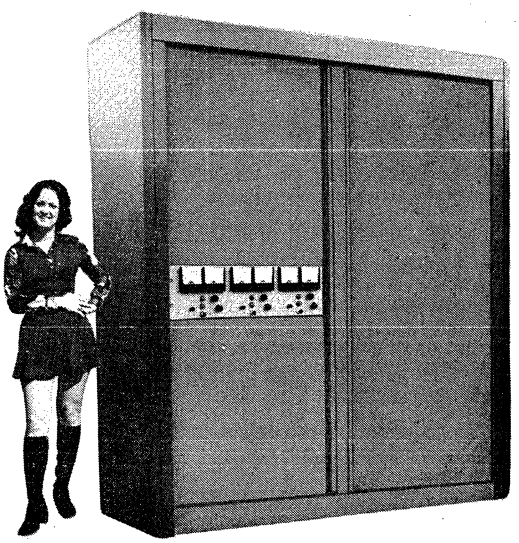
EDC

ELECTRO DEVELOPMENT CORPORATION

Engineering and sales offices located throughout the United States and Europe.

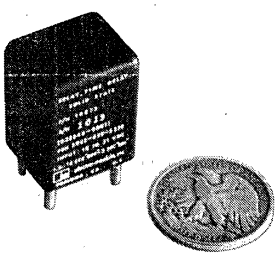
CUSTOM POWER SUPPLIES & SYSTEMS
TIME DELAY RELAYS & SENSORS

uninterruptible power systems



- Lightweight — portable and High Power Stationary Systems
- Performance unaffected by reactive loads
- Low Harmonic distortion
- Automatic sensing and switching
- Automatic battery charging
- Single and three phase configurations, 400 Hz, 60 Hz or DC output
- Reliable solid-state design
- Rugged construction
- Quick Reaction — Custom capability
- Self contained batteries

time delay relays and sensors



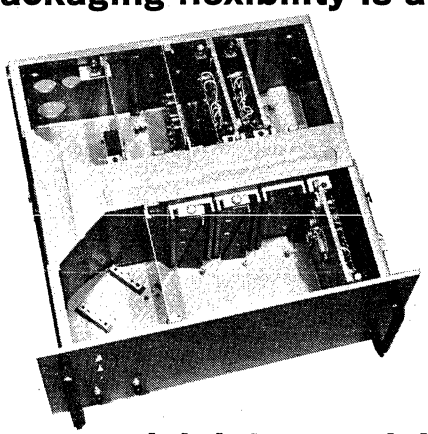
Time Delays in Accordance with MIL-R-83726

Voltage, Frequency, and Phase Sensitive Relays

Compatible with MIL--STD-704A Voltage Transients

Meet the Requirements of MIL-STD-461

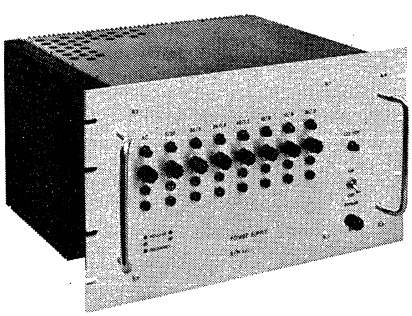
packaging flexibility is an inherent advantage of the building block design system



- **INDIVIDUAL PLUG-IN MODULES CONTAIN ONE OR MORE OF THE FOLLOWING MAJOR CIRCUIT ELEMENTS:**
  - Rectifier Modules
  - DC / DC Converters
  - Series Regulators
  - Current Amplifiers
  - DC / AC Inverters
  - Filter Modules
- **INDIVIDUAL PLUG-IN MODULES CAN BE SELECTED IN A VARIETY OF COMBINATIONS TO MEET YOUR MOST DEMANDING SPECIFICATIONS:**

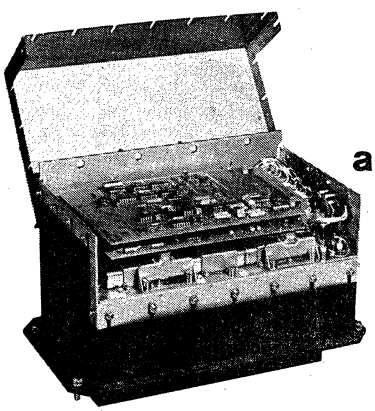
(These modules can be supplied with regulated or unregulated outputs.)

commercial data acquisition and control system power supplies



- Typical Efficiency: 70%
- Multiple Outputs, AC and DC

military computer and memory power supply



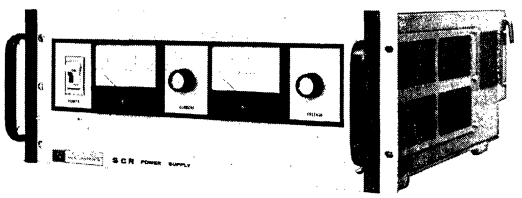
- On-Off Voltage Sequencing
- B-I-T-E (Built-in-Test Equipment)
- Over-Temperature Protection
- MIL-STD-461 EMI Compatibility
- Multiple Outputs
- Undervoltage and Overvoltage Protection
- Undervoltage Detection
- High Density Packaging
- MIL-S-901 High Shock

electro-module, inc.

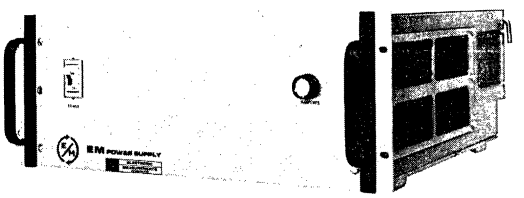
2855 METROPOLITAN PLACE, POMONA, CALIFORNIA 91767 • (714) 593-3565 • TELEX 670339

PRECISE REGULATION kw POWER supplies

The SCR Power Supplies are high efficiency, high power units designed for a wide range of applications where both precise constant-current and constant-voltage operation are required. Competitive comparison shows E/M power supplies have lowest voltage ripple, more watts per cubic inch and per pound.



The EM Power Supplies have the same advantages and the same applications where the precise regulation of the SCR Power Supply is not required. The EM Power Supplies are a low-cost 1% regulated voltage and current DC source in the medium power ranges up to 10 kw.



		Price				Price				Price	
Rating	Height*	EM	SCR	Rating	Height*	EM	SCR	Rating	Height*	EM	SCR
10V-250A	7	$1,200	$1,400	40V-125A	8¾	$1,300	$1,600	160V-15A	7	$ 950	$1,100
10V-500A	8¾	1,600	2,000	40V-250A	12¼	1,975	2,500	160V-30A	8¾	1,300	1,600
20V-125A	7	1,050	1,200	50V-200A	12¼	1,975	2,500	160V-60A	12¼	1,975	2,500
20V-250A	8¾	1,275	1,500	80V-30A	7	950	1,100	250V-10A	7	950	1,100
20V-500A	12¼	2,050	2,650	80V-60A	8¾	1,200	1,500	250V-20A	8¾	1,300	1,600
30V-100A	7	1,050	1,200	100V-100A	12¼	1,975	2,500	250V-40A	12¼	1,975	2,500
30V-200A	8¾	1,450	1,800	120V-20A	7	975	1,300	500V-5A	7	1,300	1,500
40V-60A	7	950	1,100	120V-40A	8¾	1,200	1,500	500V-10A	8¾	1,600	2,000

*19″ rack mounted, 20″ depth. Voltage and current adjustable over wide range. **GUARANTEED FOR FIVE YEARS**

The RE Series, for precise laboratory or systems applications, features 0.01% regulation; remote sensing/programming; automatic E/I crossover; 0.5 mV ripple; and 1000 ohms/volt programming constant.

Model	E Out	I Out	Height**	Price
RE 40-5	0-40	5	3½	$345
RE 40-10	0-40	10	5¼	$445
RE 60-2.5	0-60	2.5	3½	$320
RE 60-5	0-60	5	5¼	$445

The C 600 Series serves applications where precise constant-current operation down to currents as low as 1.0 microamp is required.

Model	Output			Regulation (%)		Ripple Below +0.04% of setting		Height**	Price
	Voltage		Current						
	Max I	Min I		Line	Load	Neg. Gnd.	Pos. Gnd.		
C 612 AM	100V	260V	1 μa-100 mA	0.15	0.1	0.5 μa	0.1 μa	3½	$320
C 630 CM	200V	280V	10 μa-1A	0.15	0.1	0.4 μa	0.4 μa	8¾	$962
C 633 CM	300V	420V	2.2 μa-300 mA	0.15	0.1	0.5 μa	0.1 μa	5¼	$500
C 636 CM	600V	730V	2.2 μa-220 mA	0.15	0.1	0.1 μa	0.2 μa	8¾	$700

** All units fit 19″ rack. All units, input 105-125 VAC 47-63 Hz; C 630 CM, C 633 CM, and C 636 CM have a voltage limiter.

CALL TOLL FREE 800-631-4298. Write for your copy of our 1971 Power Supply Catalog with complete specifications, accessories, options/modifications and prices for all models.

ELECTRONIC MEASUREMENTS INC.
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Phone: (New Jersey) 201 - 922-9300 • (Toll-Free) 800 - 631-4298
Specialists in Power Conversion Equipment

WHEN THINKING PRECISE kw POWER SUPPLIES . . . IT'S E/M.

CONSTANT-CURRENT SOURCES FOR KRYPTON, XENON AND OTHER LAMPS

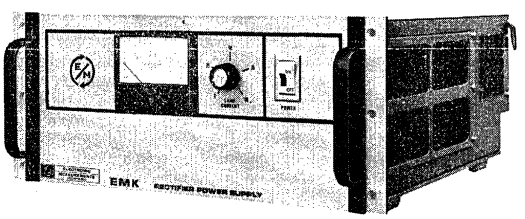
EMX Power Supplies are specifically designed as constant-current sources for Xenon and other high pressure lamps. The EMX Series provides stable light output, automatic starting through igniter pulse timing control, output current adjustment, and provisions for remote turn-on/off and programming. Low current ripple insures maximum lamp life.

Model	Type Lamp	Price
EMX 28-75	1600W lamp	$ 900
EMX 35-100	2500W lamp	$1000
EMX 40-165	6000W lamp	$1200

EMK Power Supplies are specifically for Krypton precision arc lamps; for single lamps or two lamps in series. Ideal for laser pumping. *Option 5 (below) provides automatic, built-in lamp ignition without expensive high-voltage components on a separate chassis.* This supplies a high-voltage pulse of about 20 kV across the Krypton lamp, immediately followed by a sustaining voltage to maintain the plasma. If the lamp ignites, the high voltage circuits are deactivated; if no ignition occurs, the sequence repeats for about six attempts and then shuts down. Other features include remote on-off terminals for cooling interlock, remote turn-on/off and programming, ripple less than 1% (0.5% with Option 5), and response speed under 10 ms.

Single-Lamp Models			
EMK 120-50	120 VDC	50A	$1200
EMK 150-40	150 VDC	40A	$1200
Two-Lamp Models			
EMK 200-30	200 VDC	30A	$1200
EMK 240-25	240 VDC	25A	$1200
EMK 220-50	220 VDC	50A	$2100

All models operate from 208/220 or 380V 3-phase 47-63 Hz input except EMK 220-50.



STANDARD OPTIONS

1. Local Elapsed Time Meter — $50 (Xenon & Krypton)
2. Local Voltmeter — $25 (Xenon & Krypton)
3. Reduced ripple to less than 1% RMS — $100 (Xenon only)
4. Remote controlled current programming automatically between two preset levels with preset time interval — $150 (Xenon only)
5. Built-in automatic igniter — eliminates need for separate chassis, etc., for high voltage ignition pulse — $500 (Krypton only). Specify I suffix (EMKI) and one- or two-lamp operation.

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Specialists in Power Conversion Equipment

WHEN THINKING CONSTANT-CURRENT SOURCES FOR ARC LAMPS... IT'S E/M.

Multiple output voltages in one power supply

The Multi-Module Power Supplies are unique in providing multiple output voltages in a single package. Versatile design offers the user a wide selection of voltages and currents, permitting the design of custom power supplies to meet specific requirements. Special design features include a frequency converter and preregulator to reduce size and increase efficiency. A unique pulse-width-modulated post-regulator, utilizing magnetic components, provides the regulation characteristics required for logic circuits.

Input Range: 80-130/160-260 VAC, 47-1000 Hz
Output Voltage and Current Ranges: Per Table ±0.5V adjustment range
Regulation: ±0.5% overall line and load combined
Ripple: 25 mV p/p for voltages to 6.2V
50 mV p/p for higher voltages
Ambient Temperature Range: 0°C to 50°C
Temperature Coefficient: 0.05% / °C
Stability: 0.1% for eight hours after warm-up
Protective Circuits: Adjustable overcurrent shutdown; overvoltage crowbar

Selection Guide For Basic 3-Output Models

All Models	100 Watts Model MM 100	200 Watts Model MM 200	400 Watts Model MM 400	Overvoltage Protection
Output Voltages*	Maximum Current	Maximum Current	Maximum Current	
	Amps	Amps	Amps	
No. 1 +4 to +6.2	10	20	40	Built-in
No. 2 +12 to +16	2.5	5	10	Optional
No. 3 −12 to −16	2.5	5	10	Optional
Alt. No. 2 +24 to +32	1.25	2.5	5	Optional
Alt. No. 3 −24 to −32	1.25	2.5	5	Optional

* Any value may be selected between those shown. Outputs Nos. 2 and 3 are complementary and all outputs are referenced to the same ground. Select either 12 to 16 or 24 to 32 volts. Remember, total power from all outputs combined cannot exceed value listed for a particular model.

The Multi-Module Series output voltages and currents were selected to cover the most popular combinations known at this time. To select your Multi-Module from the above guide, proceed as follows:

1. Let's assume your basic requirements are: Output No. 1 +5V DC at 8A, Output No. 2 +15V at 1A, and Output No. 3 −15V at 2A.
2. Determine maximum total power output (5 x 8 = 40W, 15 x 1 = 15W, 15 x 2 = 30W) for a total of 85W, which is below 100W, so we tentatively select Model MM100.
3. Check voltages to determine that they are within range specified. +5 volts is between 4 and 6.2V for Output No. 1; ±15 is between ±12 to ±16 for Outputs Nos. 2 and 3.
4. Check current ratings to be sure they do not exceed limits for model selected. 8A is below 10A (max. for Output No. 1), 1A is below 2.5A for Output No. 2, and 2A is below 2.5A for Output No. 3.
5. Specify Model MM100 with +5V at 8A, +15V at 1A, and −15V at 2A.
6. If either current or power exceeds maximum value specified, select larger model.

Prices	Lots 1-24
Model MM 100	$350.00 ea. net
Model MM 200	$450.00 ea. net
Model MM 400	$600.00 ea. net

CALL TOLL FREE 800-631-4298. Write for your copy of our Power Supply Catalog and Multi-Module technical bulletin, which include complete specifications, accessories, options/modifications, and prices for all models.

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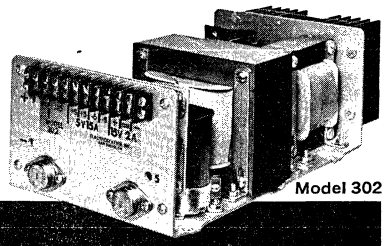
Specialists in Power Conversion Equipment

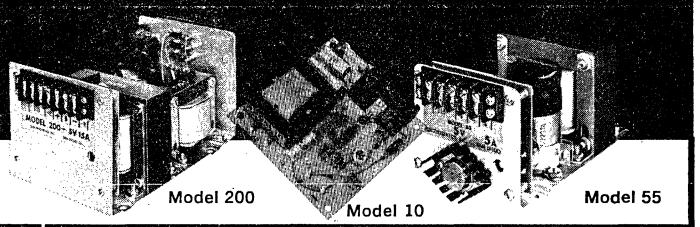
When thinking multiple-output power supplies...think E/M.

low cost 24-hour delivery direct from stock


Model 302

DC POWER SUPPLIES

QUALITY SUPPLIES SINCE 1965


Model 200 Model 10 Model 55

SINGLE AND DUAL – 60 WATTS

MODEL	VOLTAGE	AMPS
55 - 3	2.5 - 3.5	5.0
55 - 4	3.5 - 4.5	5.0
55 - 5	4.5 - 5.5	5.0
55 - 6	5.5 - 6.5	4.5
55 - 7	6.5 - 7.5	4.5
55 - 8	7.5 - 8.5	4.5
55 - 9	8.5 - 9.5	4.0
55 - 10	9.5 - 10.5	4.0
55 - 11	10.5 - 11.5	4.0
55 - 12	11.0 - 13.0	3.0
55 - 14	13.0 - 15.0	3.0
55 - 16	15.0 - 17.0	3.0
55 - 18	17.0 - 19.0	2.5
55 - 20	19.0 - 21.0	2.0
55 - 22	21.0 - 23.0	2.0
55 - 24	23.0 - 25.0	2.0
55 - 26	25.0 - 27.0	2.0
55 - 28	27.0 - 29.0	2.0
55 - 30	29.0 - 30.0	2.0
55 - 1212	±11.0 - 13.0	1.0
55 - 1515	±14.0 - 16.0	1.0
55 - 1818	±17.0 - 19.0	1.0

Size: 6.00 L x 3.50 W x 3.13 H Wt.: 4.25 Lbs.

QUANTITY	PRICE	WITH OVERVOLTAGE
SINGLE (Models 55 - 3 thru 55 - 30)		
1 - 9	$59 ea.	$65 ea.
10 - 24	$56 ea.	$60 ea.
DUAL (Models 55 - 1212 thru 55 - 1818)		
1 - 9	$69 ea.	$79 ea.
10 - 24	$65 ea.	$74 ea.

SINGLE AND DUAL – 10 WATTS

MODEL	VOLTAGE	AMPS
10 - 5	4.5 - 5.5	1.2
10 - 12	11 - 13	0.8
10 - 15	14 - 16	0.6
10 - 24	23 - 25	0.4
10 - 28	26 - 30	0.35
10 - 1212	±11 - 13	0.35
10 - 1515	±14 - 16	0.35
10 - 1818	±17 - 19	0.35

ANY OUTPUT TO 30 VOLTS AVAILABLE

Size: 4.5 L x 4.5 W x 1.50 H Wt.: 1.2 Lbs.

		WITH
SINGLE	**PRICE**	**OVERVOLTAGE**
1 - 9	$27 ea.	$32 ea.
10 - 24	24 ea.	28 ea.
DUAL		
1 - 9	35 ea.	45 ea.
10 - 24	32 ea.	40 ea.

SINGLE AND DUAL – 200 WATTS

MODEL	VOLTAGE	AMPS
200 - 5	4.5 - 5.5	15.0
200 - 12	11.5 - 12.5	10.0
200 - 15	14.5 - 15.5	9.0
200 - 24	23.5 - 24.5	7.5
200 - 28	27.5 - 28.5	7.0
200 - 48	47.5 - 48.5	4.0
200 - 0505	± 4.5 - 5.5	7.0
200 - 1212	±11.5 - 12.5	5.0
200 - 1515	±14.5 - 15.5	4.5
200 - 2424	±23.5 - 24.5	3.5
200 - 2828	±27.5 - 28.5	3.5

Any Single Output To 50 Volts Available
Any Dual Output To 30 Volts Available
Size: 10.75 L x 5.50 W x 5.00 H Wt.: 15 Lbs.

		WITH
SINGLE	**PRICE**	**OVERVOLTAGE**
1 - 9	$ 99 ea.	$114 ea.
10 - 24	94 ea.	107 ea.
DUAL		
1 - 9	119 ea.	129 ea.
10 - 24	113 ea.	122 ea.

TRIPLE – 5V AND ±12 or 15

MODEL	VOLTAGE	AMPS
300	5 V	1
	± 12 or 15 V	0.25
301	5 V	5A
	± 12 or 15 V	1A
302	5 V	15A
	± 12 or 15 V	2A

Size: 300 - 4.5 L x 4.5 W x 1.50 H Wt.: 2 Lbs.
301 - 7.0 L x 6.0 W x 3.38 H 6 Lbs.
302 - 13.25 L x 6.0 W x 4.00 H 16.5 Lbs.

	MODEL	PRICE	WITH OVERVOLTAGE
1-9	300-12 / 300-15	$ 60 ea.	$ 70 ea.
	301-12 / 301-15	$ 99 ea.	$111 ea.
	302-12 / 302-15	$159 ea.	$174 ea.
10-24	300-12 / 300-15	$ 56 ea.	$ 65 ea.
	301-12 / 301-15	$ 93 ea.	$104 ea.
	302-12 / 302-15	$149 ea.	$163 ea.

ELECTRICAL SPECIFICATIONS: ALL MODELS

INPUT: 105-125 VAC. 50-420 Hz (230V OPTIONAL)

REGULATION: LINE: 0.005% or 2 MV MIN (10 VOLT CHANGE) LOAD: 0.05% or 10 MV MIN (FULL LOAD CHANGE)

RIPPLE: LESS THAN 250 MICROVOLTS

IMPEDANCE: 100 Hz - 0.001 OHMS
1 KHz - 0.005 OHMS
10 KHz - 0.01 OHMS
100 KHz - 0.1 OHMS

RECOVERY TIME: 25 MICROSECONDS

OVERSHOOT: NONE ON TURN ON OR OFF

TEMPERATURE:
OPERATING −40 TO +71°C
STORAGE −65 TO +85°C
COEFFICIENT 0.01%/°C MAX

CURRENT LIMITING: FIXED - FOLD-BACK TYPE - AUTOMATIC RECOVERY

OUTPUT: FLOATING

SEMICONDUCTORS: SILICON

CAPACITORS: COMPUTER GRADE 10 YEAR LIFE

OVERVOLTAGE PROTECTION: OPTIONAL

ORDERING INFORMATION

All prices FOB San Diego, One Year Warranty. Free Catalog on Request. For Overvoltage Models Add — 0 To Model Number.

"Quality Power Supplies Since 1965"

Electrostatics, inc.
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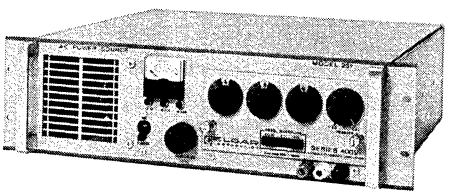
ELGAR CORPORATION
8159 ENGINEER ROAD, SAN DIEGO, CALIFORNIA 92111 TEL. (714) 565-1155

SOLID STATE AC POWER SOURCES

- ALL SOLID STATE CIRCUITRY
- MULTIPLE OUTPUT VOLTAGES 0-32, 130, 260
- SHORT CIRCUIT PROTECTION
- MID BAND DISTORTION - .5%
- REGULATED OUTPUT VOLTAGE ±1%
- LOW NOISE —70DB RATED OUTPUT



ELECTRICAL AND MECHANICAL SPECIFICATIONS MAIN FRAME AMPLIFIERS

MODEL	OUTPUT			INPUT			DIMENSIONS				PRICE
	POWER VA	PHASE	FREQ HZ	VOLTAGE VAC	FREQ HZ	PHASE	H IN	W IN	D IN	WGT LBS	$
121	120	1	45-10000	105-125/210-250	47-63	1	3½	19	15	45	545
251	250	1	45-10000	105-125/210-250	47-63	1	5¼	19	15	60	640
501A	500	1	45-5000	105-125/210-250	47-63	1	7	19	18	105	1380
751A	750	1	45-5000	105-125/210-250	47-63	1	7	19	19	115	1725
1001A	1000	1	45-5000	105-125/210-250	47-63	1	12¼	19	20	210	2250
1501	1500	1	45-5000	190-230/210-250	47-63	3	14	19	20	230	3050
1751	1750	1	45-5000	190-230/210-250	47-63	3	14	19	20	230	3450
153A	150	3	45-10000	105-125/210-250	47-63	1	5¼	19	18	70	1350
503	500	3	45-5000	105-125/210-250	47-63	1	7	19	19	115	1650
1503	1500	3	45-5000	190-230/210-250	47-63	3	14	19	20	230	3150
1753	1750	3	45-5000	190-230/210-250	47-63	3	14	19	20	230	3650

● Single phase amplifiers with appropriate oscillator may be combined to provide 1, 2 or 3 phase systems with higher power outputs

PLUG-IN OSCILLATOR MODULES

FIXED FREQUENCY					VARIABLE FREQUENCY				
MODEL	FREQ HZ	ACCURACY %	PHASE	PRICE $	MODEL	FREQ HZ	ACCURACY %	PHASE	PRICE $
451-.1	50	±.1	1	175	401-V	45-10000	±1.0	1	300
453-.1	50	±.1	3	275	403-V	45-10000	±1.0	3	450
461-.1	60	±.1	1	175	461-V	45-70	±.5	1	300
463-.1	60	±.1	3	275	463-V	45-70	±.5	3	450
441-.1	400	±.1	1	175	431-V	300-500	±.5	1	300
443-.1	400	±.1	3	275	433-V	300-500	±.5	3	450
					400-A	External Oscillator Adapter			50
					400-B	Blank OSC Module (3 Phase Systems)			25
					400-C	Blank OSC Module			25

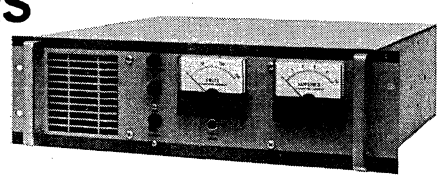
● Oscillator modules with .01% amplitude stability and frequency stability can be provided — consult factory

● Decoder programmer oscillators which permit remote BCD programming of amplitude, frequency and phase are available for use in automatic test systems — consult factory

● MIL-STD-704A Testing equipment

SOLID STATE AC LINE CONDITIONERS

- ELIMINATE TRANSIENTS
- <20 USEC RESPONSE TIME
- .2% HARMONIC DISTORTION
- FULL CURRENT INTO ZERO POWER FACTOR
- PRECISE VOLTAGE REGULATION
- CREST FACTOR 3.5
- 100 DB ISOLATION
- REDUCES 500V 10 USEC TRANSIENTS BY 1000:1



ELECTRICAL AND MECHANICAL SPECIFICATIONS

MODEL	INPUT			OUTPUT			DIMENSIONS			WGT.	PRICE
	RANGES $(VAC)_1$	FREQ (Hz)	CURRENT (AMPS)	VOLTAGE $(VAC)_2$	POWER (KVA)	REGULATION %	H IN	W IN	D IN	NET LBS	$
6006B	95-135	57-63	15.0	115	1	±.025	5¼	19	17	65	1500
6246B	200-280	57-63	8.0	240	1	±.025	5¼	19	17	65	1500
6225B	180-260	47-53	8.5	220	1	±.025	5¼	19	17	65	1650
6245B	200-280	47-53	8.0	240	1	±.025	5¼	19	17	65	1650
6004B	95-135	380-420	15.0	115	1	±.025	12¼	19	20	65	3425
3006B	95-135	57-63	46.0	115	3	±.025	12¼	19	20	175	3425
3246B	200-280	57-63	18.0	240	3	±.025	12¼	19	20	175	3650
3225B	180-260	47-53	20.0	220	3	±.025	12¼	19	20	175	3650
3245B	200-280	47-53	18.0	240	3	±.025	24¼	19	20	175	6800
5006B	95-135	57-63	75.0	115	5	±.025	24¼	19	20	375	6800
5246B	200-280	57-63	40.0	240	5	±.025	24¼	19	20	375	7025
5225B	180-260	47-53	43.0	220	5	±.025	24¼	19	20	375	7025

NOTE 1: Selected by Tap Switch NOTE 2: 230 VAC input with 115 VAC output is available on request.

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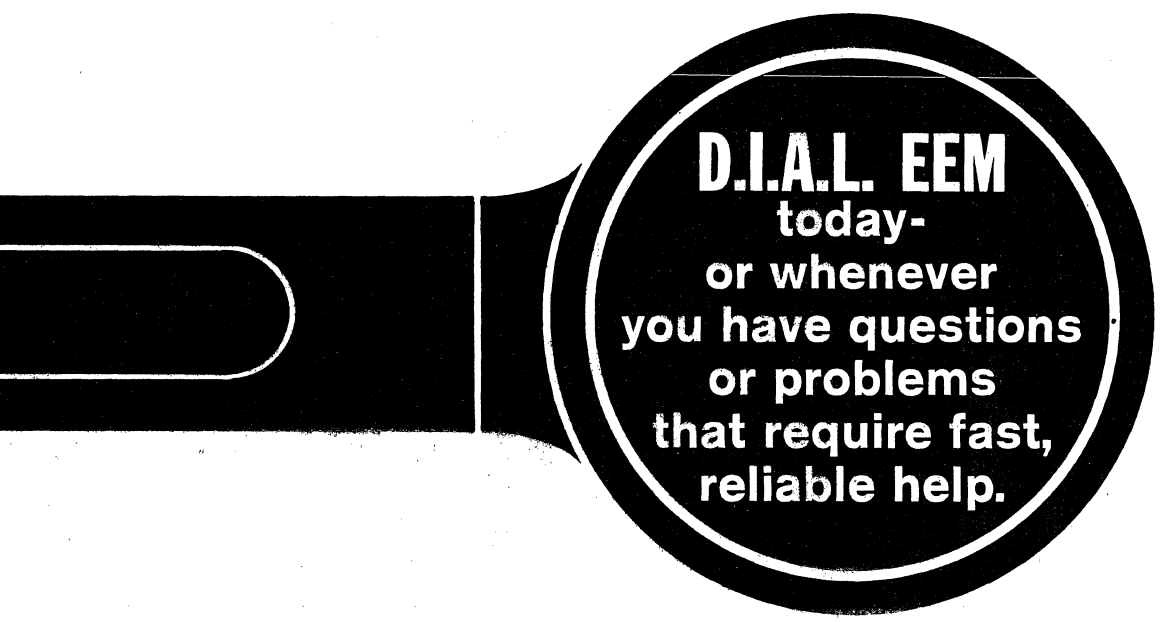

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645 Stewart Ave., Garden City, N. Y. (516) 248-9700

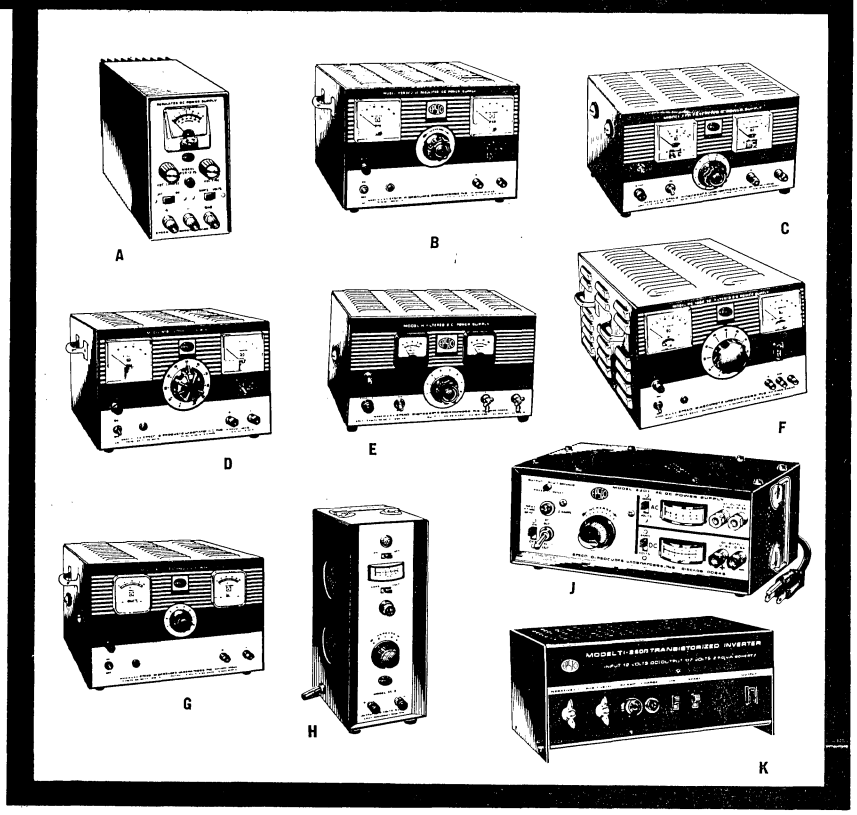
EPSCO REGULATED & SEMI-REGULATED POWER SUPPLIES

Ruggedly-constructed, low voltage dc power supplies for use in design, development, testing of transistor circuitry . . . for servicing and operating auto, aircraft, marinecraft radio, electronic equipment . . . for production line testing, industrial and educational laboratory work and many other applications.

Precision made and engineered to give unequalled performance life per dollar. Features include: Voltage regulation, ac ripple filtering, adjustable output voltage, large easy-to-read meters, isolated output terminals, 1-year warranty.

INPUT — *Regulated Models:* 105-125 vac. 60 Hz *Industrial* and *General Purpose Models:* 117 vac 50/60 Hz. Models available to fit W.E. and EIA racks. Custom-design or modification of standard units to your specs.

INVERTER — Transistorized. Converts 12 vdc to 117 vac, 60 Hz to operate equipment from car, truck or boat battery, or other 12 vdc source for camping, traveling, boating. Reverse polarity and short circuit protection.



REGULATED

Model	Figure	Output Volts	Output Current	Line Reg.**	Load Reg.*	Max. Ripple, RMS	Meters††	DC Imp. Ohms*	Size (H x W x D)	Net Wt. Lbs.	Net Price
PSR-12-25	A	0-25	0-500mA	0.01% +2mV	0.01%	100μV	0-30V/600mA	.006	5¼ x 3⅛ x 10	7	99.50
PSR-12-50	A	0-50	0-250mA	0.01% +2mV	0.01%	100μV	0-60V/300mA	.02	5¼ x 3⅛ x 10	7	99.50
PSR-500-32	B	2-32	0-15A	0.1%	1.0%	0.5%	0-50V, 0-25A	.02	9¾ x 14¼ x 14¼	66	395.00
PSR-500-55	B	2-55	0-10A	0.1%	1.0%	0.5%	0-75V, 0-15A	.06	9¾ x 14¼ x 14¼	68	395.00

INDUSTRIAL

Model	Figure	Output Voltage	Output Amps.	Load Regulation* (V/A)†	Max. Ripple %	Meters††	DC Impedance Ohms*	Size (H x W x D)	Net Wt. Lbs.	Net Price
EF	C	4-28	0-5	0.9 (1-5A)	1.0	0-50V, 0-6A	0.9 (1-5A)	7 x 12 x 8½	22	137.50
		2-14	0-5	0.6 (1-5A)	1.0		0.6 (1-5A)			
EFB	C	0-32	0-4	1.25	0.1	0-40/20V, 0-10A	1.25	7 x 12 x 8½	28	192.50
		0-16	0-8	1.0	0.1		1.0			
EFBR‡		0-32	0-4	1.25	0.1	0-40/20V, 0-10A	1.25	8¾ x 19 x 8½	34	225.00
		0-16	0-8	1.0	0.1		1.0			
GFL	D	0-125	0-5	1.5	0.5	0-150V, 0-5A	1.5	9¾ x 14¼ x 14¼	88	350.00
GFLR‡		0-125	0-5	1.5	0.5	0-150V, 0-5A	1.5	10½ x 19 x 14¼	100	385.00
NFB	D	0-32	0-15	0.4	0.75	0-50V, 0-25VA	0.4	9¾ x 14¼ x 14¼	84	310.00
NFBR‡		0-32	0-15	0.4	0.75	0-50V, 0-25A	0.4	10½ x 19 x 14¼	97	345.00
PS-5	D	0-55	0-10	0.8	0.5	0-75V, 0-15A	0.7	9¾ x 14¼ x 14¼	70	355.00
PS-5R‡		0-55	0-10	0.8	0.5	0-75V, 0-15A	0.7	10½ x 19 x 14¼	89	385.00
PS-1000-32	F	0-32	0-30	0.2	0.75	0-50V, 0-30A	0.2	9¾ x 14¼ x 19¼	113	460.00
PS-1000-55	F	0-55	0-20	0.5	0.5	0-75V, 0-30A	0.5	9¾ x 14¼ x 19¼	113	465.00
PS-1000-125	F	0-125	0-8A	1.0	Less than 1%	0-150V, 0-10A	1.0	9¾ x 14¼ x 19¼	113	465.00

GENERAL PURPOSE

D-612T	E	0-16	0-10	0.44 (3-10A)	0.5 @ 5A	0-20V, 0-10A	0.44 (3-10A)	7 x 12 x 8½	20	99.50
		0-8	0-10	0.3 (3-10A)	2 @ 10A		0.3 (3-10A)			
H	E	12 (adj.)	0-10	0.23 (3-10A)	5	0-20V, 0-30A	0.23 (3-10A)	7 x 12 x 8½	30	130.00
		6 (adj.)	0-20	0.15 (3-20A)	5		0.15 (3-20A)			
EC-1	H	12 (adj.)	0-5	1.4	0.5	None	1.4	10¾ x 4⅜ x 6½	12	44.50
EC-2	H	0-16	0-5	1.8	0.5	0-20V, 10A	1.8	10¾ x 4⅜ x 6½	11	74.50
PS-30	G	12 (adj.)	0-30	0.12 (6-30A)	1	0-20V, 0-50A	0.27	9¾ x 14¼ x 14¼	68	230.00
PS-50	G	12 (adj.)	0-50	0.17	0.5	0-20V, 0-50A	0.17	9¾ x 14¼ x 19¼	106	370.00
3301	J	0-16 DC	0-3	1.8 (1-3A)	.5	0-20V, 0-5A DC	2.4 DC	4¾ x 10¾ x 6½	12	115.00
		0-20 AC	0-3			0-20V, 0-5A AC	0.5 AC			

INVERTER

TI250B	K	**Input:** 12 vdc. **Output:** 117 vac, 60 Hz, 250 VA max. **Voltage Regulation:** 15% max. no load to full load constant battery voltage. **Frequency Regulation:** 4 Hz max. no load to full load.	4½ x 10 x 7½	11½	79.50

‡Rack mounted version.
*No-load to full-load unless otherwise specified.
†Output voltage change for each ampere of output current change, except on regulated units, % applies for either line or load.
††All 2% accuracy except 5% for general purpose units. Rectifiers: Selenium and Silicon ("avalanche" characteristics on Industrial units).
**From 105-125 VAC.

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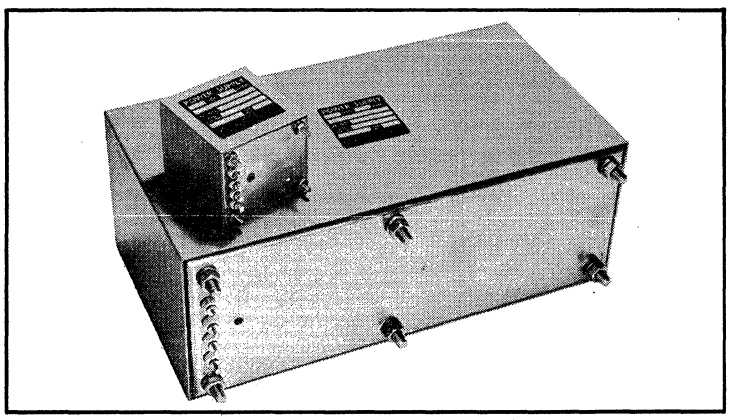
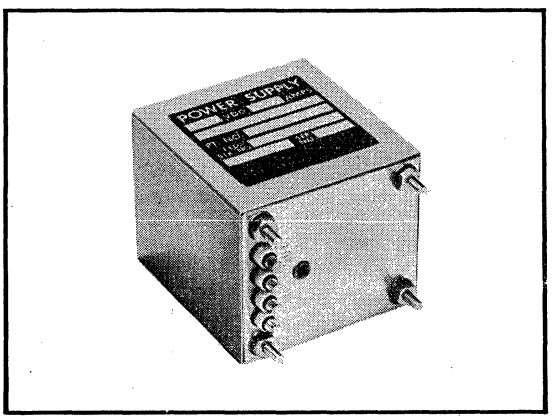
EXCLUSIVE MANUFACTURER OF ELECTRO POWER SUPPLIES AND INVERTERS

POWER SUPPLIES

Industry Standards

AC TO DC - MODULAR





"S" 90 SERIES

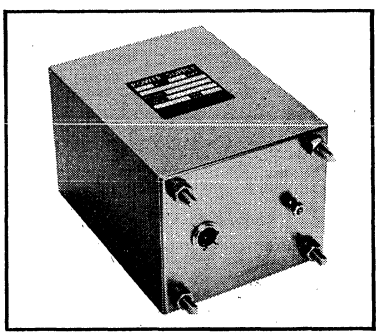
"S" – STANDARD – "M" – MINIATURE
– COMPUTER GRADE –

"M" 80 SERIES

- Typical Outputs – 2.5VDC to 300VDC 0 to 30 Amps
- Regulation ±.01 – ±.05%
- Short Circuit Protection – Automatic Recovery
- Ripple (Typical) 0.002%

MS-100 SERIES

- Qualified to Military Environments
- Operating Temperature -55° C to + 100° C
- Output 2.5 – 300VDC 0 to 25 Amps



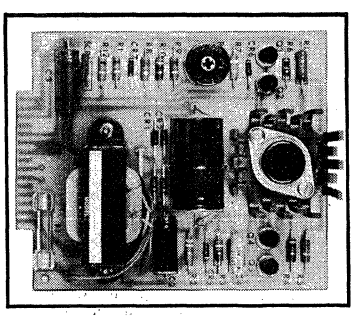
MS SERIES – DD SERIES

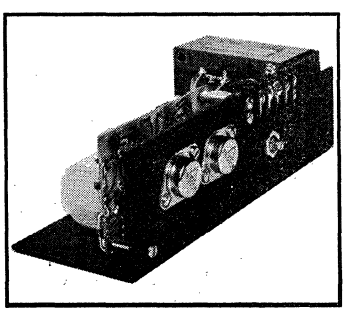
DD-115 SERIES

- Full Military Specs.
- Operating Temperature -55° C to + 115° C
- Output 2.5 to 300VDC 0 to 15 Amps

"FC" SERIES

- Low Cost
- High Reliability
- 5.0VDC to 28.0VDC @ 3.0 Amps to 0.025 ma
- Duals – ± 12VDC, ± 15VDC, ± 18VDC





"LO" SERIES

- Low Cost
- High Reliability
- 5.0VDC to 28.0VDC @ 5.0 Amps to 1.2 Amps
- Multi outputs – available

– COMMERCIAL GRADE –

DC TO DC CONVERTERS

High Efficiency – Input – 12VDC to 48VDC Typical – Output 0 – 1000VDC

MARATHON ELECTRIC

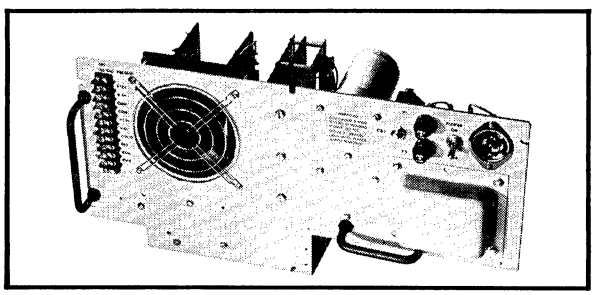
FIRING CIRCUITS

Muller Avenue, Norwalk, Connecticut 06852 - Phone: (203) 846-1633

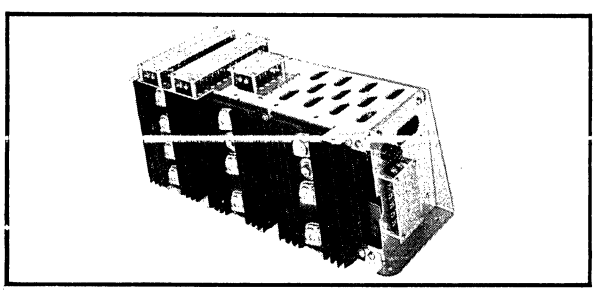
CUSTOM "OEM" POWER SUPPLIES

FIRING CIRCUITS DIVISION WELCOMES THE OPPORTUNITY

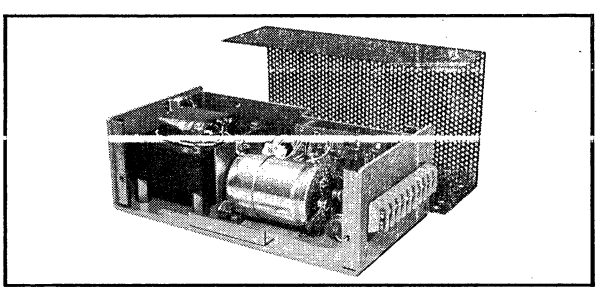
to review your specifications, design and build the power supply or power system you require.



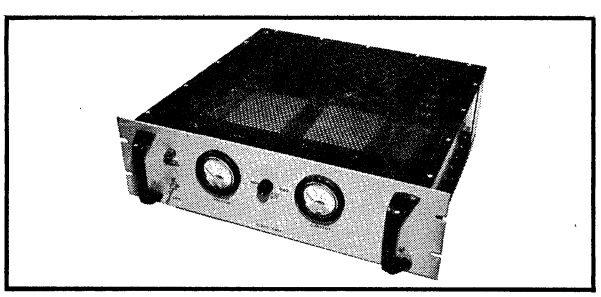
- Computer Supply
- "MICRO-800"
- UL Applications



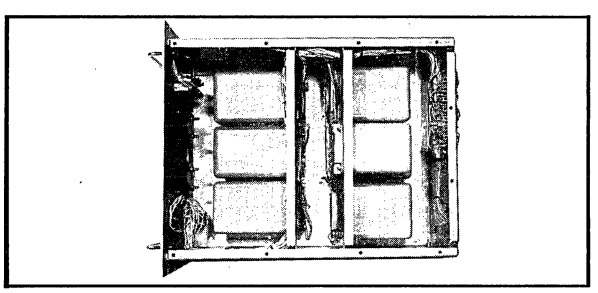
- Multi-Output
- Plus Logic
- Power System
- Ground Support Test Equipment



- Low Profile
- Comupter Supply
- High Reliability
- UL Applications



- Dual Rack
- Qualified to Full Military Specifications



- Standard DC to DC Converters — in rack
- Automatic People Movers

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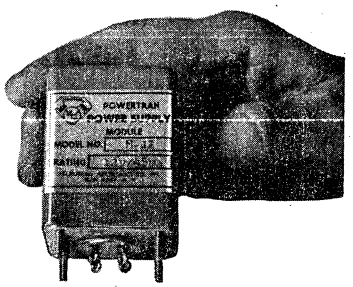
FERROTRAN ELECTRONICS CO., INC.

SOLID STATE POWER SUPPLY MODULES

All silicon, long-life semi-conductor, regulated POWERTRAN power supply modules. Guaranteed 3 years. Gives single, fixed D.C. output voltages.

INPUT VOLTAGE — 115 volts A.C.



M-12 MIDGET MODULE

Will operate to 70°C. without derating.

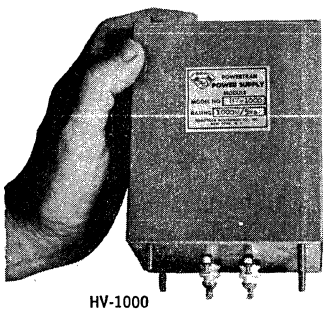
Model	D.C. Volts	D.C. Cur.	% Reg.	% Rip.	Case	Price
M-.6	.6	30ma	4.	.9	EB	$32
M-1.0	1.0	30	4.	.9	EB	32
M-1.5	1.5	30	4.	.9	EB	32
M-2.0	2.0	30	4.	.45	EB	32
M-2.5	2.5	30	4.	.5	EB	32
M-3.0	3.0	30	6.	.6	EB	34
M-4.0	4.0	30	5.	.5	EB	34
M-5	5	50	3.	.3	EB	34
HM-5	5	50	2.	.08	FB	36
M-6	6	50	1.8	.18	EB	34
HM-6	6	50	1.5	.06	FB	36
MC-7	7	175	1.3	.1	GB	46
MCH-7	7	280	1.7	.3	HB	50
M-8	8	50	2.	.15	EB	34
M-9	9	50	1.6	.2	EB	34
M-10	10	50	1.4	.12	EB	34
HM-10	10	50	1.	.03	FB	36
MC-10	10	175	1.3	.08	HB	46
MCH-10	10	280	1.3	.3	HB	50
M-12	12	45	1.3	.12	EB	34
HM-12	12	50	1.	.03	FB	36
MC-12	12	150	1.3	.08	HB	46
MCH-12	12	250	1.3	.1	JB	50
M-15	15	45	1.5	.13	EB	34
HM-15	15	50	1.	.05	FB	36
MC-15	15	140	1.3	.1	HB	45
MCH-15	15	250	1.3	.1	JB	50

All units shown are available with 220 volts A.C. input.

FIXED VOLTAGE MODULES

Model	D.C. Volts	D.C. Cur.	% Reg.	% Rip.	Case	Price
M-18	18	45	1.5	.18	EB	$34
MC-18	18	140	1.5	.1	HB	46
M-20	20	45ma	1.5	.15	EB	35
HM-20	20	50	1.	.05	FB	37
MC-20	20	140	1.3	.05	HB	45
MCH-20	20	225	1.5	.1	JB	50
M-22	22	45	1.5	.15	EB	35
MC-22	22	130	1.3	.08	HB	45
MCH-22	22	225	1.5	.1	JB	52
MC-23	23	130	1.3	.05	HB	44
M-24	24	40	1.5	.15	EB	35
HM-24	24	45	1.2	.02	FB	37
MC-24	24	125	1.3	.05	HB	46
MCH-24	24	200	1.8	.1	JB	52
M-25	25	40	1.5	.15	EB	35
MC-25	25	125	1.3	.05	HB	46
MC-26	26	125	1.3	.05	HB	44
MCH-26	26	200	1.8	.1	JB	48
M-27	27	40	1.5	.15	EB	35
MC-27	27	125	1.3	.05	HB	46
MCH-27	27	180	1.8	.1	JB	52
M-28	28	40	1.5	.15	EB	35
HM-28	28	45	1.5	.05	FB	37
MC-28	28	125	1.3	.05	HB	48
MCH-28	28	180	1.8	.1	JB	54
M-30	30	40	1.5	.15	EB	35
HM-30	30	40	1.5	.05	FB	37
MC-30	30	110	1.5	.1	HB	46
MCH-30	30	160	1.8	.1	JB	52
M-35	35	40	1.5	.15	EB	36
M-40	40	40	1.5	.22	EB	36
M-45	45	35	1.5	.2	EB	36
MC-45	45	100	1.5	.1	HB	46
MCH-45	45	140	1.8	.1	JB	52
HV-45	45	40	1.5	.15	GA	44
HV-48	48	60	1.5	.15	GA	44
M-50	50	30ma	1.5	.2	EB	36
HV-50	50	40	1.5	.15	GA	44
HV-60	60	40	1.5	.15	GA	44

NO DERATING WITH TEMPERATURE



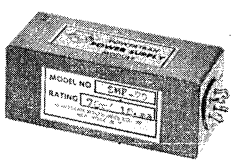
HV-1000

All silicon components; solid state regulator; floating outputs; ideal for photomultipliers and indicator tubes.

Model	D.C. Volts	D.C. Cur.	% Reg.	% Rip.	Case	Price
HV-70	70	40	1.5	.15	GA	$44
HV-75	75	60	1.3	.1	GA	52
M-100	100	2	1.5	.1	EB	38
HM-100	100	6	1	.05	HB	44
HV-100	100	60	1.5	.1	GA	54
HM-120	120	6	1	.05	HB	44
HV-120	120	55	1.3	.12	HA	60
HM-150	150	5	1	.05	HB	45
HV-150	150	40	1	.1	HA	62
HV-175	175	40	1.2	.12	HA	64
HM-200	200	5	.5	.05	HB	50
HV-200	200	40	1.3	.12	HA	64
HM-250	250	4	1	.05	HB	55
HV-250	250	40	1.5	.05	JA	68
HM-300	300	3	1	.05	HB	58
HV-300	300	35	1.5	.1	JA	70
HM-400	400	2	1	.05	HB	60
HV-400	400	20	1.5	.2	JA	75
HM-500	500	1.8	1	.05	JB	64
HV-500	500	15	1.5	.2	JA	75
HM-750	750	1.2	1	.1	JB	70
HV-750	750	8.5	1.2	.3	JB	105
HM-1000	1000	1	1	.1	JB	72
HV-1000	1000	5	1.3	.3	LB	120

Power supplies with output volts of 750 or higher have special ceramic high voltage terminals.

INPUT VOLTAGE — 115 volts A.C.



SMF-70

SMF SERIES

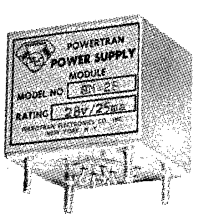
Case: 3″x1 3/16″x1 1/4″; Mounts on a chassis with 2 ea. 4-40 blind inserts; no projecting studs; ideal for printed circuit boards; fixed voltage. 4 pin connector.

Add $2 to SMF prices for 220 volts A.C. input unit. Height of case is 1½″.

SUBMINIATURE MODELS

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMF-5	5	40ma	2.	.2	$36
SMF-6	6	40	1.3	.15	36
SMF-10	10	40	1.	.15	36
SMF-12	12	40	1.	.1	36
SMF-15	15	40	1.	.1	36
SMF-20	20	30	1.2	.25	36
SMF-24	24	30	1.2	.2	36
SMF-28	28	25	1.2	.3	37
SMF-30	30	20	1.5	.3	37
SMF-40	40	15	1.5	.2	38
SMF-50	50	15	1.5	.2	38
SMF-60	60	10	1.5	.1	38
SMF-70	70	10	1.2	.1	38

NO DERATING WITH TEMPERATURE



SM-28

SM SERIES

Case; 1 5/8″x1 7/8″x1 5/8″; Mounts on a chassis with 4 ea. 6-32 studs. 5/8″ diam. connector in cover. 4 pin connector.

Specifications and prices are the same as for SMF units. i.e.; SM-28 corresponds to SMF-28. Only difference is case style.

FERROTRAN ELECTRONICS COMPANY, INC.
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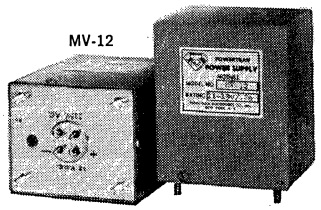
FERROTRAN ELECTRONICS CO., INC.

SOLID STATE POWER SUPPLY MODULES

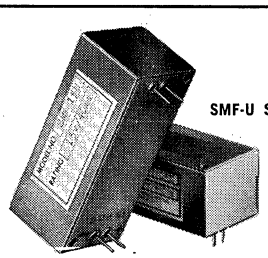
All silicon, long-life, semi-conductor POWERTRAN power supply modules. Guaranteed 3 years.

INPUT VOLTAGE — 115 volts A.C.
ADJUSTABLE OUTPUT MODULES



Variable D.C. output; repairable; output voltage adjustable thru screwdriver control on stud side of case. Compact series regulated modules with short circuit protection; all silicon.

Model	D.C. Volts	D.C. Cur.	% Reg.	% Rip.	Case	Price
MV-3	2.5-3.8	200ma	.8	.1	HA	$52
MCS-3	2.5-3.8	450	.8	.1	JB	60
MV-4	3.5-4.5	200	.8	.1	HA	52
MCS-4	3.5-4.5	450	.8	.1	JB	60
MV-5	4.5-5.5	200	.7	.1	HA	52
MCS-5	4.5-5.5	450	.8	.1	JB	60
HCV-5	4.5-5.5	1a	.4	.2	JA	75
MV-6	5.8-7	200	.6	.2	HA	52
MCS-6	5.8-7	450	.8	.3	JB	60
HCV-6	5.5-6.8	1a	.4	.2	JA	75
MV-10	9-12	200	.4	.03	HA	52
MCS-10	9-11	450	.5	.1	JB	60
HCV-10	8.5-11.8	1a	.4	.1	JA	75
MV-12	11-13	200	.2	.025	HA	52
MCS-12	11-13	400	.5	.05	JB	60
HCV-12	11-14.5	1a	.4	.05	JA	75
HV-15	14-16	200	.5	.03	HA	52
MCS-15	14-16	400	.5	.05	JB	60
HCV-15	14-18	800	.4	.1	JA	75
MV-20	19-22	180	.5	.03	HA	53
MCS-20	19-22	350	.5	.05	JB	62
HCV-20	18-22	700	.4	.3	JA	76
MV-24	23-26	180	.5	.04	HA	53
MCS-24	23-26	350	.5	.05	JB	62
HCV-24	23-26	700	.4	.3	JA	76
MV-28	27-29	150	.5	.04	HA	53
MCS-28	27-29	300	.4	.04	JB	62
HCV-28	26.5-29	600	.25	.3	JA	76
MV-30	28-32	150	.5	.04	HA	53
MCS-30	28-32	300	.4	.04	JB	62
HCV-30	28-32	600	.25	.3	JA	76



SMF-U SERIES

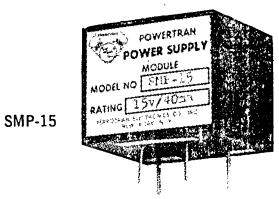
A new series of subminiature, fixed voltage power supplies in a shielded metal case for mounting either on PC boards or metal chassis. Prices and specs. identical to SMF units. Order as SMF-5U, SMF-6U, etc.

INPUT VOLTAGE — 115 volts A.C.
UNREGULATED MODULES

Ideal raw D.C. supplies containing transformer, rectifiers and capacitor filter. Simply attach series regulator or zener diode to convert to a regulated power supply; all solid state.

Model	D.C. Volts	D.C. Current	Case	Price
SU-5A	5	2amp	HA	$34
SU-5B	5	6	JA	44
SU-6A	6	1	GB	32
SU-6B	6	2	HA	34
SU-6C	6	6	JA	44
SU-10A	10	1.5	HA	34
SU-10B	10	.5	GB	32
SU-10C	10	6	JA	44
SU-12A	12	1.5	HA	36
SU-12B	12	.5	HA	34
SU-12C	12	.25	HA	32
SU-12D	12	4	JA	44
SU-15A	15	1	HA	34
SU-15B	15	.5	GB	32
SU-15C	15	.25	FB	30
SU-15D	15	3.2	JA	44
SU-20A	20	.8	HA	34
SU-20B	20	.3	GA	32
SU-20C	20	1.2	HA	35
SU-20D	20	2.4	JA	44
SU-24C	24	2	JA	44
SU-25A	25	.8	HA	36
SU-25B	25	.3	HA	34
SUM-25	25	.06	EB	26
SU-28A	28	.8	HA	36
SU-28B	28	.3	GB	32
SU-28C	28	1.8	JA	44
SU-30A	30	.7	HA	36
SU-30B	30	.3	GB	32
SU-30C	30	1.6	JA	45
SU-40A	40	.5	HA	36
SU-40B	40	.2	GB	32
SU-48	48	.4	HA	36
SU-50A	50	.4	HA	36
SU-50B	50	.2	GA	34
SU-50C	50	1	JA	45
SU-60	60	.38	HA	36
SU-75	75	.3	HA	36
SU-90A	90	.25	HA	36
SU-90B	90	.1	HA	34
SU-100	100	.2	HA	36
SU-120A	120	.2	HA	36
SU-120B	120	.3	JA	45
SU-120C	120	.5	JA	45
SU-150	150	.1	HA	34
SU-200A	200	.09	HA	36
SU-250	250	.065	HA	36
SU-300	300	.06	HA	38
SU-400	400	.06	HA	38
SU-500	500	.05	LB	48
SU-750	750	.03	LB	58
SU-900	900	.025	LB	58
SU-1000	1000	.02	LB	58
SU-1250	1250	10ma	LB	58
SU-1400	1400	5	LB	58
SU-1500	1500	5	LB	62
SU-1750	1750	3	LB	65
SU-2000	2000	2	LB	70

INPUT VOLTAGE — 115 volts A.C.
PRINTED CIRCUIT MODULES



FOR PRINTED CIRCUIT BOARDS

Epoxy encapsulated power modules in an epoxy shell; incorporates 4 pins for direct soldering to printed circuit boards; lightweight.

SMP Units in Case: 1⅝"x1⅞"x1½".

MP Units in Case: 2⅛"x1⅞"x1⅝".

SINGLE OUTPUT VOLTAGE

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMP-5	5	40ma	2.0	.30	$35
MP-5	5	50	3.0	.30	34
SMP-6	6	40	1.3	.15	35
MP-6	6	50	1.8	.18	34
SMP-10	10	40	1.0	.15	35
MP-10	10	50	1.4	.12	34
SMP-12	12	40	1.0	.10	35
MP-12	12	45	1.3	.12	34
SMP-15	15	40	1.0	.10	35
EMP-15	15	45	1.5	.13	34
SMP-20	20	30	1.2	.25	35
MP-20	20	45	1.5	.15	35
SMP-24	24	30	1.2	.20	35
MP-24	24	40	1.5	.15	35
SMP-28	28	25	1.2	.30	35
MP-28	28	40	1.5	.15	35
MP-30	30	40	1.5	.15	35
MP-40	40	40	1.5	.22	36
MP-50	50	30	1.5	.20	36
MP-100	100	2	1.5	.10	38

DUAL OUTPUT VOLTAGE

Lightweight; Epoxy; SMMP case: 1⅝"x1⅞"x1½"; MMP case: 2"x2¾"x2". 6 pins.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMMP-6	6, 6	20ma	1.	.3	$40
MMP-6	6, 6	45	2.	.100	38
SMMP-10	10, 10	20	1.	.1	40
MMP-10	10, 10	45	1.2	.005	38
SMMP-12	12, 12	20	1.	.1	40
MMP-12	12, 12	45	1.2	.005	38
SMMP-15	15, 15	20	1.5	.1	40
MMP-15	15, 15	45	1.2	.005	38
SMMP-20	20, 20	15	1.5	.2	40
MMP-20	20, 20	40	1.2	.01	38
SMMP-24	24, 24	15	1.5	.2	40
MMP-24	24, 24	35	1.5	.01	38
SMMP-28	28, 28	12	1.5	.2	40

ADDITIONAL POWER SUPPLIES ON NEXT PAGE

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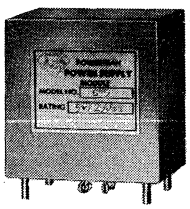
FERROTRAN
ELECTRONICS CO., INC.

SOLID STATE POWER SUPPLY MODULES

All silicon, long-life semi-conductor, regulated POWERTRAN power supply modules. Guaranteed 3 years. Gives single, fixed D.C. output voltages.

NEW!



ULTRA — COMPACT ECONOMY-POWER MODULES

FIXED VOLTAGE — SINGLE OUTPUT

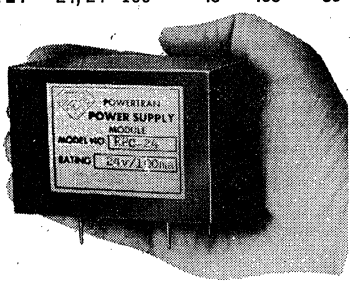
Case; GB metal case; 2¾″x2⅜″x2 13/16″. 4 pin connector.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
E-5	5	250ma	.5	.01	$45
E-6	6	200	.4	.10	45
E-10	10	175	.3	.10	45
E-12	12	150	.2	.10	45
E-15	15	150	.2	.10	45
E-20	20	120	.2	.10	45
E-24	24	120	.2	.10	45
E-30	30	150	.3	.01	50
E-35	35	100	.3	.02	50
E-40	40	100	.3	.02	50
E-44	44	100	.3	.02	50
E-48	48	75	.3	.02	50

FIXED VOLTAGE — DUAL OUTPUT

Case; GB metal case; 2¾″x2⅜″x2 13/16″. Contains 2 isolated power supplies. 6 pin connector.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
EE-5	5, 5	150ma	.5	.10	$50
EE-6	6, 6	150	.4	.10	50
EE-12	12, 12	120	.3	.05	50
EE-15	15, 15	100	.3	.04	50
EE-20	20, 20	100	.3	.05	50
EE-24	24, 24	100	.3	.05	50

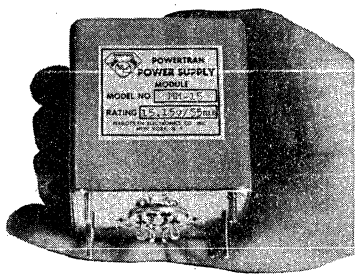


FIXED VOLTAGE — SINGLE OUTPUT MODULES FOR P.C. BOARDS

Case; Black epoxy; 2⅞″x2″x2″.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
EPC-5	5	150	.4	.20	$40
EPC-6	6	150	.4	.20	40
EPC-10	10	150	.2	.10	40
EPC-12	12	100	.2	.10	40
EPC-15	15	100	.2	.10	40
EPC-20	20	100	.2	.10	40
EPC-24	24	100	.2	.10	40

INPUT VOLTAGE — 115 volts A.C. DUAL OUTPUT MIDGET MODULES



MM15 DUAL OUTPUT OP-AMP MODULE

These precision engineered modules furnish two matched output voltages from independent power supply units. The current shown is available from each tap. Ideal for OP-AMPS; 6 pin connector.

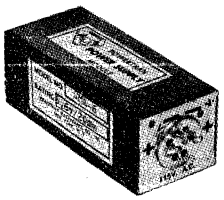
Model	D.C. Volts	D.C. Cur.	% Reg.	% Rip.	Case	Price
MM-5	5, 5	50	1.7	.08	GB	$48
MA-515	5, 15	50	1.7	.1	GB	52
MM-6	6, 6	50	1.6	.05	GB	48
MA-612	6, 12	50	1.6	.1	GB	52
MA-615	6, 15	50	1.6	.1	GB	52
MM-10	10, 10	60	1.2	.005	GB	48
HMC-10	10, 10	150	1.2	.05	JB	65
MM-12	12, 12	60	1.2	.005	GB	48
HMC-12	12, 12	150	1.5	.02	JB	68
MM-15	15, 15	55	1	.006	GB	50
HMC-15	15, 15	150	1.5	.02	JB	65
MM-18	18, 18	50	1	.01	GB	50
MM-20	20, 20	50	1	.01	GB	50
HMC-20	20, 20	120	1.2	.04	JB	65
MM-24	24, 24	45	1	.01	GB	50
HMC-24	24, 24	110	1.3	.04	JB	65
MM-25	25, 25	45	1	.01	GB	50
MM-28	28, 28	45	1	.01	HB	51
HMC-28	28, 28	110	1.4	.05	JB	65
MM-30	30, 30	45	1	.01	HB	51
HMC-30	30, 30	100	1.5	.15	JB	65
HMC-45	45, 45	80	1.5	.15	JB	65
HHV-50	50, 50	40	1	.2	JA	58
HHM-60	60, 60	20	1.5	.1	HB	50
HHV-60	60, 60	40	1	.2	JA	60
HHM-70	70, 70	20	1.5	.1	HB	50
HHV-70	70, 70	40	1	.2	JA	60
HHM-100	100, 100	10	1.5	.1	JB	55
HHV-100	100, 100	30	1	.08	JA	70
HHM-120	120, 120	5	1.5	.1	JB	55
HHV-120	120, 120	25	1	.05	JA	70
HHV-150	150, 150	20	1	.05	JA	75

MIL SPEC MODULES

All power supplies described on these pages may be militarized. Will meet all environmental specs. of MIL-E-5272C. Call us for an estimate.

SEE SECTION 5600 FOR LIST OF FERROTRAN TRANSFORMERS

INPUT VOLTAGE — 115 volts A.C. SUBMINIATURE DUAL OUTPUT



SMA-6

Case; 3″x1 3/16″x1¼″; Mounts on a chassis with 2 ea. 4-40 blind inserts; no projecting studs; ideal for printed circuit boards; fixed voltage; 6 pin connector.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMA-6	6, 6	20ma	1.0	.3	$40
SMA-10	10, 10	20	1.0	.1	40
SMA-12	12, 12	20	1.0	.1	40
SMA-15	15, 15	20	1.5	.1	40
SMA-20	20, 20	15	1.5	.2	41
SMA-24	24, 24	15	1.5	.2	41
SMA-28	28, 28	12	1.5	.2	41

Case; 1⅝″17⅞″x1⅝″; Mounts on a chassis with 4 ea. 6-32 studs. ⅝″ diam. connector in cover. 6 pins; case style similar to SM units (see photo).

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMAC-6	6, 6	20ma	1.0	.3	$40
SMAC-10	10, 10	20	1.0	.1	40
SMAC-12	12, 12	20	1.0	.1	40
SMAC-15	15, 15	20	1.5	.1	40
SMAC-20	20, 20	15	1.5	.2	41
SMAC-24	24, 24	15	1.5	.2	41
SMAC-28	28, 28	12	1.5	.2	41

INPUT VOLTAGE — 115 volts A.C. INDICATOR TUBE SUPPLIES

All solid-state, silicon, power supply modules used to operate indicator display devices, numeral lights, etc. for digital read-out. Also for power decoder drivers and diode counters.

Model	D.C. Volts	D.C. Current	Case	Price
NI-1	175	20ma	AJ	$30
NI-3	180	15	AJ	30
NI-4	200	12	AJ	30
NI-6	175	35	EB	30
NI-7	180	30	EB	30
NI-8	200	25	FB	30
NI-10	175	48	FB	30
NI-11	180	45	FB	31
NI-12	200	40	FB	31

Models NI-1 through NI-4 also available in epoxy encapsulated plastic case for PC board mounting 1⅝″x1⅞″x1½″. NI-6 through NI-12 in case 2″x2¾″x2″ for PC board mounting.

CASE SIZES

EB — 1¾″ x 1⅞″ x 2¾″
FB — 2¼″ x 2″ x 2½″
GA — 2¾″ x 2⅜″ x 2¾″
GB — 2¾″ x 2⅜″ x 2¾″
HA — 3″ x 2⅝″ x 3½″
HB — 3″ x 2⅝″ x 3 3/16″
JA — 3½″ x 3″ x 4¼″
JB — 3½″ x 3″ x 3⅞″
LB — 4¼″ x 3⅝″ x 4½″

FERROTRAN ELECTRONICS COMPANY, INC.
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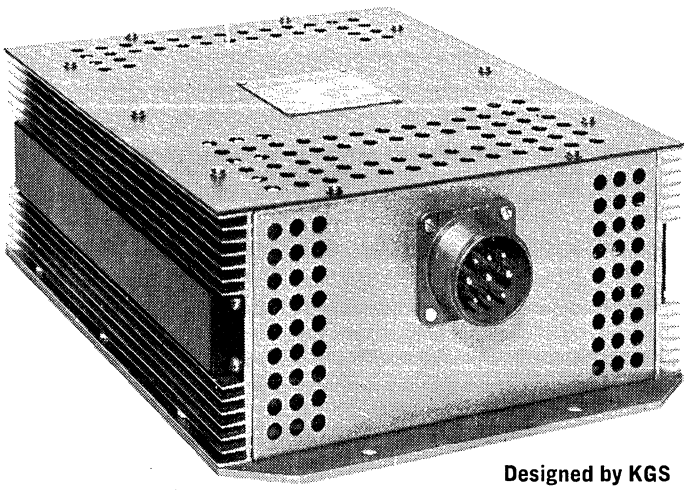
FLITE-TRONICS

60 Hz & 400 Hz STATIC INVERTERS



Designed by KGS

Other Inverters Available:

- **Model PC-14C ( ) 100 VA**
- **Model PC-14D ( ) 60 VA**
- **Model PC-14B 125 VA**
- **Model PC-15B ( ) 250 VA**
- **Model PC-17**

Environmental specifications of the above models, same as PC-17A

- **12 VDC to 24 VDC Converters**
- **24 VDC to 12 VDC Converters**

For applications requiring greater than 750 VA of continuous power, the Flite-Tronics' Model PC-17A Inverter can be paralleled as necessary to double, triple, or quadruple the output power of a single unit. This is simply done by phase locking the oscillator in the PC-17A. Malfunction of a single unit when connected in this manner will not damage the other units in parallel. Each unit has its own overload protection. Each device is capable of self-preservation.

SPECIFICATIONS MODEL PC-17A (750 VA) STATIC INVERTER

INPUT VOLTAGE:
28 VDC ±2.0 VDC

INPUT CURRENT:
39A — full load
1.5A — no load

OUTPUT VOLTAGES:
115 VAC +5% −7%
26 VAC +5% −7%

OUTPUT FREQUENCY:
400 Hz ±1%

OUTPUT POWER:
750 VA continuous for 115 VAC output
150 VA continuous for 26 VAC output
NOTE: Total continuous output power 750 VA.

OUTPUT WAVEFORM:
Sine Wave, Single Phase

HARMONIC DISTORTION:
7% maximum (Typically 3%)

POWER FACTOR:
.8 to −.95

ALTITUDE:
45,000 feet

EFFICIENCY:
70% typical

TEMPERATURE:
−65°F to 160°F

WEIGHT:
16.2 lbs.

SIZE:
Width 8½″
Length 12″
Height 4 1/16″

INPUT OVERVOLTAGE:
Withstands 130% overvoltage (37 VDC) for five minutes minimum while delivering full rated 750 VA output power. Output voltage under this condition 115 VAC +5% −7%.

EMISSION RFI:
Radiated & Conducted . . . 90KC to 1000MC.
Far below levels specified in Appendix A of RTCA Paper 120-61/DO-108 Category "A".

HUMIDITY:
Greater than 95% for ten days, temperature cycled between 75°F to 160°F.

VIBRATION:
Tested to withstand in three directions:
.08 DA 5-15 Hz
.036 DA 15-70 Hz
10 G's 70-500 Hz

SHOCK:
To withstand at least 10 G's for 11 milliseconds in three directions.

OVERLOAD CAPABILITY:
Deliver 150% of rated output current at rated output voltage for a duration of not less than 5 minutes (i.e., 900 volt amp load).

INPUT VOLTAGE PROTECTION:
Unit withstands transients of 88 volts lasting 1 millisecond on the 28.0 VDC input line.

EXCESSIVE OVERLOAD & OUTPUT SHORT CIRCUIT:
Withstands without damage or degradation loads exceeding 150% nominal to an output short circuit. Unit delivers rated output on removal of above condition.

SPECIFICATIONS MODEL PC-16 STATIC INVERTER

POWER OUTPUT:
250 VA Continuous
150% Overload 5 minutes
pf — .8 to 1.0

VOLTAGE INPUT:
1. 28 VDC ±2 Volts
2. Withstands 88 Volt Transient for 1 Millisecond

INPUT CURRENT:
14 Amp — full load
1 Amp — no load

FREQUENCY:
60 HZ ±1 Hz

VOLTAGE OUTPUT:
115 VAC RMS +5% −7%

AMPLITUDE DISTORTION:
Less than 7%

WAVE FORM:
Sine Wave

PHASE:
Single

SHORT CIRCUIT
Withstand for 1 minute or longer

TEMPERATURE:
−10°F to +160°F

ALTITUDE:
45,000 Ft.

WEIGHT:
16 lbs.

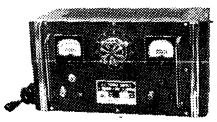
SIZE:
7½″ x 12″ x 4″ overall dimensions

For application requiring greater than 250 VA of continuous power Model PC-16 can be paralleled to double or triple the output power of a single unit.

FLITE-TRONICS, co., inc. 3314 Burton Avenue., Burbank, Calif. 91504 U.S.A.
Phone: (213) 849-1552

GATES POWER SUPPLIES

SILICON POWER RECTIFIER



For transister circuits and electronic equipment

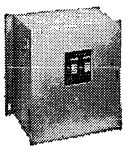
MODEL G92F

Input: 115 VAC, 60 cycles, single phase. **Output:** 0-32 VDC, 0-10 Amps DC Continuous Duty. **Regulation:** No load to full load 15%. **Ripple:** Less than 0.3% RMS. **Meters:** 2% Accuracy. **Dimen.:** 17″ x 9″ x 9″.

Price: $187.00 Net

5 Amps Price: $187.50 Net

INDUSTRIAL POWER UNITS

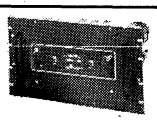


MODEL A10

Input: 115 or 230 VAC, 60 cycles, single phase. **Output:** 115 VDC, 125 Watts. **Application:** Power sources for operating DC Motors, Relays, Solenoids, Magnetic Chucks. **Dimen.:** 11″H x 9″W x 6½″D.

Price: $69.00 Net

250 Watts Price: $80.00

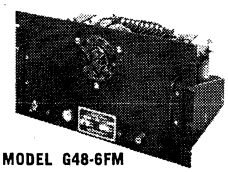


MODEL GX30-10

SILICON RACK MOUNT SUPPLY

Input: 115 VAC, 60 cycles, single phase. **Output:** 26, 28, 30 VDC, 0-10 Amps Continuous Duty. **Regulation:** 10% no load to full load. **Ripple:** 0.3% RMS. **Dimen.:** 8¾″H x 19″W x 10″D.

Price: $152.00 Net

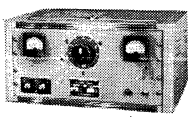


MODEL G48-6FM

SELENIUM POWER SUPPLY

Input: 115 VAC, 60 cycles, single phase. **Output:** 0-48 VDC, 0-6 Amps. **Control:** Continuously variable over entire range. **Ripple:** 1% RMS. **Dimen.:** 19″W x 13″D x 10½″H, Fits RETMA, Western Electric racks.

Price: $209.00 Net



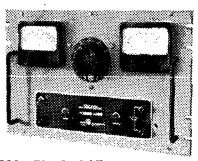
MODEL GS14-15F

SILICON POWER SUPPLY

Input: 115 VAC, 60 cycles, single phase. **Output:** 0-14 VDC, 0-15 Amps Continuous Duty. **Ripple:** Less than 1% RMS. **Meters:** 2% Accuracy. **Dimen.:** 9″H x 17½″W x 9″D.

Price: $176.00 Net

Rack Model Same Price



MODEL G101F

AIRCRAFT BATTERY ELIMINATOR

Input: 115 VAC, 60 cycles, single phase. **Output:** 0-32 VDC, 0-20 Amps Continuous Duty. **Ripple:** 0.5% RMS. Unique overload device prevents needle slam and shows overload condition. **Regulation:** VDC at full load, 30; VDC at 1/10 load, 35. **Meters:** 2% Accuracy. **Dimen.:** 19″ x 14¼″ x 12¼″.

Price: $303.00 Net

May be used for Rack or Bench

ECONOMY RANGE DC POWER SUPPLIES

Less Than 1% Ripple, Good Regulation, Rack Mount Type, Heavy Duty Construction, Powerstat, Fused 2% Meters, 115 VAC Input.

Model	Output Volts DC @ Amps		Price
GT 12-5	0-12	5	$ 88
GT 12-10	0-12	10	143
GT 12-15	0-12	15	160
GT 12-25	0-12	25	169
GT 12-100	0-12	100	435
GT 14-5	0-14	5	132
GT 14-15	0-14	15	149
GT 14-20	0-14	20	160
GT 14-30	0-14	30	304
GT 14-40	0-14	40	314
GT 14-50	0-14	50	385
GT 14-75	0-14	75	413
GT 14-100	0-14	100	460
GT 16-5	0-16	5	94
GT 16-10	0-16	10	99
GT 16-25	0-16	25	171
GT 16-30	0-16	30	215
GT 16-40	0-16	40	286
GT 16-50	0-16	50	407
GT 16-70	0-16	70	429
GT 16-80	0-16	80	446
GT 28-5	0-28	5	99
GT 28-12	0-28	12	186
GT 28-24	0-28	24	302
GT 32-5	0-32	5	116
GT 32-8	0-32	8	164
GT 32-12	0-32	12	197
GT 32-15	0-32	15	203
GT 32-24	0-32	24	325
GT 32-30	0-32	30	358
GT 32-50	0-32	50	468
GT 32-60	0-32	60	561
GT 48-5	0-48	5	152
GT 48-10	0-48	10	180
GT 48-15	0-48	15	187
GT 48-25	0-48	25	275
GT 48-35	0-48	35	330
GT 48-50	0-48	50	385
GT 48-60	0-48	60	468
GT 48-80	0-48	80	550
GT 48-100	0-48	100	605
GT 80-5	0-80	5	242
GT 80-10	0-80	10	303
GT 80-20	0-80	20	450
GT 80-50	0-50	50	Inquire
GT 80-100	0-80	100	Inquire
GT 115-5	0-115	5	260
GT 115-10	0-115	10	280
GT 115-15	0-115	15	300
GT 115-20	0-115	20	340
GT 115-25	0-115	25	380
GT 115-30	0-115	30	420
GT 115-40	0-115	40	490
GT 115-50	0-115	50	560
GT 115-60	0-115	60	660
GT 115-70	0-115	70	700
GT 125-5	0-120	5	300

ECONOMY RANGE DC POWER SUPPLIES (Cont'd)

Model	Output Volts DC @ Amps		Price
GT 130-2	0-130	2	$136
GT 130-5	0-130	5	240
GT 130-10	0-130	10	310
GT 200-10	0-220	10	400

3 PHASE MODELS WITH POWERSTAT & METERS IN CABINET. GOOD RIPPLE & REGULATION

Model	Output Volts DC @ Amps		Price
GP 125-40	0-125	40	Inquire
GP 125-80	0-125	80	Inquire
GP 125-125	0-125	125	Inquire
GP 250-15	0-250	15	Inquire
GP 250-25	0-250	25	Inquire
GP 250-40	0-250	40	Inquire
GP 250-75	0-250	75	Inquire
GP 500-5	0-500	5	Inquire
GP 500-10	0-500	10	Inquire
GP 500-25	0-500	25	Inquire
GP 500-35	0-500	35	Inquire

LOW-COST BASIC/OEM SUPPLIES

Model	Output Volts DC @ Amps		Price
L 6.3-30	6.3	30/1%	$137
L 12-12	12	12/Rip. 1Mv/.01%	198
L 12-15	12	15/1%	187
L 12-24	12	24	110
L 12-24	12	24/1%	158
L 12-50	12	50	146
L 12-50	12	50/Rip. 1%	245
L 24-30	24	30/Rip. 1%	$344
L 28-1	28	1/0.5%	61
L 28-2	28	1/Rip. .05%	72
L 28-5	28	5	94
L 28-8	28	8	121
L 28-12	28	12	132
L 28-24	28	24/(N.F.)	127
L 28-24	28	24	198
L 28-30	28	30	344
L 28-50	28	50/(N.F.)	226
L 28-50	28	50	314
L 28-50	28	50/1% R.	443
L 28-100	28	50/1% R.	460
L 115-2.5	115	2.5	94
L 115-5	115	5	136
L 115-10	115	10/(N.F.)	207
L 115-10	115	10	374
L 220-5	220	5	245
L 220-10	220	10	374
L 440-5	440	5	384

(N.F.) means not filtered.

NEW

RACK MOUNT, TRANSISTORIZED LINE & LOAD REGULATED POWER SUPPLIES

Regulation: ±0.1%, Line & Load ±100 mv. Input: 115 VAC, 60 Hz, single phase.

Model	Output Volts DC @ Amps		Price
GQ 15-5	0-15	5	$225
GQ 15-10	0-15	10	310
GQ 15-24	0-15	25	495
GQ 15-50	0-15	50	729
GQ 36-5	0-36	5	310
GQ36-10	0-36	10	407
GQ 36-15	0-36	15	530
GQ 36-25	0-36	25	649
GQ 36-50	0-36	50	989
GQ 60-5	0-60	5	407
GQ 60-10	0-60	10	530
GQ 60-15	0-60	15	655
GQ 60-20	0-60	20	975
GQ 125-2.5	0-125	2.5	407
GQ 125-5	0-125	5	510
GQ 125-10	0-125	10	980

12 VOLT POWER SUPPLIES — 1% RIPPLE

Model	Output Volts DC @ Amps		Price
GS 12-1	12	1	$ 39
GS 12-3	12	3	61
GS 12-5	12	5	72
GS 12-10	12	10	94
GS 12-15	12	15	143
GS 12-20	12	20	165
GS 12-25	12	25	187
GS 12-30	12	30	209

3 PHASE — BENCH MODEL PLATING SUPPLIES

Model	Output Volts DC @ Amps		Price
GL 6-50	6	50	$224
GL 9-50	9	50	233
GL 12-50	12	50	242
GL 18-50	18	50	260
GL 6-75	6	75	282
GL 9-75	9	75	290
GL 12-75	12	75	304
GL 18-75	18	75	321
GL 6-100	6	100	295
GL 9-100	9	100	312
GL 12-100	12	100	330
GL 18-100	18	100	348
GL 6-150	6	150	330
GL 9-150	9	150	361
GL 12-150	12	150	387
GL 18-150	18	150	409
GL 6-200	6	200	363
GL 9-200	9	200	387
GL 12-200	12	200	409
GL 6-250	6	250	409
GL 9-250	9	250	436
GL 12-250	12	250	506

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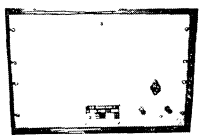
GATES POWER SUPPLIES

A single source for all possible types of "brute force" and regulated power supplies that can fill 90% of your design and application needs. Gates Power Supplies give you absolutely lowest cost and long life. The units are excellently constructed of high rated components for trouble free, years of service.
Silicon or Selenium. Single and three-phase units. 1 to 100 Volts, 1 to 1000 Amps. Metered and unmetered Static or variable outputs. Rack, cabinet or chassis mounts. Unit or hundred quantities 48 hour delivery. Two year guarantees. Power Supplies for OEM Application, Testing Prototype, Lab Type Units, Plating, Motor Control, Cathode Protection, Transistor Power, Anodizing, Battery Charging, Battery Conversions, Marine Types, Aircraft Starting.

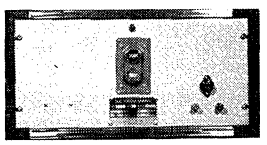


MODEL G230-25

Input: 208/440, 3 phase, 60 cycles. **Output:** 230 @ 25A. **Ripple:** 4.5%. **Regulation:** 1/10 Load 8%. **Meters:** None. **Dimen.:** 21″W x 15″D x 14″H.
Price: $633.00 Meters $55.00 Extra

Model G12-250

Input: 208, 3 phase, 60 cycles. **Output:** 0-12 Volts @ 250 Amps. **Ripple:** 4.5%. **Regulation:** 1/10 Load 8%. **Meters:** Yes. **Dimen.:** 20″W x 20″D x 35″H.
Price: $633.00



MODEL G220-10

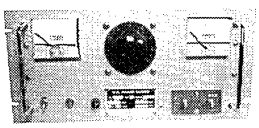
Input: 115 VAC. **Output:** 220 VDC @ 10A. **Ripple:** 48%. **Meters:** None. **Dimen.:** 21″W x 15″D x 10″H.
Price: $468.00 Meters $55.00 Extra

SILICON INDUSTRIAL POWER UNIT MODEL G30-40F

Input: 115 VAC, 60 cycles, single phase. **Output:** 0-32 VDC, 0-40 Amps DC, continuous duty. **Ripple:** 1% RMS. **Dimen.:** 12¼″H x 19″W x 13″D. **Regulation:** D.C.V. at full load: 32 minimum. D.C.V. at 1/10 load: 35 maximum.
Price: $468.00

MODEL GT125-5F

Input: 115 VAC. **Output:** 0-125 @ 5A. **Ripple:** 0.5%. **Regulation:** Unregulated. **Meters:** Yes. **Dimen.:** 21″W x 15″D x 10½H.
Price: $358.00

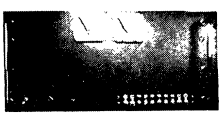


MODEL GT14-40

Input: 115 VAC. **Output:** 0-14 @ 40A. **Ripple:** 0.1%. **Regulation:** Unregulated. **Meters:** Yes. **Dimen.:** 19″W x 13½″D x 8½″H.
Price: $303.00 — Rack Mounted

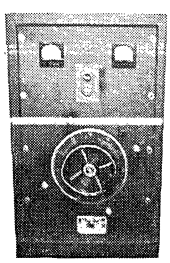
MODEL GX28-50

Input: 115 VAC. **Output:** 28 @ 50A. **Ripple:** 0.5%. **Regulation:** Unregulated. **Meters:** None. **Dimen.:** 19″W x 13½″D x 12¼″H.
Price: $358.00 — Rack Mounted



MODEL G45-30

Input: 115 VAC. **Output:** 45, 42, 40, 36, 32, 30, 29, 28, 26 @ 30A. **Ripple:** 1%. **Regulation:** Fan Cooled. **Meters:** 5%. **Dimen.:** 19″W x 10″D x 8½″H.
Price: $413.00

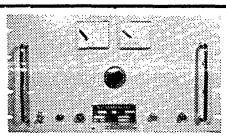


MODEL GT20-200

Input: 220 VAC 60 cycles 1 phase. **Output:** 0-22 VDC @ 200A. **Ripple:** 1%. **Cabinet:** 35″ x 20″ x 20″. **Meters:** Volt and Amp.
Price: $688.00

NEW

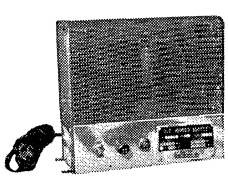
NEW SCR REGULATED POWER SUPPLIES



GCR32-30
115 VAC 24-32 @ 30A 1% ±1% Meters 19″W x 17″D x 12¼″H
Price: $605.00 — Cabinet $25.00 more

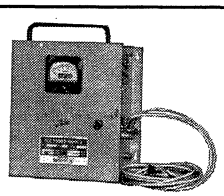
GCR32-25
115 VAC 24-32 @ 25A 1% ±1% Meters 19″W x 17″D x 12¼″H
Price: $556.00 — Cabinet $25.00 more

GCR32-20
115 VAC 24-32 @ 20A 1% ±1% Meters 19″W x 17″D x 12¼″H
Price: $523.00 — Cabinet $25.00 more



SILICON POWER SUPPLY MODEL GX24-1

Input: 115 VAC, 60 cycles, 1 phase. **Output:** 24 VDC, 0-1 Amps DC, continuous duty. **Ripple:** 0.3% RMS. **Regulation:** 8% no load to full load. **Dimen.:** 3″ x 5″ x 10″.
Price: $83.00 — 0-2 Amps Price: $94.00

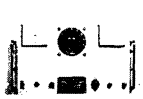


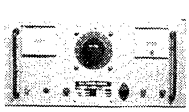
PORTABLE SILICON BATTERY CHARGER MODEL G612-20

Input: 115 VAC, 60 cycles, 1 phase. **Output:** 6-12 VDC, 20 Amps continuous duty. **Meter:** Amp. meter 2% Accuracy. **Dimen.:** 11″H x 9″W x 6½″D.
Price: $64.00

SILICON RECTIFIER MODEL GT32-30

Input: 115 Volts, 50-60 cycles, 1 phase. **Output:** 30 Amps, 0-32 VDC. **Rectifier:** Full wave silicon rectifier. **Ripple:** 1% RMS. **Voltage Control:** Powerstat. **Meters:** 2% Accuracy volt meter, amp meter. **Dimen.:** 10½″ x 13½″ x 19″.
Price: $385.00 — Weight: 92 Lbs.



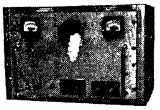


SILICON RECTIFIER MODEL GT32-24

Input: 115 Volts, 50-60 cycles, 1 phase. **Output:** 24 Amps, 0-32 VDC. **Rectifier:** Full wave silicon rectifier. **Ripple:** 1%. **Voltage Control:** Powerstat. **Dimen.:** 8¾″x13½″x19″. **Meters:** 2% Accuracy volt meter, amp meter.
Price: $358.00 — Weight: 75 Lbs.

BENCH PLATING RECTIFIER MODEL G50-8

Input: 115 Volts, 50-60 cycles, 1 phase. **Output:** 50 Amps, 0-8 VDC. **Rectifier:** Full wave silicon rectifier. **Ripple:** 2% $75. extra. **Voltage Control:** Powerstat. **Meter:** 2% Accuracy, volt meter, amp meter. **Dimen.:** 21″ x 15″ x 10″.
Price: $193.00



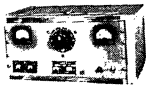
BENCH PLATING RECTIFIER MODEL G100-8

Input: 115 Volts, 50-60 cycles, 1 phase. **Output:** 100 Amps, 0-8 VDC. **Rectifier:** Full wave silicon rectifier. **Ripple:** 2% $75. extra. **Voltage Control:** Powerstat. **Meter:** 2% Accuracy, volt meter, amp meter. **Dimen.:** 21″ x 15″ x 10″.
Price: $303.00

BENCH PLATING RECTIFIER MODEL G200-6

Input: 115 Volts, 50-60 cycles, 1 phase. **Output:** 200 Amps, 0-6 VDC. **Rectifier:** Full wave silicon rectifier. **Ripple:** 2% $100 extra. **Cooling:** Fan. **Voltage Control:** Powerstat. **Meters:** 2% Accuracy, volt meter, amp meter. **Dimen.:** 21″ x 15″ x 19″.
Price: $424.00

BENCH PLATING RECTIFIER MODEL G50-15



Input: 115 Volts, 50-60 cycles, 1 phase. **Output:** 50 Amps, 0-15 VDC. **Rectifier:** Full wave silicon rectifier. **Ripple:** 2% $125 extra. **Voltage Control:** Powerstat. **Meters:** 2% Accuracy, volt meter, amp meter. **Dimen.:** 21″ x 15″ x 10″.
Price: $231.00

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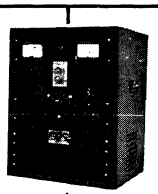
GATES POWER SUPPLIES

SILICON POWER RECTIFIER
MODEL G50-50R

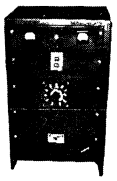


Input: 220 VAC, 60 cycles, 3 phase. **Output:** 0-50 VDC, 0-50 Amps Continuous Duty. **Ripple:** .3% RMS. **Regulation:** No load to full load 8%. **Meters:** 2% Accuracy. **Dimen.:** 21″ x 15″ x 19″.

SILICON INDUSTRIAL POWER UNIT
MODEL G30-100

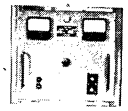
Input: 220 VAC, 60 cycles, 3 phase. **Output:** 0-32 VDC, 0-100 Amps Continuous Duty. **Ripple:** .3% RMS. **Regulation:** 5-8% 1/10th load to full load with constant input and at maximum output voltage setting. **Meters:** 2% Accuracy. **Dimen.:** 21″ x 15″ x 19″.

SILICON AIRCRAFT BATTERY ELIMINATOR
MODEL G30-200



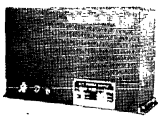
Input: 220 VAC, 60 cycles, 3 phase. **Output:** 0-32 VDC, 0-200 Amps Continuous Duty also avail. 300A. **Ripple:** .5% RMS. **Regulation:** 5-8% 1/10th load to full load with constant input and maximum output voltage setting. **Meters:** 2% Accuracy. **Dimen.:** 25″ x 25″ x 43″.

SILICON REGULATED POWER SUPPLY
MODEL G530-40M



Input: 115 VAC, 60 cycles, 1 phase. **Output:** 5-30 VDC, 0-40 Amps. **Ripple:** 1% RMS. **Regulation:** ±1% from no load to full load. **Meters:** 2% Accuracy. **Dimen.:** 21″ x 15″ x 19″.

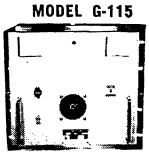
SILICON POWER SUPPLY
MODEL GX30-5



Input: 115 VAC, 60 cycles, single phase. **Output:** 28-30-32 VDC, 0-5 Amps, DC Continuous Duty. **Regulation:** 12% no load to full load. **Ripple:** .5% RMS. **Dimen.:** 5″W x 13½″L x Overall Height 9″.

Price: $94.00
6 Amps Price: $105.00

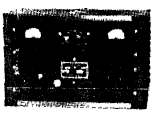
SILICON GENERAL PURPOSE RECTIFIER
MODEL G-115



Input: 115 VAC, 60 cycles, single phase. **Output:** 0-32 VDC, 0-50 Amps DC Continuous Duty variable over entire range. **Ripple:** 1% RMS. **Dimen.:** 22″H x 19″W x 15″D.

Price: $574.00 Net

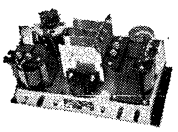
DC POWER SUPPLY
MODEL G94F



Input: 115 VAC, 60 cycles, single phase. **Output:** 0-300 VDC Continuous Duty variable 0-1 Amps. **Ripple:** 3 MV RMS. **Dimen.:** Rack 8¾″H x 19″L x 9½″D. Cabinet 10½″H x 22″L x 12″D.

Price: $303.00
0-2 Amp Price: $374.00

SILICON POWER SUPPLY
MODEL GX30-20



Input: 115 VAC, 60 cycles, single phase. **Output:** 0-34 VDC, 0-20 Amps Continuous Duty. **Regulation:** No load to full load 18%. **Ripple:** Below 1%. Silicon Rectifiers, High Efficiency. **Dimen.:** 10″ x 17″ x 3″.

Price: $204.00 Net

24 VOLT POWER SUPPLIES — RACK TYPE — 1% RIPPLE

Model	Output Volts DC @ Amps		Price
G 24-6R	24	6	$105
G 24-15R	24	15	116
G 24-25R	24	25	138
G 24-50R	24	50	231

INDUSTRIAL POWER UNITS — SINGLE PHASE

Model	Output VDC @ Watts		Input VDC	Price
GK 115-125A	115	125	115	$ 69
GK 115-125B	115	125	230	69
GK 115-125C	115	125	440	69
GK 115-250A	115	250	115	80
GK 115-250B	115	250	230	80
GK 115-250C	115	250	440	80
GK 115-375A	115	375	115	98
BK 115-375B	115	375	230	98
GK 115-375C	115	375	440	98
GK 115-500A	115	500	115	116
GK-115-500B	115	500	230	116
GK 115-500C	115	500	440	116
GK 115-750A	115	750	115	143
GK 115-750B	115	750	230	143
GK 115-750C	115	750	440	143
GK 115-1000A	115	1000	115	165
GK 115-1000B	115	1000	230	165
GK 115-1000C	115	1000	440	165
GK 230-125A	230	125	115	74
GK 230-125A	230	125	230	74
GK 230-125C	230	125	440	74
GK 230-250A	230	250	115	83
GK 230-250B	230	250	230	83
GK 230-250C	230	250	440	83
GK 230-375A	230	375	115	121
GK 230-375B	230	375	230	121
GK 230-375C	230	375	440	121
GK 230-500A	230	500	115	127
GK 230-500B	230	500	230	127
GK 230-500C	230	500	440	127
GK 230-750A	230	750	115	189
GK 230-750B	230	750	230	189
GK 230-750C	230	750	440	189
GK 230-1000A	230	1000	115	198
GK 230-1000B	230	1000	230	198
CK 230-1000C	230	1000	440	198

HIGH VOLTAGE DC POWER SUPPLIES

1% Ripple, Good Regulation, Cabinets, Meters, Heavy Duty Construction, Powerstat, Fused 1% Meters, 115 VAC Input Heavy Duty Line Cord.

Model	Input VDC	Input Phase	Output VDC	Output Amps	Price
GP 32-5	115	1	0-32	5	Inquire
GP 32-10	115	1	0-32	10	Inquire
GP 32-20	115	1	0-32	20	Inquire
GP 32-40	115	1	0-32	40	Inquire
GP 32-100	220	3	0-32	100	Inquire
GP 32-150	220	3	0-32	150	Inquire
GP 60-6	115	1	0-60	6	Inquire
GP 60-10	115	1	0-60	10	Inquire
GP 60-12	115	1	0-60	12	Inquire
GP 60-20	115	1	0-60	20	Inquire
GP 60-50	220	3	0-60	50	Inquire
GP 60-80	220	3	0-60	80	Inquire
GP 60-250	220	3	0-60	250	Inquire
GP 125-2.5	117	1	0-125	2.5	Inquire
GP 125-3	117	1	9-124	3	Inquire
GP 125-5	117	1	0-125	5	Inquire
GP 125-10	117	1	0-125	10	Inquire
GP 125-20	117	1	0-124	20	Inquire
GP 125-24	220	3	0-125	24	Inquire
GP-125-40	220	3	0-125	40	Inquire
GP 125-80	220	3	0-125	80	Inquire
GP 125-120	220	3	0-125	120	Inquire
GP 250-5	117	1	0-250	5	Inquire
GP 250-10	117	1	0-250	10	Inquire
GP 250-12	220	3	0-250	12	Inquire
GP 250-20	220	3	0-250	20	Inquire

NOTE: All Models 60 cycles.

HIGH VOLTAGE DC POWER SUPPLIES (Cont'd)

Model	Input VDC	Input Phase	Output VDC	Output Amps	Price
GP 250-40	220	3	0-250	40	Inquire
GP 250-60	220	3	0-250	60	Inquire
GP 300-1	220	3	0-250	1	$303
GP 300-1.5	220	3	0-250	1.5	341
GP 300-2	220	3	0-250	2	385
GP 300-3	220	3	0-250	3	495
GP 300-5	220	3	0-250	5	710
GP 500-1	220	3	0-500	1	335
GP 500-1.5	220	3	0-500	1.5	396
GP 500-2	220	3	0-500	2	468
GP 500-3	220	3	0-500	3	578
GP 500-5	220	3	0-500	5	798
GP 500-5	220	3	0-500	5	Inquire
GP 500-10	220	3	0-500	10	Inquire
GP 500-20	220	3	0-500	20	Inquire
GP 500-30	220	3	0-500	30	Inquire

NOTE: All Models 60 cycles.

SILICON RECTIFIERS FOR EXITATION OF SYNCHRONOUS MOTORS. HEAVY DUTY, INDUSTRIAL CONSTRUCTION. PROVEN IN USE.

KW	Volts DC	Amps DC	Price
3.5	125	28	Inquire
5	125	40	Inquire
7	125	56	Inquire
10	125	80	Inquire
22	125	168	Inquire
55	125	440	Inquire

MAGNETICALLY REGULATED DC POWER SUPPLIES

Regulation: Line ±1% for ±15% line voltage change load ±2% for any load change between ½ load and full load. Ripple 1% RMS Maximum. Rack or cabinet types.

Catalog No.	DC Output Volts	Amps	Load Regulation 20% F.L.	Load Regulation 50% F.L.	Price
6GDCV10	6	10	9	7	$143
6GDCV15	6	15	9	7	154
12GDCV5	12	5	7	5	101
12GDCV10	12	10	7	5	132
12GDCV15	12	15	7	5	171
18GDCV5	18	5	5	4	106
18GDCV10	18	10	7	5	155
24GDCV5	24	6	5	4	128
24GDCV10	24	10	6	4	158
24GDCV15	24	15	5	4	220
24GDCV25	24	25	6	4	303
28GDCV8	28	8	6	4	158
28GDCV15	28	15	7	5	220
48GDCV4	48	4	3.5	2.5	120
48GDCV4	48	4	4	2	164
48GDCV20	48	20	3	2	245
125GDCV2	125	2	2.5	1.5	129
150GDCV2	150	2	2	1.5	129
200GDCV1	150	1	3	2	123
250GDVC1	250	1	3	2	132

SEND FOR COMPLETE CATALOG

GATES ELECTRONIC COMPANY, INC.

526 VAN NEST AVE., BRONX, N. Y. 10460 • TELEPHONES: TU 1-5900 and 823-8200

RECHARGEABLE NICKEL-CADMIUM BATTERIES

STANDARD BATTERIES FOR STANDARD APPLICATIONS

- Micro-valve resealable vent
- High-rate discharge
- Excellent discharge voltage characteristic
- Overcharge capability
- Long operating life
- High reliability
- Indefinite storage life
- Rechargeable over and over
- Mount in any position

General Electric sealed nickel-cadmium batteries provide a highly reliable source of portable electrical power that is ready to go when you are. These multi-purpose dollar saving batteries can be charged time and time again without "using up" any of the active materials in the electrochemical system, so you get high power performance after every charge. And you don't have to worry about overcharging. General Electric's nickel-cadmium batteries can be left on charge in an overcharge condition at the recommended rate for weeks and months without any adverse effects.

General Electric sealed nickel-cadmium batteries can be operated in any position, making them ideal for cordless portable devices where long life and high performance are required. The "storeability" and maintenance-free dependability of these batteries also make them well suited for standby power applications where the batteries must be ready to serve the instant normal power fails.

These rechargeable nickel-cadmium batteries are designed for standard applications in which the cell case temperature in the battery pack will not exceed 49°C (120°F). For more rigorous high temperature applications, specify General Electric's Goldtop* rechargeable batteries below.

Write for Bulletin GEA-9865

STANDARD RATINGS & DIMENSIONS

Capacity Ampere-hour		d-c Volts	Cell Type	Model Number	Max. Overcharge Rate in mA	Maximum Dimension			
						Dia.		Ht.	
1 Hr.	10 Hr.					In.	mm	In.	mm
CYLINDRICAL BATTERIES									
.080	.090	1.2	Sub N	GCB100ST	8	.450	11.4	1.015	25.8
.100	.110	1.2	⅓ AA	GCF100ST	10	.574	14.6	.702	17.8
.150	.170	1.2	⅓ A	GCK150ST	15	.643	16.3	.656	16.7
.175	.200	1.2	—	GCL200ST	20	.673	17.1	.655	16.6
.250	.275	1.2	½ AA	GCF250ST	25	.574	14.6	1.28	32.5
.400	.450	1.2	—	GCL450ST	40	.673	17.1	1.12	28.4
.450	.500	1.2	AA	GCE450SB	45	.560	14.2	1.978	50.2
.500	.550	1.2	AA	GCF500ST	50	.574	14.6	1.952	49.6
.500	.550	1.2	½ Sub C	GCR550ST	55	.900	22.9	1.045	26.5
.600	.660	1.2	A	GCK600ST	60	.643	16.3	1.955	49.9
.700	.770	1.2	½ C	GCT700ST	70	1.028	26.1	.985	25.0
1.0	1.2	1.2	Sub C	GCR1.0ST	100	.900	22.9	1.645	41.8
1.0	1.1	1.2	⅗ C	GCT1.0ST	100	1.028	26.1	1.184	30.1
1.0	1.1	1.2	⅔ C	GCT1.1ST	110	1.028	26.1	1.30	33.0
1.5	1.8	1.2	C	GCT1.5SB	150	1.028	26.1	1.952	49.6
1.5	1.8	1.2	C	GCT1.5ST	150	1.028	26.1	1.855	47.1
2.0	2.3	1.2	½ D	GCW2.0ST	200	1.29	32.8	1.464	37.2
3.5	4.0	1.2	D	GCW3.5SB	350	1.29	32.8	2.41	61.2
3.5	4.0	1.2	D	GCW3.5ST	350	1.29	32.8	2.345	59.6
RECTANGULAR AND OVAL BATTERIES						W		L		H	
						In.	mm	In.	mm	In.	mm
4.0	4.4	1.2	V04	GR4.0	400	.64	16.2	2.37	60.2	2.92	74.2
4.0	4.4	1.2	Oval	G04.0ST	400	1.32	33.5	2.14	54.4	1.71	43.4
.500	.550	6.0	AA	5GCF500	50	.78	19.8	3.01	76.5	2.16	54.9
.500	.550	12.0	AA	10GCF500	50	1.34	34.0	3.01	76.5	2.16	54.9
1.0	1.2	6.0	Sub C	5GCR1.0	100	1.12	28.4	4.71	120	1.84	46.7
1.0	1.2	12.0	Sub C	10GCR1.0	100	2.02	51.3	4.71	120	1.84	46.7
2.0	2.3	6.0	½ D	5GCW2.0	200	1.51	38.1	6.68	170	1.67	47.4
2.0	2.3	12.0	½ D	10GCW2.0	200	2.81	71.4	6.68	170	1.67	42.4
3.5	4.0	6.0	D	5GCW3.5	350	1.58	40.1	6.75	171	2.62	66.5
3.5	4.0	12.0	D	10GCW3.5	350	2.88	73.2	6.75	171	2.62	66.5

GOLDTOP* BATTERIES FOR HIGH TEMPERATURE APPLICATIONS

General Electric's Goldtop* line of sealed cylindrical nickel-cadmium batteries is the finest available today.

The key to the improvement in the Goldtop battery system lies in its ability to withstand higher temperatures. All elements of the battery, including the plates, the seal, and the separator, have been designed to withstand higher cell temperatures.

The new Goldtop line represents years of research and development aimed at improving the materials, processes, and performance of sealed nickel-cadmium batteries. The Goldtop battery adds new high-temperature quick-recharge and long-life capability to the proved features of the standard line:

Write for Bulletin GEA-9232

STANDARD RATINGS & DIMENSIONS GOLDTOP BATTERIES—1.2 VOLTS D-C

Capacity Ampere-hour at 25°C		Cell Type	Maximum Dimensions				Bateries Designed for Normal Charge Rates		Batteries Designed for Quick-charge Rates	
			Diameter		Height			Maximum Continuous Overcharge Rate In Milliamps		Maximum Continuous Overcharge Rate in Milliamps
1 Hour	10 Hour		In Inches	In Milli-meters	In Inches	In Milli-meters	Model Number		Model Number	
0.100	0.110	1/3AA	.574	14.58	.702	17.83	XGCF100ST	10	XKCF100ST	30
.130	.150	1/3A	.643	16.33	.656	16.66	XGCK130ST	13	XKCK130ST	45
.250	.275	1/2AA	.574	14.58	1.280	32.51	XGCF250ST	25	XKCF250ST	75
.450	.500	AA	.574	14.58	1.952	49.58	XGCF450ST	45	XKCF450ST	150
.600	.660	A	.643	16.33	1.965	49.91	XGCK600ST	60	XKCK600ST	180
.900	1.0	2/3C	1.028	26.11	1.300	33.02	XGCT900ST	90	XKCT900ST	270
1.0	1.2	Cs	.900	22.86	1.645	41.78	XGCR1.0ST	100	XKCR1.0ST	300
1.5	1.8	C	1.028	26.11	1.855	47.12	XGCT1.5ST	150	XKCT1.5ST	450
2.0	2.3	1/2D	1.290	32.77	1.464	37.20	XGCW2.0ST	200	XKCW2.0ST	600
3.5	4.0	D	1.290	32.77	2.345	59.56	XGCW3.5ST	350	XKCW3.5ST	1000

* Trademark of General Electric Co.

For complete information contact your nearby GE Sales Office, or write to General Electric Co., Section 988-60. Schenectady, N.Y. 12345.

GENERAL ELECTRIC

NOBRUSH® FREQUENCY

GENERATOR CORPORATION

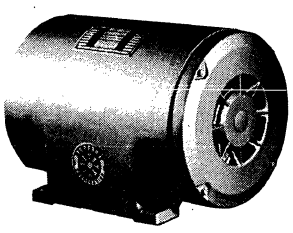
The heart of each "NoBrush" Frequency Converter is a "NoBrush" permanent magnet generator—a revolutionary development in its own right. The "NoBrush" permanent magnet generator features a cast aluminum rotor designed to give amazing voltage stability. It elimniates brushes, commutators, slip rings, resulting in absolute minimum maintenance. Elimination of excitation losses gives amazingly high efficency, with consequent low heating. Other "NoBrush" advantages are excellent wave form, and immunity to damage by repeated overload or short circuit.

PERMANENT MAGNET DESIGN

"NoBrush" Motor Generators and Frequency Converters were developed in response to the demand for an efficient, compact, dependable quiet unit, for powering electronic and high frequency equipment. A typical "NoBrush" generator is mounted with a high quality induction or synduction motor within a single shell. Oversize pre-lubricated ball bearings, sealed for life, insure long term maintenance-free operation. Magnetism is permanently "locked in" at a high level. Problems of radio interference, sparking, fouling, etc., have been eliminated. Because of its simple design and rugged construction, the unit withstands extremes of mechanical and electrical operating conditions, resulting in continuous long-life service.

PERMANENT MAGNET FEATURES:

- ☐ *Line Isolation and Stabilization*
- ☐ *Maximum Dependability*
- ☐ *Cool Operation*
- ☐ *Very Low Audible Noise*
- ☐ *Extremely Low R.F. Noise (zero for most applications)*
- ☐ *Compact Construction*
- ☐ *Light Weight*
- ☐ *High Overload Capacity*
- ☐ *Minimum Maintenance*
- ☐ *Withstands Short Circuits*
- ☐ *Stable Output Voltage*
- ☐ *Low Internal Impedance (favorable for pulse loads)*
- ☐ *Operates in Adverse Environments*

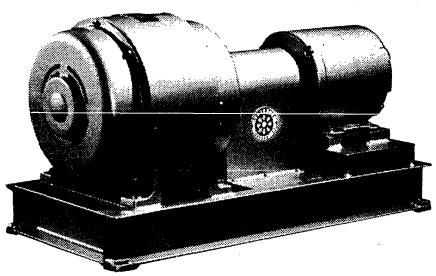


60 TO 60 Hz LINE ISOLATOR SERIES 30 UNIT SHELL

This small isolator stabilizer Motor-Generator offers full line isolation for small power requirements up to 1 KVA. Permanent magnet field generator coupled with the high inertia of the rotating system assures maximum electrical isolation between line and load. The rugged unit shell construction gives long, maintenance-free operation.

Model No.	KVA Rating	Phase In/Out	Output Voltage	Input Voltage	Dimensions H"/L"/Weight
35-118	0.35	1/1	115/230	115/230	14.5"/14.0"/110 lbs.
30-194	0.5	3/1	115/230	230/460	14.8"/16.1"/120 lbs.
30-198	0.5	1/1	115/230	115/230	14.8"/16.1"/120 lbs.
30-195	1.0	3/3	120/208	230/460	14.8"/16.1"/130 lbs.
30-199	1.0	1/3	120/208	115/230	14.8"/16.1"/130 lbs

These 60 to 60 Hz brushless generators, including those in the next column are designed to accept long term input variation of up to ±15% from nominal with no change in output. Inertia stabilization allows these units to absorb input line transients of as much as 30% for as long as 500 milliseconds with less than 1% change in output.

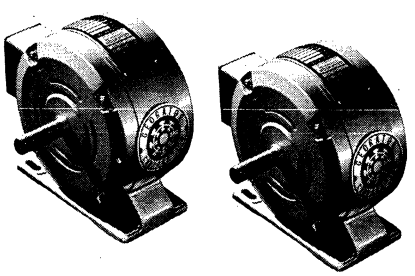


60 TO 60 Hz ISOLATOR STABILIZER SERIES 37 IN LINE

Motor Generators to provide full line isolation and distortion-free power to protect electronic equipment from power line excursions and intermittent power loss. Available in ratings from 1.5 KVA to 5 KVA. Efficient, permanent magnet generator, rugged construction, reliable, simple, and quiet.

Model No.	KVA Rating	Phase In/Out	Output Voltage	Input Voltage	Dimensions H"/L" Weight
37-015	1.5	3/1	115/230	220/440	18.3"/34"/300 lbs.
37-118	1.5	1/1	115/230	230	18.3"/34"/315 lbs.
37-130	2.5	3/3	120/208	220/440	18.3"/34"/215 lbs.
37-133	2.5	1/3	120/208	230	18.3"/34"/400 lbs.
37-070	2.5	3/1	115/230	220/440	18.3"/34"/335 lbs.
37-134	2.5	1/1	115/230	230	18.3"/34"/400 lbs.
37-123	5.0	3/1	120/208	220/440	18.3"/38"/410 lbs.

More powerful 60 to 60 Hz units up to 25 KVA, all designed for 60 Hz systems, 230/460 volt input power, are available in both 1 phase and 3 phase output power models. Voltage regulation of ±2% from no load to full load, plus voltage adjustability, and control meters are provided with these larger units.



ALTERNATORS PERMANENT MAGNET

The original, revolutionary, "NoBrush" generator. Permanent magnets yield stability, reproducibility, ruggedness and virtually zero R.F. noise. Available in large variety of ratings, frequencies and voltages. Supplementary windings with rectifiers available for D.C. output.

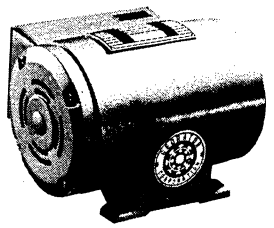
400 Hz ALTERNATORS

Model No.	KVA Rating	Phase Out	Speed RPM	Dimensions H"/L"/Weight
36-001	0.25	1	3428	8¼"/4⅛"/17 lbs.
36-003	0.5	1	3428	8¼"/4⅛"22 lbs.
36-030	0.5	3	3428	8¼"/4⅛"/21½ lbs.
36-006	1.0	1	1714	12⅜"/4⅜"/35½ lbs.
36-007	1.0	3	1714	13⅜"/4⅜"/35½ lbs.
36-008	2.0	3	1714	13⅜"/4⅜"/45 lbs.
36-009	2.5	1	1714	17¼"/6¾"/105 lbs.
36-010	5.0	1	1714	17¼"/6¾"/137 lbs.
36-011	5.0	3	1714	17¼"/6¾"/103½ lbs.
36-012	7.5	3	1714	17¼"/6¾"/120 lbs.
36-013	10.0	3	1714	17¼"/6¾"/135 lbs.

- ☐ Alternator Frequencies Available Include: 50, 60, 120, 180, 240, 300, 360, 420, 840 Hz.
- ☐ All Units are Available with:
  - Standard and Non-Standard AC Voltages.
  - Multiple DC Outputs/Low Voltage taps.
  - Special Housings for Flange Mountings.
- ☐ Separate ROTORS and STATORS can be provided for OEM Applications.
- ☐ Permanent Magnet Alternators for: Pilot Excitors—Field Flashing—Tachometers—Control Applications—Aircraft.

CONVERTERS & GENERATORS

The simplest, most rugged, most dependable power source.

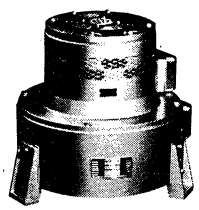


60 TO 400 Hz FREQUENCY CONVERTERS SERIES 30 UNIT SHELL

A highly compact, brushless, Motor Generator Set for conversion of 50 or 60 Hz power to 400 Hz or higher frequencies. Generator and Motor Rotors are pressed on a common shaft, with shielded ball bearing at ends of shaft, all contained within an aluminum alloy shell.

Model No.	KVA Rating	Phase In/Out	Output Voltages Full Load*	Input Voltage**	Dimensions H"/L"/Weight
30-021	0.15	1/1	115/200	115/230	8"/11"/40 lbs.
30-001	0.25	1/1	115	115/230	8"/11"/43 lbs.
30-004	0.25	1/3	115/200	115/230	8"/11"/43 lbs.
30-002	0.5	1/1	115	115/230	8"/11"/51 lbs.
30-005	0.5	1/3	115/200	115/230	8"/11"/51 lbs.
30-016	0.5	3/3	115/200	208-220/440	8"/11"/51 lbs.
30-006	0.75	3/3	115/200	208-220/440	8"/11"/51 lbs.
30-003	1.0	1/1	115	115/230	12¼"/15¼"/118 lbs.
30-025	1.0	1/3	115/200	115/230	12¼"/15¼"/107 lbs.
30-007	2.0	1/3	115/200	115/230	12¼"/15¼"/137 lbs.
30-020	2.0	3/3	115/200	208-220/440	12¼"/15¼"/121 lbs.
30-029	2.5	3/3	115/200	208-220/440	12¼"/15¼"/153 lbs.

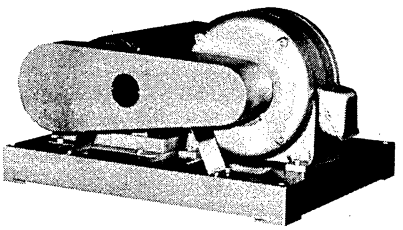
- ☐ Other Generator Outputs Available: 120, 180, 280, 360, and 840 Hz
- ☐ Other Standard and Non-Standard Voltages.
- ☐ Exact 400 Hz Output.
- ☐ DC Outputs at Low or High Voltage.



60 TO 400 Hz FREQUENCY CONVERTER SERIES 33 VERTICAL

High quality induction motor is close coupled to a famous "NoBrush" generator for a really outstanding unit. Very compact, with high power to weight and size ratio. Available variations include: 50 Hz Input; Standard and Non-Standard AC output voltages; DC outputs at low or high voltage; and other output frequencies.

Model No.	KVA Rating	Phases In/Out	Dimensions Diameter	Height	Weight
33-001	2.5	3/1	20.5"	18.3"	173 lbs.
33-002	3.5	3/1	20.5"	18.3"	178 lbs.
33-003	5.0	3/1	20.5"	18.3"	273 lbs.
33-004	5.0	3/3	20.5"	18.3"	250 lbs.
33-005	7.5	3/3	20.5"	19.5"	259 lbs.
33-006	10.0	3/3	20.5"	19.5"	340 lbs.
33-102	15.0	3/3	24.0"	24.2"	485 lbs.
30-120	25.0	3/3	23.0"	26.5"	1,213 lbs.



50 TO 60 Hz and 60 TO 60 Hz FREQUENCY CONVERTERS

These ruggedly built, belt driven, motor-generator sets are mounted on a sturdy steel frame base. Units in the 0.5 to 5 KVA power range are designed around the highly efficient NoBrush Permanent Magnet Generator. Units in the 12.5 to 25 KVA power range have brushless rotating rectifier type generators with voltage regulators, to provide ±1% output voltage regulation. These motor-generators provide frequency conversion, basic power, and superior line isolation and stabilization for exported and imported electrical and electronic equipment.

50 to 60 Hz

Model No.	KVA Rating	Phase In/Out	Voltage Output	Approx. Wt. lbs.
37-110	2.0	1/1	115/230	420
37-151	2.5	3/1	115/230	420
37-109	5.0	3/3	120/208	465
37-xxx	12.5	3/1	115-120/230-240	1,050
37-xxx	25.0	3/3	208-240/416-480	1,550

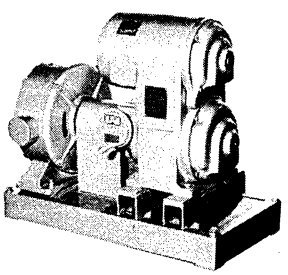
60 to 50 Hz

Model No.	KVA Rating	Phase In/Out	Voltage Output	Approx. Wt. lbs.
37-105	0.5	1/1	115/230	230
37-102	1.5	1/1	115/220	400
37-111	1.5	3/1	115/230	400
37-095	2.5	3/1	115/230	440
37-xxx	12.5	3/1	115-120/230-240	1,100
37-xxx	25.0	3/3	208-240/230-240	1,580

Universal 50/60 to 60/50 Hz

Model No.	KVA Rating	Phase In/Out	Voltage Output	Approx. Wt. lbs.
37-116	1.5	3/1	115/230	380
37-112	2.5/1.5	3/3-1	115/200 & 115	400

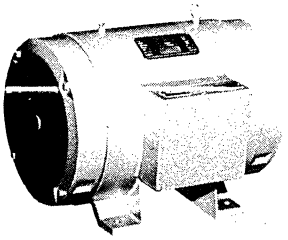
Series 37 Data Sheets containing detailed specifications are available upon request.



VARIABLE FREQUENCY CONVERTERS SERIES 32

Series 32 Variable Frequency Converters are available both in standard design units and to customer specifications—in ratings from 0.5 to 10 KVA. Variations in frequency as high as 2 to 1 can be provided. Some typical units are shown below.

Model No.	KVA Rating	Phase In/Out	Input Hz	Variable Frequency	Output Voltage
32-037	2.5	3/1	60	45-65	100-140/180-240
32-007	2.5	3/1	60	300-500	115
32-016	5.0	3/3	60	380-420	105-125/183-217
32-025	10.0	3/3	60	380-420	105-125/183-217
32-036	0.75	3/3	60	750-850	115/200



60 TO 180 Hz, 360 Hz, 840 Hz FREQUENCY CONVERTERS FOR HIGH FREQUENCY TOOLS, MOTORS, AND LIGHTING

These frequency converters are available for powering high frequency metal-working tools, wood-working tools, motors, and lighting systems. The highly dependable, minimum maintenance, PERMANENT MAGNET BRUSHLESS DESIGNS are available in many ratings up to: 5 KVA for 180 Hz applications; 10 KVA for 360 Hz applications; and 30 KVA for 840 Hz applications.

Georator is a leading supplier of power units to the electronic, electrical, computer, and machine tool industries. Georator units are unsurpassed for quality and reliability. NOTE: Specifications subject to change without notice.

GEORATOR CORPORATION

Makers of NOBRUSH power systems

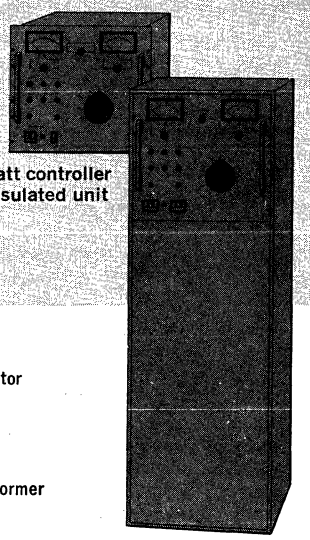
9016 PRINCE WILLIAM STREET MANASSAS, VIRGINIA 22110

TELEPHONE: (703) 368-2101

HV DC power supplies

HIPOTRONICS®

. . . A COMPLETE LINE OF HIGH VOLTAGE POWER SUPPLIES FOR ALL HV REQUIREMENTS, INCLUDING PULSED APPLICATIONS AND ACCELERATOR SUPPLIES. OUTPUT CURRENTS RANGE FROM 0.1 MA TO 100 AMPERES. ALL UNITS ARE CONSERVATIVELY DESIGNED FOR CONTINUOUS USE; THEY ARE AVAILABLE WITH FULLY INSTRUMENTED CONTROL CONSOLES, OR WITHOUT CONTROLS FOR USE IN OEM EQUIPMENT OR WITH EXISTING CONTROLLERS.



5 kilowatt controller for oil-insulated unit

5 and 10 kilowatt air insulated unit

DESIGN FEATURES

- Reversible polarity
- Output-connected, triple-range voltage meter
- Triple-range current meter in return leg of HV circuit
- Adjustable overload relay, 10% to 110% rated current, with reset button
- Rated current available from zero to rated voltage
- Meter recalibration potentiometers

CUSTOMIZED CAPABILITY

Hipotronics has designed and custom-manufactured a wide variety of power supplies for a wide variety of uses. Customized power supplies include application-oriented units for: electrostatics, accelerators, lasers, high power radar, high voltage component testing, and many more.

PERSONNEL SAFETY FEATURES

- Output shorting solenoid and/or bleeder resistor
- Series-limiting resistor in output circuit
- External interlock provision and pilot light
- Zero start interlock and pilot light

EQUIPMENT SAFETY FEATURES

- Surge protection for meters and relays
- Backup circuit breaker in primary of HV transformer
- Input circuit breakers and pilot light

SPECIFICATIONS

400-WATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.
1	400	801-400
2	200	802-200
3	130	803-130
4	100	804-100
5	80	805- 80
6	65	806- 65
7.5	50	807.5- 50
10	40	810- 40
15	25	815- 25
20	20	820- 20
25	15	825- 15
30	12	830- 12
40	10	840- 10
50	8	850- 8
60	6.5	860- 6.5
75	5	875- 5
90	4.5	890- 4.5
100	4	8100- 4

INPUT . . . . . 115 volts, 50/60 Hz, 1 phase, 5 amperes
REGULATION . . 15% no load to full load
RIPPLE . . . . . 2% rms
HV OUTPUT . . . 20-foot shielded cable (Bushing available on request)

1 KILOWATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.
1	1000	801-1000
2	500	802- 500
3	330	803- 330
4	250	804- 250
5	200	805- 200
6	165	806- 165
7.5	130	807.5- 130
10	100	810- 100
15	65	815- 65
20	50	820- 50
25	40	825- 40
30	33	830- 33
40	25	840- 25
50	20	850- 20
60	16	860- 16
75	13	875- 13
90	11	890- 11
100	10	8100- 10
120	8	8120- 8
150	6.5	8150- 6.5
200	5	8200- 5

INPUT . . . . . 115 volts, 50/60 Hz, 1 phase, 12 amperes
REGULATION . . 15% no load to full load
RIPPLE . . . . . 2% rms
HV OUTPUT . . . 20-foot shielded cable (Bushing available on request)

1.5 KILOWATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.
1	1500	801-1500
2	750	802- 750
3	500	803- 500
4	375	804- 375
5	300	805- 300
6	250	806- 250
7.5	200	807.5- 200
10	150	810- 150
15	100	815- 100
20	75	820- 75
25	60	825- 60
30	50	830- 50
40	37.5	840- 37.5
50	30	850- 30
60	25	860- 25
75	20	875- 20
90	17	890- 17
100	15	8100- 15
120	12.5	8120- 12.5
150	10	8150- 10
200	7.5	8200- 7.5
250	6.0	8250- 6.0
300	5.0	8300- 5.0

INPUT . . . . . 115 volts, 50/60 Hz, 1 phase, 20 amperes
REGULATION . . 15% no load to full load
RIPPLE . . . . . 2% rms
HV OUTPUT . . . 20-foot shielded cable (Bushing available on request)

2.5 KILOWATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.
1	2500	801-2500
2	1250	802-1250
3	830	803- 830
4	625	804- 625
5	500	805- 500
6	425	806- 425
7.5	300	807.5- 300
10	250	810- 250
15	160	815- 160
20	125	820- 125
25	100	825- 100
30	80	830- 80
40	60	840- 60
50	50	850- 50
60	40	860- 40
75	33	875- 33
90	27	890- 27
100	25	8100- 25
120	20	8120- 20
150	16	8150- 16
200	12.5	8200- 12.5
250	10	8250- 10
300	8	8300- 8
400	6	8400- 6
500	5	8500- 5

INPUT . . . . . 115 volts, 50/60 Hz, 1 phase, 30 amperes
REGULATION . . 15% no load to full load
RIPPLE . . . . . 2% rms
HV OUTPUT . . . 20-foot shield cable (Bushing available on request)

5 KILOWATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.	Input
1	5000	801-5000	208/230 V, 3 PHASE, 50/60 Hz, 20 AMPS
2	2500	802-2500	
3	1666	803-1666	
4	1250	804-1250	
5	1000	805-1000	
6	840	806- 840	
7.5	670	807.5- 670	
10	500	810- 500	
15	335	815- 335	
20	250	820- 250	
25	200	825- 200	
30	166	830- 166	
40	125	840- 125	208/220 V, SINGLE PHASE 50/60 Hz, 35 AMPS
50	100	850- 100	
60	84	860- 84	
75	67	875- 67	
90	56	890- 56	
100	50	8100- 50	
120	41.5	8120- 41.5	
150	33.3	8150- 33.3	
200	25.0	8200- 25	
250	20.0	8250- 20	
300	16.6	8300- 16.6	
400	12.5	8400- 12.5	
500	10.0	8500- 10.0	

REGULATION . . 10% 3 phase, 15% 1 phase, no load to full load
RIPPLE . . . . . 1% or 5% rms, 3 phase units; 2% rms, 1 phase units (see chart)
HV OUTPUT . . . 20-foot shielded cable (Bushing available on request)

10 KILOWATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.	Input
1	10 AMP	801- 10A	208/230 V, 3 PHASE, 50/60 Hz, 40 AMPS
2	5 AMP	802- 5A	
3	3300	803-3300	
4	2500	804-2500	
5	2000	805-2000	
6	1650	806-1650	
7.5	1300	807.5-1300	
10	1000	810-1000	
15	650	815- 650	
20	500	820- 500	
25	400	825- 400	
30	330	830- 330	
40	250	840- 250	440/480 V, SINGLE PHASE, 50/60 Hz, 35 AMPS
50	200	850- 200	
60	160	860- 160	
75	130	875- 130	
90	110	890- 110	
100	100	8100- 100	
120	80	8120- 80	
150	65	8150- 65	
200	50	8200- 50	
250	40	8250- 40	
300	33	8300- 33	
400	25	8400- 25	
500	20	8500- 20	
600	16	8600- 16	
750	13	8750- 13	
1000	10	81000- 10	

REGULATION . . 10% 3 phase, 18% 1 phase, no load to full load
RIPPLE . . . . . 1% or 5% rms, 3 phase units; 2% rms, 1 phase units (see chart)
HV OUTPUT . . . Cable to 600 KV; Toroid over 600 KV

HIPOTRONICS® **HIPOTRONICS INC.** Brewster, N. Y. 10509 914-279-8091 TELEX: 710-574-2420

HV DC power supplies (contd.)

HIPOTRONICS®

15 KILOWATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.	Input
1	15 AMP	801- 15A	440/480 V, 3 PHASE, 50/60 Hz, 25 AMPS
2	7.5 AMP	802- 7.5A	
3	5 AMP	803- 5A	
4	3.75 AMP	804- 3.75A	
5	3 AMP	805- 3A	
6	2.5 AMP	806- 2.5A	
7.5	2 AMP	807.5- 2A	
10	1.5 AMP	810- 1.5A	
15	1000	815-1000	
20	750	820- 750	
25	600	825- 600	
30	500	830- 500	
40	375	840- 375	
50	300	850- 300	
60	250	860- 250	
75	200	875- 200	440/480 V, 1 PHASE, 50/60 Hz, 45 AMPS
90	170	890- 170	
100	150	8100- 150	
120	125	8120- 125	
150	100	8150- 100	
200	75	8200- 75	
250	60	8250- 60	
300	50	8300- 50	
400	37.5	8400- 37.5	
500	30.0	8500- 30	
600	25.5	8600- 25	
750	20.0	8750- 20	
1000	15.0	81000- 15	

REGULATION . . 10% 3 phase, 18% 1 phase, no load to full load
RIPPLE . . . . . 1% or 5% rms, 3 phase units; 2% rms, 1 phase units (see chart)
HV OUTPUT . . Cable to 600 KV; Toroid over 600 KV

25 KILOWATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.	Input
1	25 AMP	801- 25A	440/480 V, 3 PHASE, 50/60 Hz, 45 AMPS
2	12.5 AMP	802- 12.5A	
3	8.8 AMP	803- 8.8A	
4	6.2 AMP	804- 6.2A	
5	5 AMP	805- 5A	
6	4.2 AMP	806- 4.2A	
7.5	3.3 AMP	807.5- 3.3A	
10	2.5 AMP	810- 2.5A	
15	1.7 AMP	815- 1.7A	
20	1.25 AMP	820- 1.25A	
25	1 AMP	825- 1A	
30	830	830-830	
40	620	840-620	
50	500	850-500	
60	420	860-420	
75	335	875-335	
90	280	890-280	
100	250	8100-250	1 PHASE 80 AMPS
120	200	8120-200	
150	170	8150-170	
200	125	8200-125	
250	100	8250-100	
300	85	8300- 85	
400	62	8400- 62	
500	50	8500- 50	
600	42	8600- 42	
750	33	8750- 33	
1000	25	81000- 25	

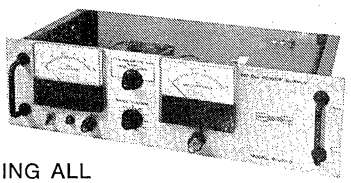
REGULATION . . 10% 3 phase, 18% 1 phase, no load to full load
RIPPLE . . . . . 1% or 5% rms, 3 phase units; 2% rms, 1 phase units (see chart)
HV OUTPUT . . Cable to 600 KV; Toroid over 600 KV

50 KILOWATT OUTPUT UNITS

Voltage (KV)	Current (ma)	Model No.	Input
1	50 AMP	801- 50A	440/480 V, 3 PHASE, 50/60 Hz, 90 AMPS
2	25 AMP	802- 25A	
3	16.6 AMP	803- 16.6A	
4	12.5 AMP	804- 12.5A	
5	10 AMP	805- 10A	
6	8.4 AMP	806- 8.4A	
7.5	6.7 AMP	807.5- 6.7A	
10	5 AMP	810- 5A	
15	3.3 AMP	815- 3.3A	
20	2.5 AMP	820- 2.5A	
25	2 AMP	825- 2A	
30	1.7 AMP	830- 1.7A	
40	1.25 AMP	840- 1.25A	
50	1 AMP	850- 1A	
60	830	860-830	
75	670	875-670	
90	560	890-560	
100	500	8100-500	
120	420	8120-420	
150	335	8150-335	1 PHASE 160 AMPS
200	250	8200-250	
250	200	8250-200	
300	166	8300-166	
400	125	8400-125	
500	100	8500-100	
600	83	8600- 83	
750	67	8750- 67	
1000	50	81000- 50	

REGULATION . . 10% 3 phase, 18% 1 phase, no load to full load
RIPPLE . . . . . 1% or 5% rms, 3 phase units; 2% rms, 1 phase units (see chart)
HV OUTPUT . . Cable to 600 KV; Toroid over 600 KV

metered HV power packs



. . . STANDARD 5-MA AND 2-MA HV POWER PACKS WITH SIMPLIFIED CONTROLS. THEY ARE LOW COST SUPPLIES, DESIGNED FOR RELAY RACK MOUNTING, FEATURING ALL INDUSTRIAL GRADE COMPONENTS.

FEATURES

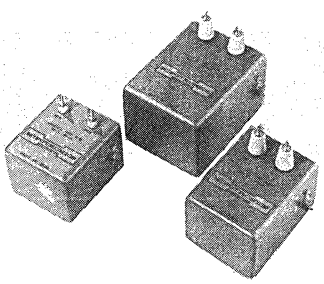
- Output-connected KV meter, 3½" square, 2% accuracy, single range
- Output-connected current meter, 3½" square, 2% accuracy, single range
- Continuously adjustable output control
- AC input switch, fuse, and pilot light
- HV fuse, with blown indicator
- 115-volt, 50/60-Hz input
- Surge and transient protection on all meters and powerstats
- Reversible polarity

SPECIFICATIONS

Output (KV)	Current (ma)	Ripple (% rms/ma)	Polarity	Model No.	KV Meter	Current Meter (ma)	Size WxHxD (in.)
0-2.5	5	.5	Reversible	R 2B	0-3	0-5	19x7x8
0-5	5	.5	Reversible	R 5B	0-6	0-5	19x7x8
0-10	5	.5	Reversible	R 10B	0-12	0-5	19x7x8
0-15	5	.5	Reversible	R 15B	0-15	0-5	19x7x8
0-20	5	.5	Reversible	R 20B	0-25	0-5	19x7x8
0-30	5	.5	Reversible	R 30B	0-30	0-5	19x12x10
0-50	5	.5	Reversible	R 50B	0-50	0-5	19x12x10
0-60	2	.5	Reversible	R 60B	0-60	0-2.5	19x12x10

OPTIONAL EXTRAS
1. Bench top cabinet $50.00
2. Short circuit limiter — Ideal for capacitor charging, flocking, electrostatic operations, etc. Supply will operate with short circuit on output and limit current to 5 ma . . . . . $ 5.00

standard HV power packs



. . . WIDE RANGE OF COMPACT MINATURIZED HV POWER PACKS, WITH OUTPUT VOLTAGES FROM 2 TO 100 KV AND CURRENT RATINGS OF 2, 5 OR 10 MA.

FEATURES

- Hermerically sealed, oil-or epoxy-filled
- Solid state rectifiers
- 10-year life
- Low ripple
- Good regulation
- Compact, highly miniaturized
- Reversible polarity

Note:
Inquiries are invited for units with outputs different than our standards, built-in line regulation, short circuit, current-limited features, lower output ripple, 220V, 50/60-cycle inputs, DC to HV DC, or center-tapped output.

SPECIFICATIONS

Input: 0-125 volts, output voltages and currents stated for nominal 117 volt input
Regulation: 10 to 15% no load to full load
Ripple: 0.5% rms per milliampere output
Life: 10 years at 25°C ambient with rated output voltage and current
Terminations: Ceramic bushings on models 30 KV and below. Re-entrant receptacles with 3-foot mating coaxial cables on models 40 KV and up

Output Voltage (KV)	Current (ma)	Model No.	Size HxWxD (in.)	Output Voltage (KV)	Current (ma)	Model No.	Size HxWxD (in.)
2.5	5	2.5B	3½x3¾x2¾	15	10	15C	6⅛x4⅝x4
2.5	10	2.5C	4¼x3⅞x3⅞	20	5	20B	6⅛x4⅝x4
5	5	5B	4¼x3⅞x3⅜	25	10	25C	10x6x5
5	10	5C	5¼x3⅞x3⅜	30	5	30B	10x6x5
7.5	10	7.5C	5¼x3⅞x3⅜	50	5	50B	10x6x8
10	5	10B	5¼x3⅞x3⅜	60	2	60A	10x6x8
10	10	10C	6⅛x4⅝x4	100	2	100A	15½x8⅛x9¼
15	5	15B	6⅛x4⅝x4				

Prices and specifications subject to change without notice.

HIPOTRONICS®

HIPOTRONICS, INC.
Brewster, N. Y. 10509 / (914) 279-8091

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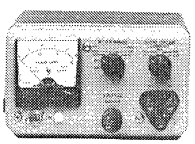
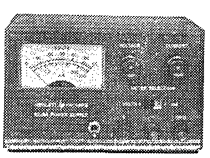
LABORATORY....INDUSTRIAL....MODULAR....DIGITALLY CONTROLLED....SPECIAL PURPOSE

From 1mV to 4000V....From 1μA to 1000A....From $99 to $3,500

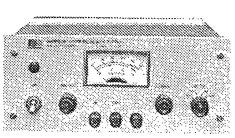
arranged by type and in order of increasing output voltage



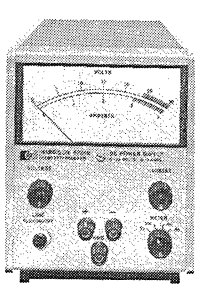
721A



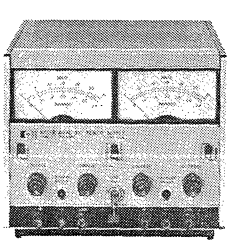
6211A–
6218A



6101A, 6102A, 6106A, 6200B–6209B, 6281A, 6284A, 6289A, 6294A, 6299A, 6384A, 6515A, 6823A



6220B–
6226B



6104A, 6105A. 6186B, 6227B, 6228B

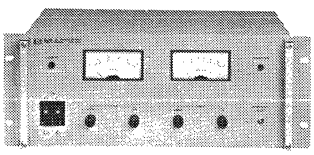
Output (volts)	Output (amperes)	Model	Load regulation	Line regulation	Ripple & noise (RMS/p-p, mV)	Remote sensing	Remote programming*	Bench or rack**	CV/CC§	Price
LOW COST LABORATORY POWER SUPPLIES										
0-7.5	0-3	6203B	5mV	3mV	0.2/1.0	★	★	B	★	190
0-10	0-1	6213A	4mV	4mV	0.2/1.0		★	B		99
0-10	0-1	6214A	4mV	4mV	0.2/1.0			B	★	120
0-20 and 0-40 Dual	0-0.6 and 0-0.3	6205B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B		255
0-20 and 0-40	0-0.6 and 0-0.3	6204B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B		170
0-20 and 0-20	0-1.5 and 0-0.75	6200B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B	★	210
0-20	0-1.5	6201B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B	★	190
0-25	0-0.4	6215A	4mV	4mV	0.2/1.0			B		99
0-25	0-0.4	6216A	4mV	4mV	0.2/1.0			B	★	120
0-30	0-0.15	721A	30mV or 0.3%	15mV or 0.3%	0.15 (rms)			B		165
0-30 and 0-60	0-1 and 0-0.5	6206B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B		190
0-40 and 0-20	0-0.3 and 0-0.6	6204B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B		170
0-40 and 0-20 Dual	0-0.3 and 0-0.6	6205B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B		255
0-40 and 0-20	0-0.75 and 0-1.5	6200B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B	★	210
0-40	0-0.75	6202B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B	★	190
0-50	0-0.2	6217A	4mV	4mV	0.2/1.0			B		99
0-50	0-0.2	6218A	4mV	4mV	0.2/1.0			B	★	120
0-60 and 0-30	0-0.5 and 0-1	6206B	4mV + 0.01%	4mV + 0.01%	0.2/1.0	★	★	B		190
0-100	0-0.1	6211A	8mV	4mV	0.2/1.0			B		105
0-100	0-0.1	6212A	8mV	4mV	0.2/1.0			B	★	130
0-160	0-0.2	6207B	2mV + 0.02%	2mV + 0.02%	0.5/40	★	★	B	★	255
0-320	0-0.1	6209B	2mV + 0.02%	2mV + 0.02%	1.0/40	★	★	B	★	255
GENERAL PURPOSE LABORATORY POWER SUPPLIES										
4-5.5	0-8	6384A	1mV	1mV	1.0/5.0	★		B		250
0-7.5	0-5	6281A	5mV	2mV + 0.01%	0.2/1.0	★	★	B	★	245
0-10	0-10	6282A	1mV + 0.01%	1mV + 0.01%	0.5/25	★	★	B	★	350
0-10	0-20	6256B	200μV + 0.01%	200μV + 0.01%	0.2/10	★	★	R	★	485
0-10	0-50	6259B	200μV + 0.01%	200μV + 0.01%	0.5/5.0	★	★	R	★	725
0-10	0-100	6260B	200μV + 0.01%	200μV + 0.01%	0.5/5.0	★	★	R	★	895
0-20 Dual	0-3	6253A	4mV + 0.01%	2mV + 0.02%	0.2/1.0	★	★	R	★	490
0-20	0-3	6284A	4mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	B	★	230

***"B" indicates bench-type supply and "R" indicates full-rack width supplies. All bench supplies except Model 721A can be rack mounted using accessory rack mounting hardware.

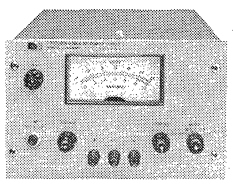
additional listing on next page

DC POWER SUPPLIES

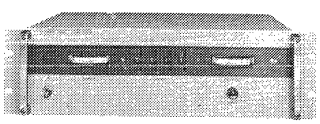
arranged by type and in order of increasing output voltage



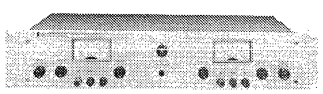
6259B–6261B, 6268B, 6269B



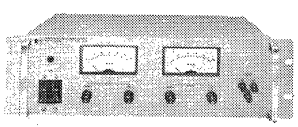
6282A, 6285A, 6286A, 6290A, 6291A, 6296A, 6824A



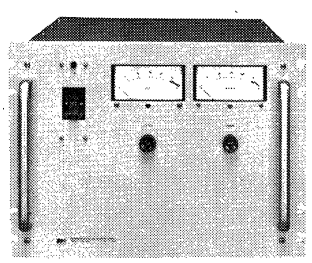
6521A–6525A



890A, 6253A, 6255A, 6263B, 6265B, 6266B, 6271B, 6427B, 6433B, 6438B, 6443B



895A, 6256B, 6264B, 6267B, 6274B, 6428B, 6434B, 6439B, 6448B



6453A–6459A

GENERAL PURPOSE LABORATORY POWER SUPPLIES (Cont.)

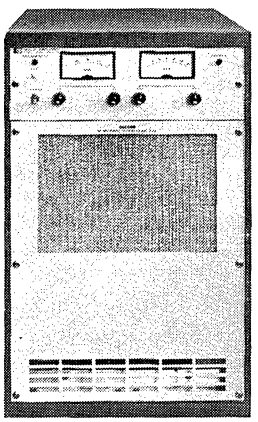
Output (volts)	Output (amperes)	Model	Load regulation	Line regulation	Ripple & noise (RMS/p-p, mV)	Remote sensing	Remote programming*	Bench or rack**	CV/CC§	Price
0-20	0-5	6285A	1mV + 0.01%	1mV + 0.01%	0.5/25	★	★	B	★	350
0-20	0-10	6263B	200μV + 0.01%	200μV + 0.01%	0.2/10	★	★	R	★	485
0-20	0-10	6286A	1mV + 0.01%	1mV + 0.01%	0.5/25	★	★	B	★	395
0-20	0-20	6264B	200μV + 0.01%	200μV + 0.01%	0.2/10	★	★	R	★	550
0-20	0-50	6261B	200μV + 0.01%	200μV + 0.01%	0.5/5.0	★	★	R	★	855
0-24	0-3	6224B	4mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	B	★	355
0-25 and 0-50	0-1 and 0.5	6220B	2mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	B	★	295
0-25 Dual	0-2	6227B	0.01% + 1mV	1mV	0.25/4.0	★	★	B	★	525
0-40 Dual	0-1.5	6255A	2mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	R	★	470
0-40	0-1.5	6289A	2mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	B	★	230
0-40	0-3	6265B	200μV + 0.01%	200μV + 0.01%	0.2/10	★	★	R	★	410
0-40	0-3	6290A	1mV + 0.01%	1mV + 0.01%	0.5/25	★	★	B	★	350
0-40	0-5	6266B	200μV + 0.01%	200μV + 0.01%	0.2/10	★	★	R	★	460
0-40	0-5	6291A	1mV + 0.01%	1mV + 0.01%	0.5/25	★	★	B	★	395
0-40	0-10	6267B	200μV + 0.01%	200μV + 0.01%	0.2/10	★	★	R	★	550
0-40	0-30	6268B	200μV + 0.01%	200μV + 0.01%	1.0/5.0	★	★	R	★	745
0-40	0-50	6269B	200μV + 0.01%	200μV + 0.01%	1.0/5.0	★	★	R	★	895
0-50 and 0-25	0-0.5 and 0-1	6220B	2mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	B	★	295
0-50 Dual	0-1	6228B	1mV + 0.01%	1mV	0.25/4.0	★	★	B	★	525
0-50	0-1.5	6226B	2mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	B	★	355
0-60	0-1	6294A	2mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	B	★	245
0-60	0-3	6271B	200μV + 0.01%	200μV + 0.01%	0.2/10	★	★	R	★	460
0-60	0-3	6296A	1mV + 0.01%	1mV + 0.01%	0.5/25	★	★	B	★	395
0-60	0-15	6274B	200μV + 0.01%	200μV + 0.01%	0.2/20	★	★	R	★	695
0-100	0-0.75	6299A	2mV + 0.01%	2mV + 0.01%	0.2/1.0	★	★	B	★	270
0-320	0-0.6	890A	10mV or 0.007%	10mV or 0.007%	1.0 (rms)	★	★	R		530
0-320	0-1.5	895A	10mV or 0.007%	10mV or 0.007%	1.0 (rms)	★	★	R		675
0-1000	0-0.2	6521A	20mV or 0.005%	20mV or 0.005%	1.0 (rms)			R	★	855
0-1600	0-0.005	6515A	16mV or 0.01%	16mV or 0.01%	2.0/5.0			B		250
0-2000	0-0.1	6522A	20mV or 0.005%	20mV or 0.005%	1.0 (rms)			R	★	855
0-3000	0-0.006	6516A	16mV or 0.01%	16mV or 0.01%	2.0/5.0			B		340
0-4000	0-0.05	6525A	20mV or 0.005%	20mV or 0.005%	1.0 (rms)			R	★	855

HIGH POWER INDUSTRIAL POWER SUPPLIES

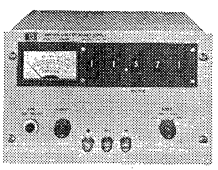
0-8	0-1000	6464C	5mV + 0.05%	5mV + 0.05%	80/1V	★	★	R	★	3500
0-15	0-200	6453A	10mV + 0.2% combined		150 (rms)	★	★	R	★	1425
0-16 or 0-18	0-600 or 0-500	6466C	5mV + 0.05%	5mV + 0.05%	180/1V	★	★	R	★	2800
0-20	0-15	6427B	20mV	10mV	40/400	★	★	R	★	425
0-20	0-45	6428B	40mV	20mV	40/500	★	★	R	★	585
0-36	0-10	6433B	36mV	18mV	36/400	★	★	R	★	395
0-36	0-100	6456B	10mV + 0.2% combined		180 (rms)	★	★	R	★	1325
0-36	0-300	6469C	5mV + 0.05%	5mV + 0.05%	180/1V	★	★	R	★	2500
0-40	0-25	6434B	40mV	18mV	40/500	★	★	R	★	570
0-60	0-5	6438B	60mV	30mV	120/400	★	★	R	★	395
0-60	0-15	6439B	120mV	60mV	60/500	★	★	R	★	550
0-64	0-50	6459A	10mV + 0.2% combined		160 (rms)	★	★	R	★	1325
0-64	0-150	6472C	100mV + 0.05%	100 mV + 0.05%	160/1V	★	★	R	★	2800
0-110	0-100	6475C	100mV + 0.05%	100mV + 0.05%	220/2V	★	★	R	★	2800
0-120	0-2.5	6443B	120mV	60mV	240/400	★	★	R	★	385
0-220	0-50	6477C	100mV + 0.05%	100mV + 0.05%	330/2V	★	★	R	★	2800

*The HP 6940A/6941A Multiprogrammer provides an economical means of programming up to 240 HP power supplies from a single minicomputer I/O channel. For more information, contact your local Hewlett-Packard sales office.

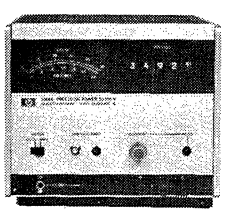
HEWLETT hp PACKARD



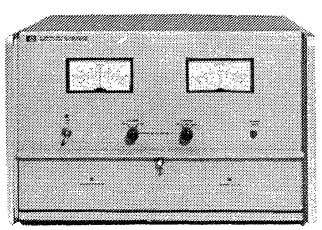
6464C–6483C



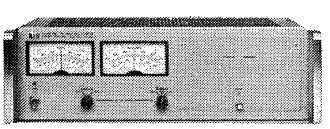
6110A-6113A
6116A, 6516A



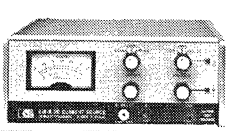
6114A
6115A



6128B, 6129B



6130B, 6131B



6177B
6181B

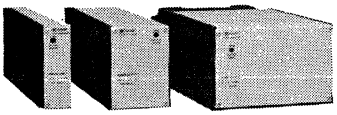
Output (volts)	Output (amperes)	Model	Load regulation	Line regulation	Ripple & noise (RMS/p-p, mV)	Remote sensing	Remote programming*	Bench or rack**	CV/CC§	Price
HIGH POWER INDUSTRIAL POWER SUPPLIES (Cont.)										
0-300	0-35	6479C	100mV + 0.05%	100mV + 0.05%	300/3V	★	★	R	★	2800
0-440 or 0-500 or 0-600	0-25 or 0-20 or 0-15	6483C	100mV + 0.05%	100mV + 0.05%	600/5V	★	★	R	★	2800
1-600	0.005-1.5	6448B	400mV + 1.0%	600mV	600/2V	★	★	R	★	595
PRECISION POWER SUPPLIES										
0-10	0-2	6113A	0.1mV + 0.001%	0.001%	0.04/0.1	★	★	B		375
0-20	0-1	6101A	100μV + 0.001%	0.001%	0.04/0.1	★	★	B		265
0-20	0-1	6111A	100μV + 0.001%	0.001%	0.04/0.1	★	★	B		375
0-20 and 20-40	0-2 and 0-1	6104A	100μV + 0.0005%	40μV + 0.0005%	0.04/0.1	★	★	B	★	440
0-20 and 20-40	0-2 and 0-1	6114A	100μV + 0.0005%	40μV + 0.0005%	0.04/0.1	★	★	B	★	525
0-40	0-0.5	6102A	100μV + 0.001%	0.001%	0.04/0.1	★	★	B		265
0-40	0-0.5	6112A	100μV + 0.001%	0.001%	0.04/0.1	★	★	B		375
20-40 and 0-20	0-1 and 0-2	6104A	100μV + 0.0005%	40μV + 0.0005%	0.04/0.1	★	★	B	★	440
20-40 and 0-20	0-1 and 0-2	6114A	100μV + 0.0005%	40μV + 0.0005%	0.04/0.1	★	★	B	★	525
0-50 and 50-100	0-0.8 and 0-0.4	6105A	50μV + 0.0005%	100μV + 0.0005%	0.04/0.1	★	★	B	★	455
0-50 and 50-100	0-0.8 and 0-0.4	6115A	50μV + 0.0005%	100μV + 0.0005%	0.04/0.1	★	★	B	★	540
0-100	0-0.2	6106A	100μV + 0.001%	0.001%	0.04/0.1	★	★	B		265
0-100	0-0.2	6116A	100μV + 0.001%	0.001%	0.04/0.1	★	★	B		375
50-100 and 0-50	0-0.4 and 0-0.8	6105A	50μV + 0.0005%	100μV + 0.0005%	0.04/0.1	★	★	B	★	455
50-100 and 0-50	0-0.4 and 0-0.4	6115A	50μV + 0.0005%	100μV + 0.0005%	0.04/0.1	★	★	B	★	540
0-3000	0-0.006	6110A	100μV + 0.001%	0.001%	2/5.0			B		530
MULTIPLE OUTPUT POWER SUPPLY FOR VACUUM TUBES										
0 to +500 −300 0 to −150	0-0.2 0-0.05 0-0.005	712C	5mV + 0.01% 50mV 50mV	5mV + 0.01% 50mV 50mV	0.5/15 30/90 15/45	★	★	B	★	545
BIPOLAR POWER SUPPLY/AMPLIFIERS										
0-±20	0-0.5	6823A	5mV + 0.02%	5mV + 0.02%	2 (rms)	★	★	B	★	240
0-±50	0-1	6824A	5mV + 0.02%	5mV + 0.02%	10 (rms)	★	★	B	★	395
DIGITALLY CONTROLLED POWER SOURCES										
0-±16	0-0.01	6933B	0.2mV	0.2mV	2/20	★	★	R		1500
0-±16	0-15	6128B	0.15mV	0.3mV	3/20	★	★	R		2700
0-±50	0-1	6130B	0.5mV	0.5mV	3/7.0	★	★	R		1800
0-±50	0-5	6129B	0.5mV	0.25mV	3/12	★	★	R		2700
0-±100	0-0.5	6131B	0.5mV	0.5mV	3/7.0	★	★	R		1800
PRECISION CONSTANT CURRENT SOURCES										
0-50	0-0.5	6177B	25ppm	25ppm	40μA/0.250		★	B		475
0-100	0-0.25	6181B	25ppm	25ppm	20μA/0.1		★	B		475
0-300	0-0.1	6186B	25ppm	25ppm	5μA/0.5		★	B		590

§ Automatic crossover between constant voltage (CV) and constant current (CC) operation.

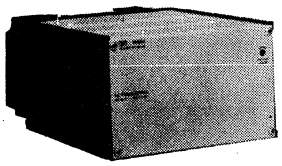
additional listing on next page

DC POWER SUPPLIES

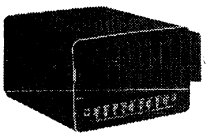
arranged by type and in order of increasing output voltage



62003A-62048G
62212A-62215G



62604J-62628J



60063B-
60246B

DC POWER SUPPLY SELECTION GUIDE

This 128-page guide is factual and informative. . . .clearly lists all the specs, features, options, prices, etc. on the majority of HP power supplies. . . .makes it easy to find the right model for any application.

DC POWER SUPPLY HANDBOOK

This 138-page book includes sections on definitions, principles of operation, AC and load connections, remote programming, output voltage and current ratings, and performance measurements.

TECHNICAL DATA SHEETS

Additional technical data sheets are available on Modular Power Supplies (62000-series), Precision Power Supplies, and Digitally Controlled Power Supplies. For your copy of any of the above product or applications literature, write Hewlett-Packard, Palo Alto, California, 94304, or contact your local HP sales office.

MODULAR POWER SUPPLIES SERIES 62000

Output △ (volts)	Output △ (amperes)	Model	Price†		Output △ (volts)	Output △ (amperes)	Model	Price†
3 ± 0.50	2	62003A	89†		±12±0.60 Dual	3	62212E	†
3 ± 0.50	4.25	62003C	125†		±12±0.60 Dual	5.5	62212G	†
3 ± 0.50	8.5	62003E	145†		15 ± 0.75	1.25	62015A	89†
3 ± 0.50	17	62003G	195†		15 ± 0.75	2.5	62015C	125†
4 ± 0.50	2	62004A	89†		15 ± 0.75	5	62015E	145†
4 ± 0.50	4	62004C	125†		15 ± 0.75	10	62015G	195†
4 ± 0.50	8	62004E	145†		15 ± 0.75	20	62615J	395†
4 ± 0.50	16	62004G	195†		±15±0.75 Dual	1	62215A	†
4 ± 0.50	40	62604J	395†		±15±0.75 Dual	2.75	62215E	†
5 ± 0.50	2	62005A	89†		±15±0.75 Dual	4.75	62215G	†
5 ± 0.50	4	62005C	125†		18 ± 0.9	1	62018A	89†
5 ± 0.50	8	62005E	145†		18 ± 0.90	2.25	62018C	125†
5 ± 0.50	16	62005G	195†		18 ± 0.90	4.5	62018E	145†
5 ± 0.50	40	62605J	395†		18 ± 0.90	9	62018G	195†
6 ± 0.50	1.75	62006A	89†		18 ± 0.90	16.7	62618J	395†
6 ± 0.50	3.75	62006C	125†		24 ± 1.20	0.75	62024A	89†
6 ± 0.50	7.5	62006E	145†		24 ± 1.20	1.75	62024C	125†
6 ± 0.50	15	62006G	195†		24 ± 1.20	3.75	62024E	145†
6 ± 0.50	33	62606J	395†		24 ± 1.20	7.5	62024G	195†
10 ± 0.50	1.5	62010A	89†		24 ± 1.20	12.5	62624J	395†
10 ± 0.50	3.25	62010C	125†		28 ± 1.40	0.7	62028A	89†
10 ± 0.50	6.5	62010E	145†		28 ± 1.40	1.5	62028C	125†
10 ± 0.50	13	62010G	195†		28 ± 1.40	3.25	62028E	145†
10 ± 0.50	25	62610J	395†		28 ± 1.4	6.5	62028G	195†
12 ± 0.60	1.5	62012A	89†		28 ± 1.4	10.7	62628J	395†
12 ± 0.60	3	62012C	125†		48 ± 2.40	0.45	62048A	89†
12 ± 0.60	6	62012E	145†		48 ± 2.40	1	62048C	125†
12 ± 0.60	12	62012G	195†		48 ± 2.40	2	62048E	145†
12 ± 0.60	23	62612J	395†		48 ± 2.40	4	62048G	195†
±12±0.60 Dual	1.25	62212A	†					

MODULAR POWER SUPPLIES SERIES 60000

6±0.6	1.5	60063A	87†		±15 ±1.50 Dual	0.2	60153D	97†
6±0.6	3	60065A	110†		±15 ±1.50 Dual	0.75	60155C	133†
6±0.6	8	60066A	197†		26 ± 2.60	0.25	60242B	72†
13 ± 1.30	0.5	60122B	72†		26 ± 2.60	0.5	60243B	79†
13 ± 1.30	1	60123B	79†		26 ± 2.60	1	60244B	88†
13 ± 1.30	2.2	60125B	100†		26 ± 2.60	1.5	60245B	100†
13 ± 1.30	6	60126B	179†		26 ± 2.60	3.5	60246B	179†

△ Additional output voltage and current ratings are available on a special handling basis.
† Quantity and OEM discounts are available. Contact your local Hewlett-Packard sales office for information.

MODULAR POWER SUPPLY SPECIFICATIONS:

Load and line regulation: 0.01% (62000-series supplies); 0.05% (60000-series supplies).
RMS ripple and noise: 1.0mV (single-output 62000- and 60000-series supplies); 0.3mV (60000 dual output supplies); 1.0mV (62000 dual output supplies); 20mV (62600-series supplies).
Remote sensing: Yes; Remote programming and CV/CC: No.
Mounting: Chassis, or rack with accessory rack tray (62000-series supplies) or panel (60000-series supplies).

HEWLETT-PACKARD POWER SUPPLIES

HEWLETT-PACKARD REGIONAL SALES OFFICES

EAST: W120 Century Road, Paramus, N.J. 07652. Tel. (201) 265-5000

MIDWEST: 5500 Howard Street, Skokie, Ill. 60076. Tel. (312) 677-0400

SOUTH: P.O. Box 2834, Atlanta, Ga. 30328. Tel. (404) 436-6181

WEST: 3939 Lankershim Boulevard, N. Hollywood, Ca. 91604. Tel. (213) 877-1282

ITT

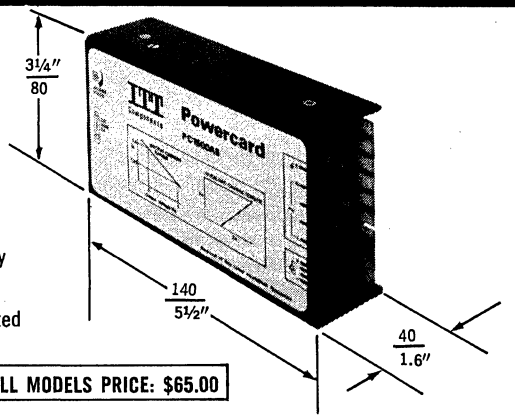
JENNINGS DC POWER SUPPLIES

INDUSTRIAL PRODUCTS

970 McLAUGHLIN AVENUE, SAN JOSE, CALIFORNIA 95116
PHONE: (408) 292-4025 TWX: 910-338-0159, TELEX: 34-6311

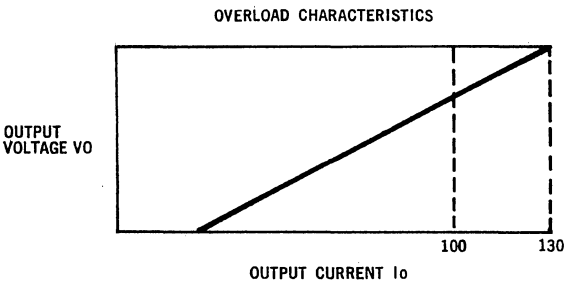
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

POWERCARD JG-PC 5 to 30 VOLTS DC



Stabilized DC output power supply over voltage and current limit protected

ALL MODELS PRICE: $65.00

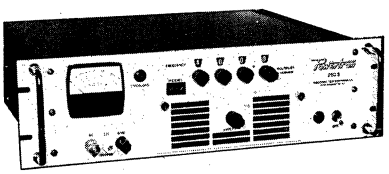


ORDERING CODE:	JG-PC250A15/15 ±12-15 V 0.25 A tracking output	JG-PC250A15/15 2x12-15 V 0.25 A JG-PC250C15/15 5-6 and 12-15 V 0.25 A isolated output	JG-PC 500A15 12-15 V 0.5 A	JG-PC1500A5 5-6 V 1.5-125 A
Line Stability:* (For a 10% input change)	500 UV/V +200 UV	500 UV/V +200 UV	100 UV/V +100 UV	100 UV/V +100 UV
Load Regulation: (No load to full load)	200 MV/V Max. 400 UV/V Type	200 MV/V Max. 400 UV/V Type	2 MV/V Max. 400 UV/V Type	2 MV/V Max. 400 UV/V Type
Ripple and Noise:* (DC to 100K Hz)	10 MV Peak to Peak	10 MV Peak to Peak	3 MV Peak to Peak	1 MV Peak to Peak
Input Voltage:	100 to 132 V or 200 to 264 V AC 48 to 65 Hz			
Insulation:	Floating output may be used up to 250 V DC above or below ground potential. Min. of 50 M ohm-input to output			
Temp. Range:	−10°C to +55°C Operations −20°C to +85°C Storage			
Temp. Coefficient:	.015%/°C			
Remote Sense	———	———	Yes	Yes
Overvoltage Protection:	———	———	———	Thyrister crowbar trip point (Vout +0.6) ±0.1
Overcurrent Protection:	Units are shipped with current limit starting at approx. 130% at full load, folding back to approx. 20% of short circuit. All units will recover automatically from current overload.			
Reverse Polarity Protection:	All units will accept a release current equal to the rating of the unit.			
Output impedance:	Less than 250 M ohm — D.C. to 250 K Hz			
Recovery Time:	Recovers to within 100 MV of initial voltage in less than 20 for a 50% load change.			
Application:	Powercards are designed as low cost units exceptionally good for linear and digital ICSI although the output voltage ranges allow wide use in other applications. The specification has been set by taking the average and maximum ratings of all major IC families as used in control instrumentation and educational applications. For user convenience, a connector with solder tabs is supplied with back powercard. Four screws at M3 metric size are provided.			
Mounting:	Powercards allow plug-in chassis or card frame mounting. Alternative mounting points, tapped M3, are provided in the base and on the rugged aluminum heat sink/cover.			
Connections:	May be soldered directly onto the board (solder pins provided) or attached to the contacts of the printed circuit edge connector provided.			
Series/Parallel Operation:				
JG-PC1500A5	Units may be connected in series for use as a 5-0-5 V supply but require derating for single 10 V output*. Parallel connection should be limited to two units to insure effective operation of the overvoltage crowbar.			
JG-PC500A15	Units may be connected in series for use as a 15-0-15 V supply but require derating for single 30 V output. Parallel connections of units OK.			
JG-PC250A15/15	Units cannot be connected in parallel with each other and require derating for single 30 V output.			
JG-PC250B15/15	The two isolated outputs on an individual unit may be connected in series to form a 15-0-15 V supply or they may be connected to give dual outputs of 12-15 V each. The two outputs may also be connected directly in parallel provided care is taken to insure that the individual output voltages are set to the same level. Powercards of this type may not be connected in parallel and require derating for single 30 V output.			
JG-PC250C5/15	Internal outputs may be series connected to form a 5-0-15 V supply or connected to give dual output 5-6 V and 12-15 V. Units cannot be parallel connected. Derating required for single 20 V output.			
Voltage:	All units have output voltage adjustment controlled by an easily accessible multiturn potentiometer. This allows precise settings over the specified voltage range plus a safety overlap. Additionally, on JG-PC250A15/15, the negative output tracks the positive output. A potentiometer in the positive line allows output voltage adjustments over the range 12-0-12 V to 15-0-15 V. The second potentiometer is for balance control e.g. and allows adjustments for 12-0-15 V, 15-0-12 V etc.			
Current:	All units have foldback overcurrent protection.			

Powertron SOLID STATE AC POWER SUPPLIES

The Powertron AC Power Supplies provide stable, low distortion, AC power at frequencies within the audio frequency spectrum. These highly reliable and versatile power sources find wide application in calibration and test stations, motor drives, gyro wheel supplies, laboratory use, military component testing, and operating foreign equipment. These supplies may be used whenever it is necessary to provide AC power at a frequency not available from the power lines.

The various supplies feature all solid state construction, wide operating frequency range, low distortion, and a wide variety of output voltages and impedances. The units are designed to be used in modular form so that a single unit can provide single phase output, and two or three units may be used to provide two phase or three phase outputs respectively.



AMPLIFIER SPECIFICATIONS

(Series 250S, Illustrated)

Output Circuit:
Single phase, isolated (Ground terminal is provided for optional grounding of output.)

Output Power:
250 VA

Load Power Factor:
.7 Lead through .7 Lag for full power output. Useable to .2 at reduced power.

Output Voltage Range:
0-130 V RMS (An output connector provided at the rear of the unit may readily be reconnected to provide optimum power output at other voltages. Ranges available are 0-260 V, 0-190 V, 0-130 V, 0-90 V, 0-75 V, 0-67 V, 0-60 V, 0-38 V, 0-30 V, and 0-17 V.

Output Frequency Range:
45 Hz to 10,000 Hz for full power out. 20 Hz to 20,000 Hz at reduced power.

Output Distortion:
0.1% mid band

Load Regulation:
Factory set to ±0.5% mid band (A control is provided for zero regulation adjustment over most of frequency range.)

Line Regulation:
±0.1% for ±5% line change.

Transient Response:
50 Microseconds.

Hum Level:
80 db approx. below rated output voltage.

Thermal Overload Protection:
Output transistors protected by thermal cut-out circuit.

Short Circuit Protection:
Output may be shorted indefinitely without damage to unit.

External Amplifier Input:
An input connector is provided at the rear of the unit when it is desired to drive the amplifier from an external source. Model XA-1 plug-in Module is required for this mode of operation.

External Sync. Input:
An input connector is provided at the rear when it is desired to synchronize the plug in oscillator with an external frequency source.

Convenience Outlets:
Two convenience outlets controlled by the power switch are provided at the rear of the unit. These permit single control operation of one or two additional amplifiers when 2ø or 3ø outputs are required. When not used for this purpose, the outlets may also be used to turn on auxiliary equipment which is mounted in the same test console.

Meter:
A voltmeter with range of 0-150 V RMS is provided to monitor the output voltage.

Input Power:
115 V or 230 V, 50-60 Hz (400 Hz input available).

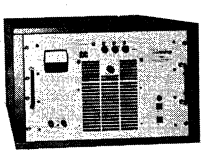
Ambient Temperature Range:
0° C to 55° C.

Dimensions:
5¼ x 19″ Rack Panel x 14″ Deep.

Weight:
75 Lbs. Approx.

The ordering designations listed below are for convenience of specifying the components required for various power supply configurations. To select an appropriate unit for your requirements first determine which category, 1-phase, 2-phase, or 3-phase, is most suitable to your intended load. Then use the ordering designation adjacent to the required output power within that category. For the complete ordering designation replace the asterisk with the ordering code letters of the plug-in-oscillator listed

1Ø Power Supplies (For Use with Single Phase Loads)

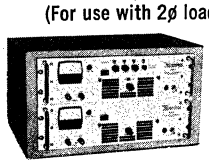


Model 1000S-1-N

Ordering Designation	Total Output Power	Output Voltage Range	Input
80S-1-*	80VA	17, 30, 38, 60, 67, 75, 90, **130**, 190, 260	1-Phase **115**, 230
250S-1-*	250VA		
500S-1-*	500VA	35, 60, 75, 120, **135**, 150, 180, 260, 380	
750S-1-*	750VA	50, 90, **115**, 180, 200, 225, 270, 390	
1000S-1-*	1KVA	65, 76, **130**, 140, 150, 260, 300	3-Phase, Line to Line 190, **208**, 225, 380, 450
1500S-1-*	1.5KVA		
2000S-1-*	2KVA	**130**, 150, 260, 280, 300	
3000S-1-*	3KVA		

2Ø - 3Ø (Open Delta) Power Supplies

(For use with 2ø loads and 3ø, 3 wire Delta loads.

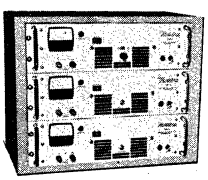


Model 500S-23-MM

Ordering Designation	Total Output Power	Output Voltage Range	Input
160S-23-*	160VA	17, 30, 38, 60, 67, 75, 90, **130**, 190, 260•	1-Phase **115**, 230
500S-23-*	500VA		
1000S-23-*	1KVA	35, 60, 75, 120, **135**, 150, 180, 260, 380	
2000S-23-*	2KVA	65, 76, **130**, 140, 150, 260, 300	3-Phase, Line to Line 190, **208**, 225, 240, 380, 450
3000S-23-*	3KVA		
4000S-23-*	4KVA	**130**, 150, 260, 280, 300	
6000S-23-*	6KVA		

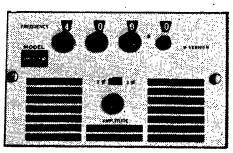
3Ø Wye-Delta Power Supplies

(For use with 3ø, 4 wire wye loads or 3ø, 3 wire, Delta Loads.



Model 750S-3-AA

Ordering Designation	Total Output Power	Output Voltage Ranges (line to neutral)	Input
240S-3-*	240VA	17, 30, 38, 60, 67, 75, 90, **130**, 190, 260	1-Phase **115**, 230
750S-3-*	750VA		
1500S-3-*	1.5KVA	35, 60, 75, 120, **135**, 150, 180, 260, 380	
3000S-3-*	3KVA	65, 76, **130**, 140, 150, 260, 300	3-Phase, Line to Line 190, **208**, 225, 240, 380, 450
4500S-3-*	4.5KVA		
6000S-3-*	6KVA	**130**, 150, 260, 280, 300	
9000S-3-*	9KVA		



PLUG-IN OSCILLATORS

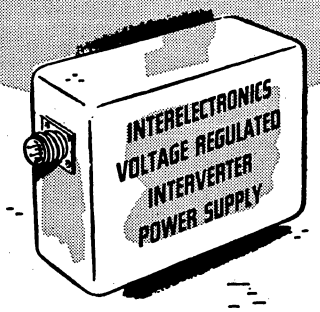
Single phase (1ø) and polyphase (Pø) oscillators are available for both fixed frequency and variable frequency output. A coarse and fine concentric control is included on each oscillator panel for precise amplitude adjustment. Polyphase oscillators include a switch on the front panel which provides either two-phase or three-phase output. All plug-in oscillators are provided with Sync. capability which permits locking-in their output frequency with an external source of the same nominal frequency.

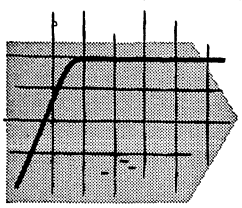
CODE		FREQUENCY	ACCURACY
Single Phase	Poly Phase		
A	AA	400 Hz	0.1%
B	BB	60 Hz	0.1%
C	CC	Specify	0.1%
D	DD	Specify	0.01%
E	EE	Specify	0.001%
K	KK	10 Hz - 10 KHz	1.0%
L	LL	10 Hz - 100 Hz	1.0%
M	MM	100 Hz - 1 KHz	1.0%
N	NN	350 Hz - 450 Hz	0.25%
P	PP	300 Hz - 500 Hz	0.25%
Q	QQ	1 KHz - 10 KHz	1.0%

WRITE FOR CATALOG 969

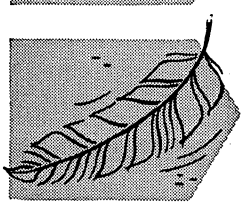
ITECO **INDUSTRIAL TEST EQUIPMENT CO.** 21 Yennicock Ave., Port Washington, N. Y. 11050
Phone (516) 883-1700

PROVEN RELIABILITY—
DC-DC, DC-AC, SOLID-STATE POWER INVERTERS
over 260,000 logged hours— voltage-regulated, frequency-controlled, for missile, telemeter, ground-support, 135°C all-silicon units available now—



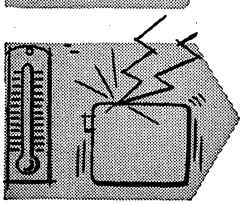


Interelectronics all-silicon thyratron-like gating elements and cubic-grain toroidal magnetic components convert DC to any desired number of AC or DC outputs from 1 to 10,000 watts.



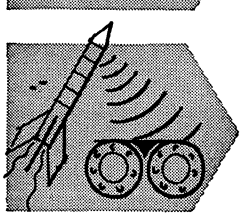
Ultra-reliable in operation (over 260,000 logged hours), no moving parts, unharmed by shorting output or reversing input polarity. High conversion efficiency (to 92%, including voltage regulation by Interelectronics patented reflex high-efficiency magnetic amplifier circuitry).

Wide input voltage range (1 to 250 volts DC). Wide input voltage regulation (output voltage maintained with variations up to 50% in input voltage).

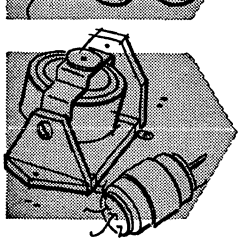


Light weight (to 6 watts/oz.), compact (to 8 watts/cu. in.), low ripple (to 0.01 mv. p-p), excellent voltage regulation (to 0.1%), precise frequency control (to 0.2%) with Interelectronics extreme environment magnetostrictive standards or to 0.0001% with fork or piezoelectric standards.

Complies with MIL specs. for shock (100G 11 misc.), acceleration (100G 15 min.), vibration (100G 5 to 5,000 cps.), temperature (to 150 degrees C), RF noise (I-26600).



AC single and polyphase units supply sine waveform output (to 2% harmonics), will deliver up to ten times rated line current into a short circuit to actuate MIL type magnetic circuit breakers or fuses, will start gyros and motors with starting current surges up to ten times normal operating line current.



Now in use in major missiles, powering telemeter transmitters, radar beacons, electronic equipment. Single and polyphase units now power airborne and marine missile gyros, synchros, servos, magnetic amplifiers.

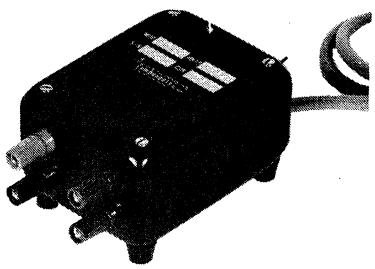
Interelectronics—first and most experienced in the solid-state power supply field produces its own all-silicon solid-state gating elements, all high flux density magnetic components, high temperature ultra-reliable film capacitors and components, has complete facilities and know how—has designed and delivered more working KVA than any other firm!

For complete engineering data, write Interelectronics today, or call (914) EL 8-8000 in Congers.

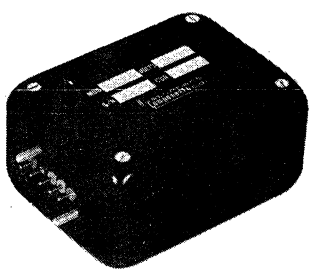
INTERELECTRONICS CORPORATION
550 U.S. Route 303, Congers, New York 10920

CONSTANT CURRENT

power supplies and regulators

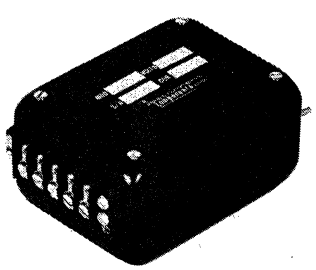


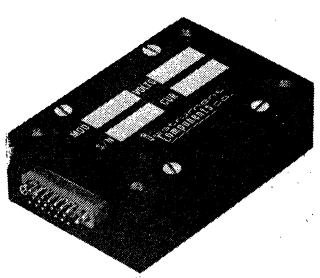
BCP1-EX
BENCH MOUNT



CP20-10
PLUG-IN

JVLCP20-10
BARRIER STRIP





MN8CR2-C

DESCRIPTION

CONSTANT CURRENT POWER SUPPLIES operate from AC line power and produce a stable regulated constant DC output current. This output is isolated from the power line and chassis.

CONSTANT CURRENT REGULATORS are powered from an unregulated DC voltage source and produce one or more stable regulated DC output currents. Normally the negative terminal is common to both input and output.

SPECIFICATIONS — electrical

Model (Basic Type)	Input Power	Output Current Current Range Set Point	Compliance Voltage	Notes
CP1	105 to 130 VAC 47 to 63 Hz	0.01 to 5 ma	0 to +15	- output is isolated
CP20	105 to 130 VAC 47 to 63 Hz	1 to 25 ma	0 to +15	- output is isolated
CP250	105 to 130 VAC 47 to 63 Hz	1 to 250 ma	0 to +20	- output is isolated
VLCP20	105 to 130 VAC 47 to 63 Hz	1 to 25 ma	0 to 6.30	- compliance voltage is precision adjustable - output is isolated
MN8CR	24 to 32 VDC	8 outputs .1 to 2 ma ea.	0 to 6.0	- compliance voltage is precision adjustable - negative terminal is common

SPECIFICATIONS — environmental operating

CP types — plug-in	−40°C to	+85°C, 10g shock
— bench mount	−10°C to	+55°C, 10g shock
— barrier strip	−20°C to	+65°C, 10g shock
MN8CR types	−40°C to	+100°C, 20g rms

CASE INFORMATION

DIMENSIONS — excluding connections

CP1, CP20, VLCP20	2″H x 3″W x 4″D
CP250	2⅜″H x 4″W x 5″D

MATERIAL — all types are black anodized aluminum

ORDERING INFORMATION

Individual data sheets for each model are available upon request. Please refer to the individual data sheets or consult with the factory when specifying a model.

Instrument Components co.

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special purpose

DC to DC POWER SUPPLIES

utility grade

DESCRIPTION

These special purpose DC to DC power supplies are designed to be used for public utility or industrial applications in sheltered environments. They provide common regulated output voltages that are normally used to power control or communication systems. Outputs are isolated from the case and from the input.

VC60 types provide up to 60 watts of class A regulated power and consist of a DC to DC converter followed by two class A regulators.

DCM types are intended to operate from high voltage DC power busses and use a duty cycle modulated pre-regulator to obtain efficiency and prevent excess heat buildup in confined areas. The duty cycle modulator is followed by an isolating DC to DC converter and two class A regulators.

DCT types are simple DC to DC converters which produce two rectified outputs which are isolated from the input, case, and from each other. They effectively serve as a 1 to 1 DC transformer.

SPECIFICATIONS — electrical

Model	DC Input Voltage	DC Output Voltage	DC Output Current	Notes
48VC60-2R15	42 to 56	+15, 0, −15 regulated	2 amps each channel	- input/output isolation - zero common - outputs are independently adjustable
125VC60-2R15	105 to 140	+15, 0, −15 regulated	2 amps each channel	- input/output isolation - zero common - outputs are independently adjustable
300DCM60-2R15	275 to 350	+15, 0, −15 regulated	2 amps each channel	- input/output isolation - uses duty cycle modulated pre-regulator
600DCM15-2R15	550 to 650	+15, 0, −15 regulated	.5 amps each channel	- input/output isolation - uses duty cycle modulated pre-regulator
28DCT-2	24 to 32	two identical outputs — unregulated	0 to 1.5 amps ea. channel	- isolated outputs follow input
48DCT-2	42 to 56	two identical outputs — unregulated	0 to 1.5 amps ea. channel	- isolated outputs follow input

SPECIFICATIONS — environmental operating

VC60 series −40°C to +65°C, — 6g shock
DCM60 series −40°C to +55°C, — 6g shock
DCM15 series −40°C to +55°C, — 6g shock
DCT100 series −40°C to +100°C, — 15g shock on unpotted units
— 30g shock on potted units

CASE INFORMATION

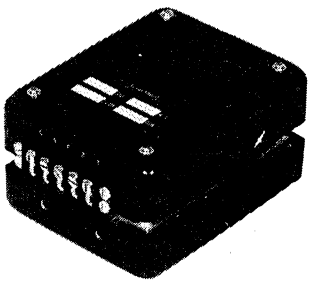
DIMENSIONS — excluding connections

VC60 series 5″H x 2¾″W x 4″D
DCM60, DCM15 4½″H x 3½″W x 6″D
DCT100 1⅞″H x 3″W x 4″D unpotted units
1⅜″H x 3″W x 4″D potted units

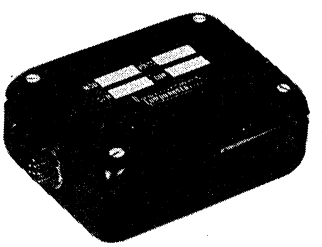
MATERIAL — all types are black anodized aluminum

ORDERING INFORMATION

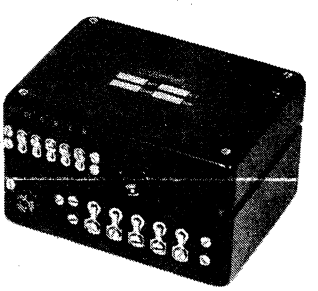
Individual data sheets for each model are available upon request. Please refer to the individual data sheets or consult with the factory when specifying a model.



48VC60-2R15



28DCT100-2U



600DCM15-2R15

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Product Section	Volumes 1, 2, 3 Page	1973 Volume 4 Page	Products
1100	Vol.2•308	Vol.4•309	Amplifiers, Audio, Operational, etc.
1200			Antennas & Accessories
1300	Vol.1•308	Vol.4•310	Audio Equipment & Accessories
1400	Vol.3•308	Vol.4•311	Cabinets, Chassis, Containers, Racks, Boxes, etc.
1500	Vol.3•342	Vol.4•314	Capacitors (All Types)
1600	Vol.3•516	Vol.4•324	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
1700	Vol.2•323		Circuit Assemblies, Circuit Boards & Breadboarding Kits
1800	Vol.3•519		Coils (Inductors, Chokes), Assemblies, Forms
1900	Vol.1•319		Communications Equipment (Facsimile, Telephone, Television)
2000	Vol.1•321	Vol.4•325	Computing, Data Handling Equipment & Accessories
2100	Vol.3•544	Vol.4•356	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2200	Vol.2•326	Vol.4•386	Controls, Control Components & Systems
2300	Vol.2•379	Vol.4•389	Crystals & Mechanical Tuning Devices; Oscillators
2350	Vol.3•978	Vol.9•392	Delay Lines (All Types)
2400	Vol.2•456	Vol.4•397	Panel Components (Including Lighting & Readouts)
2500	Vol.3•1004	Vol.4•401	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
2550	Vol.1•382		Environmental Test Equipment
2600	Vol.3•1039		Fans, Blowers & Cooling Equipment
2700	Vol.2•544	Vol.4•403	Filters
2800	Vol.3•1070		Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
2900	Vol.1•386	Vol.4•404	Instruments, Measuring & Test
3000	Vol.1•536	Vol.4•430	Instruments, Graphic Recording
3100	Vol.3•1074		Insulators, Insulating Materials & Parts
3130	Vol.2•588	Vol.4•432	Integrated Circuits & Hybrid Microcircuits
3150	Vol.3•1089		Manufacturing, Subcontracting, Custom Fabrication
3200	Vol.3•1092		Materials, Raw (Metals, Plastics, Glass, Rubber, Cloth, etc.)
3400	Vol.1•544		Microwave, Laser & Radar (Systems & Subsystems)
3450	Vol.2•607	Vol.4•438	Microwave, Laser & Radar (Components/Accessories)
3500	Vol.2•630	Vol.4•442	Motors, Rotating Components & Accessories
3600			Nuclear & Radiation Equipment
3700	Vol.2•670	Vol.4•443	Photoelectric Equipment & Components
3800	Vol.2•680		Optical Equipment & Accessories
4000	Vol.1•571	Vol.4•444	Power Supplies, Converters, Inverters, Batteries, etc.
4100	Vol.1•934		Production Machinery & Automation Equipment
4200			Engineering Aids (Books, Drafting Equipment, Whiteprinters)
4300	Vol.1•935		Recording Equipment (Non-Audio Types)
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4600			Research, Development, Engineering Services
4700	Vol.3•1093	Vol.4•492	Resistors, Fixed
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COVERING THE COST OF PARTS AND LABOR. THE WARRANTY IS HONORED AT OUR FACTORY SERVICE DEPARTMENT, FLUSHING, N. Y., AND THROUGH OUR FIELD REPRESENTATIVES.

KEPCO power supplies

Kepco's 1973 power supply catalog is organized by important product groups for ready access. The groups are classified by the major characteristics that they share. For example: OEM-type modular power supplies may be found in the first section, *Modules*. Power supplies that must respond quickly to programming instructions are cataloged in the *High Speed* section.

Many power supplies, of course, can be classified in more than one section. . . . Kepco's BHK group, for example, are high voltage, automatic crossover, fast programmable, general purpose lab style power supplies. We will catalog their complete characteristics in the *High Voltage* section, and cross-reference BHK in the *High Speed* and *General Purpose* categories.

Section 1: Modules ..... Page 708
Section 2: High Speed, Fast Programming ..... Page 718
Section 3: High Voltage (200V and more) ..... Page 726
Section 4: General Purpose Lab Supplies ..... Page 730
Section 5: Special Purpose Power Supplies ..... Page 734
Section 6: Programming Equipment ..... Page 741
Section 7: Accessories ..... Page 748
Section 8: Hardware Systems ..... Page 750

MODEL GROUP	PAGE	MODEL GROUP	PAGE	MODEL GROUP	PAGE
ABC (Tr)	732	DTM	710	PAX	712
ABC (Hyb)	726	FG	747	PCX	713
BHK	727	HB	728	PCX–MAT	713
BKF	708	JQE	730	PTR	717
BOP	718	JMK	733	PRM	714
CC	734	KG	737	PVS	740
CCP	709	KW	738	RA	750-754
CDT	735	NTC	741	SN	744
CPS	736	OPS	719-725	VIP/VP	749
DPD/R/K	742	PAT	711	WR	729

PRICES

Prices are f.o.b. Kepco's factory in Flushing, New York. Please contact our sales office for delivered price quotation and quantity discounts. All prices and specifications are subject to change without notice.

WARRANTY

All Kepco products are warranted for 5-years. The warranty is honored at our factory in Flushing, New York. All goods shipped to the factory must be prepaid and be accompanied by documentation explaining the service desired.

PARTS

Those who choose to perform their own service, can obtain parts for in-warranty equipment at no cost. Contact the factory or your Kepco sales representative. When requesting parts, use the Kepco part number as given in your instruction manual, plus the model and serial number of the product being serviced.

RETURNED GOODS (ordered in error)

Return of new and unused models is permitted within the first thirty (30) days only. There is a restocking fee equal to 10% of the sales price or $25.00 minimum. Contact the factory for authorization prior to returning any equipment for credit.

COMMUNICATIONS

Address all mail to:
Kepco, Inc., 131-38 Sanford Avenue, Flushing, N.Y. 11352

Telephone: (212) 461-7000
TWX Number: 710-582-2631
Cable Address: KEPCOPOWER NEWYORK

KEPCO INDEX by OUTPUT VOLTAGE

MODULAR (1)

VOLTS	AMPS	MODEL	PAGE
1.25 ±10%	0–7	BKF 1.25–7	708
3.5 ±10%	0–5	BKF 3.5–5	708
4.5 (dual)	0–20 (dual)	PRM 2X4.5–20	716
5.0 ±10%	0–3	BKF 5–3	708
5.0 ±10%	0–5	BKF 5–5	708
5 Nominal*	10 Nominal*	PRM 5–10	716
5.0 ±5%	0–11	BKF 5–11	708
5.2	0–15	PRM 5–15	715
5.2 (dual)	0–20 (dual)	PRM 2X5–20	716
5.2	0–25	PRM 5–25	715
5.2	0–25	PRM 5–25F	715
6.3 Nominal*	8 Nominal*	PRM 6.3–8	716
6.3	0–15	PRM 6–15	715
6.3 (dual)	0–20 (dual)	PRM 2X6–20	716
6.3	0–25	PRM 6–25	715
6.3	0–25	PRM 6–25F	715
0–7	0–1	PAX 7–1	712
0–7	0–2	CCP 7–2	709
0–7	0–2	PAT 7–2	711
0–7	0–2	PCX 7–2	713
0–7	0–5.5	PTR 7–5.5	717
8 Nominal*	7 Nominal*	PRM 8–7	716
8.0 ±5%	0–10	BKF 8–10	708
10 Nominal*	6 Nominal*	PRM 10–6	716
12.0 ±10%	0–1.4	BKF 12–1.4	708
12.0 ±10%	0–2.4	BKF 12–2.4	708
12 Nominal*	5 Nominal*	PRM 12–5	716
12.0 ±5%	0–7	BKF 12–7	708
12	0–10	PRM 12–10	715
12 (dual)	0–12 (dual)	PRM 2X12–12	716
12	0–15	PRM 12–15	715
12	0–15	PRM 12–15F	715
0–15	0–0.75	PAX 15–0.75	712
15.0 ±10%	0–1.2	BKF 15–1.2	708
0–15	0–1.5	CCP 15–1.5	709
0–15	0–1.5	PAT 15–1.5	711
0–15	0–1.5	PCX 15–1.5	713
15.0 ±10%	0–2	BKF 15–2	708
0–15	0–3.3	PTR 15–3.3	717
15 Nominal*	4 Nominal*	PRM 15–4	716
15.0 ±5%	0–6	BKF 15–6	708
15 (dual)	0–10 (dual)	PRM 2X15–10	716
0 to ±16	0 to ±0.6	DTM 2X16–0.6	710
18 Nominal*	3.3 Nominal*	PRM 18–3.3	716
18	0–6.7	PRM 18–6.7	715
18 (dual)	0–8 (dual)	PRM 2X18–8	716
18	0–10	PRM 18–10	715
18	0–10	PRM 18–10F	715
0–21	0–0.5	PAX 21–0.5	712
0–21	0–1	CCP 21–1	709
0–21	0–1	PAT 21–1	711
0–21	0–1	PCX 21–1	713
0–21	0–2.5	PTR 21–2.5	717
21 Nominal*	2.9 Nominal*	PRM 21–2.9	716
24.0 ±10%	0–0.8	BKF 24–0.8	708
24.0 ±10%	0–1.2	BKF 24–1.2	708
24.0 ±5%	0–4	BKF 24–4	708
24	0–5	PRM 24–5	715
24 (dual)	0–6 (dual)	PRM 2X24–6	716
24	0–8	PRM 24–8	715
24	0–8	PRM 24–8F	715
0 to ±28	0 to ±0.4	DTM 2X28–0.4	710
28.0 ±10%	0–0.6	BKF 28–0.6	708
28.0 ±10%	0–1	BKF 28–1	708
28.0 ±5%	0–4	BKF 28–4	708
28	0–4.3	PRM 28–4.3	715
28 (dual)	0–5 (dual)	PRM 2X28–5	716
28	0–7	PRM 28–7	715
28	0–7	PRM 28–7F	715
36	0–0.3	PAX 36–0.3	712
36 Nominal*	1.7 Nominal*	PRM 36–1.7	716
36.0 ±5%	0–3	BKF 36–3	708
36	0–3.3	PRM 36–3.3	715
36 (dual)	0–4 (dual)	PRM 2X36–4	716
36	0–5	PRM 36–5	715
36	0–5	PRM 36–5F	715
0 to ±40	0 to ±0.25	DTM 2X40–0.25	710
0–40	0–0.5	CCP 40–0.5	709
0–40	0–0.5	PAT 40–0.5	711
0–40	0–0.5	PCX 40–0.5	713
0–40	0–1.4	PTR 40–1.4	717
48 Nominal*	1.25 Nominal*	PRM 48–1.25	716
48.0 ±5%	0–2.5	BKF 48–2.5	708
48	0–2.5	PRM 48–2.5	715
48 (dual)	0–3 (dual)	PRM 2X48–3	716
48	0–4	PRM 48–4	715
48	0–4	PRM 48–4F	715
60 Nominal*	1 Nominal*	PRM 60–1	716
60	0–2	PRM 60–2	715
60 (dual)	0–2.5 (dual)	PRM 2X60–2.5	716
60	0–3	PRM 60–3	715
60	0–3	PRM 60–3F	715
70 Nominal*	0.86 Nominal*	PRM 70–0.86	716
0–72	0–0.15	PAX 72–0.15	712
0–72	0–0.3	CCP 72–0.3	709
0–72	0–0.3	PAT 72–0.3	711
0–72	0–0.3	PCX 72–0.3	713
0–72	0–0.8	PTR 72–0.8	717
90 Nominal*	0.67 Nominal*	PRM 90–0.67	716
0–100	0–0.1	PAX 100–0.1	712
0–100	0–0.2	CCP 100–0.2	709
0–100	0–0.2	PAT 100–0.2	711
0–100	0–0.2	PCX 100–0.2	713
0–100	0–0.6	PTR 100–0.6	717
120 Nominal*	0.50 Nominal*	PRM 120–0.50	716
120	0–1	PRM 120–1	715
120	0–1.5	PRM 120–1.5	715
120	0–1.5	PRM 120–1.5F	715
160 Nominal*	0.37 Nominal*	PRM 160–0.37	716
240 Nominal*	0.25 Nominal*	PRM 240–0.25	716

(1) See Models BOP, CPS, JQE, OPS–I, OPS–III for additional Modular units.

HIGH SPEED (2)

VOLTS	AMPS	MODEL	PAGE
0–6	0–5	OPS 6–5M	721
0–6	0–10	OPS 6–10M	721
0–6	0–22	OPS 6–22M	722
0–6	0–45	OPS 6–45M	722
0–6	0–90	OPS 6–90M	722
0–7	0–2	OPS 7–2B	719
0–7	0–2	OPS 7–2BTA	719
0–7	0–5.5	OPS 7–5.5	720
0–15	0–1.5	OPS 15–1.5B	719
0–15	0–1.5	OPS 15–1.5BTA	719
0–15	0–3	OPS 15–3M	721
0–15	0–3.3	OPS 15–3.3	720
0–15	0–6	OPS 15–6M	721
0–15	0–12	OPS 15–12M	722
+15 to –15	+20 to –20	BOP 15–20M	718
0–15	0–25	OPS 15–25M	722
0–15	0–50	OPS 15–50M	722
0–21	0–1	OPS 21–1B	719
0–21	0–1	OPS 21–1BTA	719
0–21	0–2.5	OPS 21–2.5	720
0–25	0–2	OPS 25–2M	721
0–25	0–4	OPS 25–4M	721
0–25	0–10	OPS 25–10M	722
0–25	0–20	OPS 25–20M	722
0–25	0–40	OPS 25–40M	722
+36 to –36	+1.5 to –1.5	BOP 36–1.5M	718
0–36	0–1.5	OPS 36–1.5M	721
0–36	0–3	OPS 36–3M	721

(2) See Models BHK, CC, CCP for additional High Speed units.

KEPCO POWER SUPPLIES

VOLTS	AMPS	MODEL	PAGE
+36 to -36	+5 to +5	BOP 36-5M	718
0-36	0-8	OPS 36-8M	722
0-36	0-15	OPS 36-15M	722
0-36	0-30	OPS 36-30M	722
0-40	0-0.5	OPS 40-0.5B	719
0-40	0-0.5	OPS 40-0.5BTA	719
0-40	0-1.4	OPS 40-1.4	720
0-55	0-1	OPS 55-1M	721
0-55	0-2	OPS 55-2M	721
0-55	0-5	OPS 55-5M	722
0-55	0-10	OPS 55-10M	722
0-55	0-20	OPS 55-20M	722
0-72	0-0.3	OPS 72-0.3B	719
0-72	0-0.3	OPS 72-0.3BTA	719
0-72	0-0.8	OPS 72-0.8	720
+72 to -72	+1.5 to -1.5	BOP 72-1.5M	718
+72 to -72	+5 to -5	BOP 72-5M	718
0-75	0-0.7	OPS 75-0.7M	721
0-75	0-1.5	OPS 75-1.5M	721
0-75	0-3	OPS 75-3M	722
0-75	0-8	OPS 75-8M	722
0-75	0-15	OPS 75-15M	722
0-100	0-0.2	OPS 100-0.2B	719
0-100	0-0.2	OPS 100-0.2BTA	719
0-100	0-0.5	OPS 100-0.5M	721
0-100	0-0.6	OPS 100-0.6	720
0-100	0-1	OPS 100-1M	721
0-100	0-2.5	OPS 100-2.5M	722
0-100	0-5	OPS 100-5M	722
0-100	0-10	OPS 100-10M	722
0-150	0-1.5	OPS 150-1.5M	722
0-150	0-3.5	OPS 150-3.5M	722
0-150	0-7	OPS 150-7M	722
0-500	0-0.04	OPS 500	724
0-1000	0-0.02	OPS 1000	724
0-2000	0-0.01	OPS 2000	724
0-3500	0-0.010	OPS 3500	725
0-5000	0-0.005	OPS 5000	725

HIGH VOLTAGE [3]

0-200	0-0.1	ABC 200M	726
0-325	0-0.2	HB 2AM	728
0-325	0-0.4	HB 4AM	728
0-325	0-0.6	HB 6AM	728
0-325	0-0.8	HB 8AM	728
0-425	0-0.05	ABC 425M	726
0-500	0-0.4	BHK 500-0.4M	727
0-525	0-0.5	HB 525M	728
0-600	0-0.5	605	729
0-1000	0-0.02	ABC 1000M	726
0-1000	0-0.2	BHK 1000-0.2M	727
0-1000	0-0.5	1250B	729
0-1500	0-0.01	ABC 1500M	726
0-1500	0-0.2	1520B	729
0-2000	0-0.1	BHK 2000-0.1M	727
0-2000	0-0.5	HB 2050	729
0-2500	0-0.002	ABC 2500M	726
0-2500	0-0.05	HB 2500	729

GENERAL PURPOSE

0-2	0-1	ABC 2-1M	732
0-6	0-5	JMK 6-5M	733
0-6	0-10	JMK 6-10M	733
0-6	0-10	JQE 6-10M	730
0-6	0-22	JQE 6-22M	730
0-6	0-45	JQE 6-45M	730
0-6	0-90	JQE 6-90M	730
0-7	0-2	PCX 7-2MAT	713
0-7.5	0-2	ABC 7.5-2M	732
0-10	0-0.75	ABC 10-0.75M	732
0-15	0-1	ABC 15-1M	732
0-15	0-1.5	PCX 15-1.5MAT	713
0-15	0-3	JMK 15-3M	733
0-15	0-6	JMK 15-6M	733
0-15	0-6	JQE 15-6M	730
0-15	0-12	JQE 15-12M	730
0-15	0-25	JQE 15-25M	730
0-15	0-50	JQE 15-50M	730
0-18	0-0.5	ABC 18-0.5M	732
0-21	0-1	PCX 21-1MAT	713
0-25	0-2	JMK 25-2M	733
0-25	0-4	JMK 25-4M	733
0-25	0-4	JQE 25-4M	730
0-25	0-10	JQE 25-10M	730
0-25	0-20	JQE 25-20M	730
0-25	0-40	JQE 25-40M	730
0-30	0-0.3	ABC 30-0.3M	732
0-36	0-1.5	JMK 36-1.5M	733
0-36	0-3	JMK 36-3M	733
0-36	0-3	JQE 36-3M	730
0-36	0-8	JQE 36-8M	730
0-36	0-15	JQE 36-15M	730
0-36	0-30	JQE 36-30M	730
0-40	0-0.5	ABC 40-0.5M	732
0-40	0-0.5	PCX 40-0.5MAT	713
0-55	0-1	JMK 55-1M	733
0-55	0-2	JMK 55-2M	733
0-55	0-2	JQE 55-2M	730
0-55	0-5	JQE 55-5M	730
0-55	0-10	JQE 55-10M	730
0-55	0-20	JQE 55-20M	730
0-72	0-0.3	PCX 72-0.3MAT	713
0-75	0-0.7	JMK 75-0.7M	733
0-75	0-1.5	JMK 75-1.5M	733
0-75	0-1.5	JQE 75-1.5M	730
0-75	0-3	JQE 75-3M	730
0-75	0-8	JQE 75-8M	730
0-75	0-15	JQE 75-15M	730
0-100	0-0.2	ABC 100-0.2M	732
0-100	0-0.2	PCX 100-0.2MAT	713
0-100	0-0.5	JMK 100-0.5M	733
0-100	0-1	JMK 100-1M	733
0-100	0-1	JQE 100-1M	730
0-100	0-2.5	JQE 100-2.5M	730
0-100	0-5	JQE 100-5M	730
0-100	0-10	JQE 100-10M	730
0-150	0-1.5	JQE 150-1.5M	730
0-150	0-3.5	JQE 150-3.5M	730
0-150	0-7	JQE 150-7M	730

SPECIAL PURPOSE

0-6	0-10	CPS 6-10M	736
0-6	0-22	CPS 6-22M	736
0-6	0-45	CPS 6-45M	736
0-6	0-90	CPS 6-90M	736
0-6	0-600	KW 6-600	738
0-7	0-2	CC 7-2M	734
0-15	0-1.5	CC 15-1.5M	734
0 to ±15 (dual)	0 to ±1.5 (dual)	CDT 15-1.5M	735
0-15	0-6	CPS 15-6M	736
0-15	0-12	CPS 15-12M	736
0-15	0-25	CPS 15-25M	736
0-15	0-50	CPS 15-50M	736
0-21	0-1	CC 21-1M	734
0-25	0-0.2	KG 25-0.2	737
0-40	0-0.5	CC 40-0.5M	734
0 to ±40 (dual)	0 to ±0.5 (dual)	CDT 40-0.5M	735
0-72	0-0.3	CC 72-0.3M	734
0-100	0-0.05	KG 100-0.05	737
0-100	0-0.2	CC 100-0.2M	734
0 to ±100 (dual)	0 to ±0.2 (dual)	CDT 100-0.2M	735
0.0000-100.00	0-1	PVS 100-1M	740

[3] See Models OPS-IX, OPS-X for additional High Voltage units.

*Nominal output-two settings above and below nominal are available.

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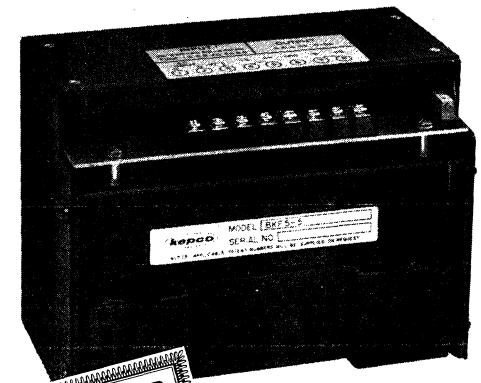
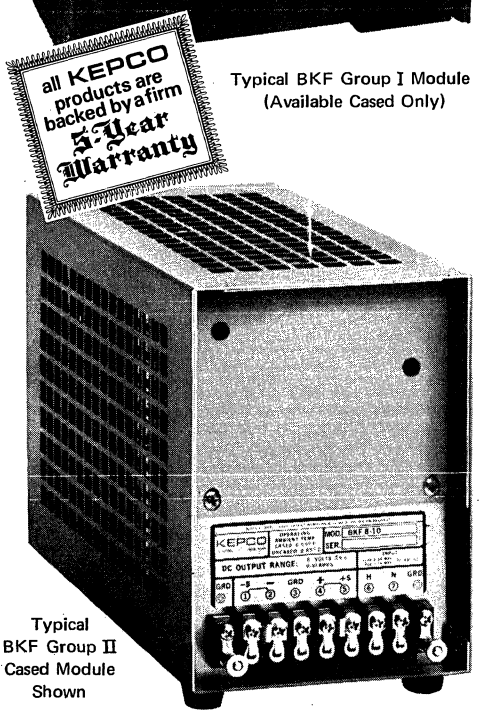
KEPCO BKF *modular* POWER SUPPLIES

UL RECOGNIZED TO UL478 and UL114

The Kepco BKF design combines an I-C driven series transistor regulator with a modified re-entrant over-current circuit. Voltage is controlled over a small adjustment range, protected by a built-in overvoltage crowbar. The crowbar trip point is tabulated for each model. Adjustable trip is optionally available.



Typical BKF Group I Module (Available Cased Only)



Typical BKF Group II Cased Module Shown

GROUP I

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OV TRIP POINT VOLTS (MAX.)	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	MAX. INPUT AMPS at 125 V a-c	PRICE	SHIP WGT. lbs.	kg.
BKF 1.25–7	1.25 ±10%	0–7	(1)	1 MΩ + 1 μH	0.7	$148.00	6	2.7
BKF 3.5–5	3.5 ±10%	0–5	(1)	1 MΩ + 1 μH	0.7	148.00	6	2.7
BKF 5–3	5.0 ±10%	0–3	6.5	3 MΩ + 1 μH	0.6	129.00	6	2.7
BKF 5–5	5.0 ±10%	0–5	6.5	1 MΩ + 1 μH	0.9	148.00	6	2.7
BKF 12–1.4	12.0 ±10%	0–1.4	15.3	9 MΩ + 1 μH	0.6	129.00	6	2.7
BKF 12–2.4	12.0 ±10%	0–2.4	15.3	5 MΩ + 1 μH	0.7	148.00	6	2.7
BKF 15–1.2	15.0 ±10%	0–1.2	19.5	13 MΩ + 1 μH	0.6	129.00	6	2.7
BKF 15–2	15.0 ±10%	0–2	19.5	8 MΩ + 1 μH	0.8	148.00	6	2.7
BKF 24–0.8	24.0 ±10%	0–0.8	30.0	30 MΩ + 1 μH	0.6	129.00	6	2.7
BKF 24–1.2	24.0 ±10%	0–1.2	30.0	20 MΩ + 1 μH	0.7	148.00	6	2.7
BKF 28–0.6	28.0 ±10%	0–0.6	35.3	50 MΩ + 1 μH	0.5	129.00	6	2.7
BKF 28–1	28.0 ±10%	0–1	35.3	30 MΩ + 1 μH	0.7	148.00	6	2.7

(1) Adjustable overvoltage trip point is standard. See option "–V" paragraph for specifications.

GROUP II

BKF 5–11	5.0 ±5%	0–11	6.5	0.3 MΩ + 0.5 μH	1.4	213.00(2)	23	10.4
BKF 8–10	8.0 ±5%	0–10	11.1	0.4 MΩ + 0.5 μH	1.3	213.00(2)	23	10.4
BKF 12–7	12.0 ±5%	0–7	15.3	0.9 MΩ + 0.5 μH	2.0	213.00(2)	23	10.4
BKF 15–6	15.0 ±5%	0–6	19.5	1.3 MΩ + 0.5 μH	2.0	213.00(2)	23	10.4
BKF 24–4	24.0 ±5%	0–4	30.0	3.0 MΩ + 0.5 μH	2.0	213.00(2)	23	10.4
BKF 28–4	28.0 ±5%	0–4	35.3	4.5 MΩ + 0.5 μH	2.2	213.00(2)	23	10.4
BKF 36–3	36.0 ±5%	0–3	45.7	6.0 MΩ + 0.5 μH	2.0	213.00(2)	23	10.4
BKF 48–2.5	48.0 ±5%	0–2.5	59.5	10.0 MΩ + 0.5 μH	2.2	213.00(2)	23	10.4

(2) Uncased. To order a cased BKF II model, add suffix "–C" to model number and $15.00 to price.

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE
SOURCE: 105–125/210–250V a-c		<0.05%
LOAD: No load – full load		<0.05% or 2.5 mV(3)
TIME: 8-hours [drift]		<0.05%
TEMPERATURE: Per °C		<0.05%
UNPROGRAMMED OUTPUT DEVIATION: (4) (Ripple and noise)	rms	<0.5 mV
	p-p (5)	<3 mV

(3) Whichever is greater except 5 mV for Model BKF 1.25–7.
(4) One terminal grounded, or connected so that common-mode current does not flow through load.
(5) 20 Hz to 10 MHz.

INPUT: 105–125V a-c or 210–250V a-c [selected], 50–440 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING (no derating):
Group I *Cased Only:* 0°C to +55°C.
Group II *Uncased:* 0°C to +65°C.
Cased: 0°C to +55°C.

TEMPERATURE, STORAGE: -20°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts [d-c or peak] can be connected between either output terminal and the case.

CONTROL: Output is controlled by a built-in multiturn rheostat trimmer. There is no provision for external programming.

VOLTAGE RECOVERY (for step load current): <50 μseconds.

OVERLOAD CURRENT CUTOFF: Modified adjustable re-entrant. Cutoff point is adjustable from 10% to 110% of the maximum current rating.

REMOTE ERROR SENSING: Compensates for up to 0.5 volt drop per output lead.

OVERSHOOT (turn-on/off): None.

SERIES/PARALLEL: BKF Modules can be series-connected for additional voltage up to their rated isolation voltage. There is no provision for parallel operation.

OVERVOLTAGE PROTECTOR: All models are equipped with a built-in crowbar whose trip point is tabulated for each model [turn-off input power to reset]. Triggering time is <10 μseconds.

Optional Adjustable Crowbar Trip: Add suffix "–V" to the model number for an installed trimmer which will adjust the crowbar trip from -10% E_o nominal to +20% E_o nominal. Add $15.00 to the price of the model. [Models with (1) have the adjustable trip-point control built in.]

TERMINALS: All input, output and sensing connections are made via a single multiterminal barrier-strip.

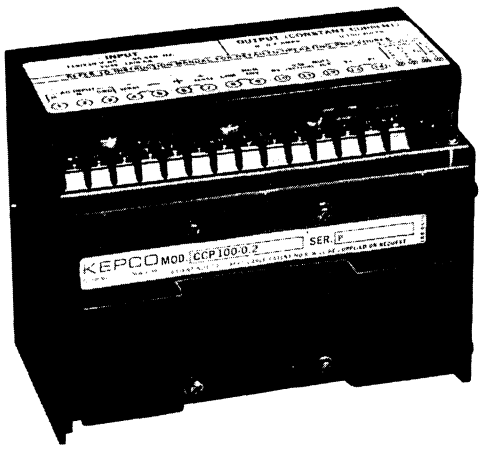
DIMENSIONS: Group I 3 1/32"H x 6 3/8"W x 4 15/16"D
Group II (Cased) 6 15/16"H x 5"W x 11 3/16"D

FINISH & CASES: Group I: Cased only, finish is black anodizing. Group II: Specify a cased model by appending the suffix "–C" to the model number and $15.00 to the price. Case finished in royal blue epoxy.

MOUNTING: For rack mount use adapters:
Group I RA 26–1 mounts single module; RA 27–2 mounts two modules; RA 28–4 mounts four modules.
Group II RA 25–1 mounts single module; RA 8–2 mounts two modules; RA 9–3 mounts three modules.

Data and prices subject to change without notice.

KEPCO
CCP
current stabilized modular
POWER SUPPLIES



The Kepco CCP modules are current controllers with a built-in current sensing resistor and adjustable voltage limiter. They employ a monolithic I-C amplifier driving a self-cooled NPN series transistor regulator. Capacitorless output filtering insures rapid recovery from switching or load transients. The output current ranges from true zero to 100%, linearly controlled by an external rheostat.

MODEL	d-c OUTPUT RANGE AMPS	VOLTS	OUTPUT IMPEDANCE CURRENT MODE d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
CCP 7–2	0–2	0–7	35 kΩ + 8 μF	$158.00	6	2.7
CCP 15–1.5	0–1.5	0–15	100 kΩ + 3 μF	158.00	6	2.7
CCP 21–1	0–1	0–21	200 kΩ + 2 μF	158.00	6	2.7
CCP 40–0.5	0–0.5	0–40	800 kΩ + 1 μF	158.00	6	2.7
CCP 72–0.3	0–0.3	0–72	2.4 MΩ + 0.6 μF	158.00	6	2.7
CCP 100–0.2	0–0.2	0–100	10 MΩ + 0.4 μF	158.00	6	2.7

all KEPCO products are backed by a firm 5-Year Warranty

INFLUENCE QUANTITY		OUTPUT EFFECTS CURRENT MODE
SOURCE: 105–125/210–250V a-c		<0.0005% or 0.2 μA[1]
LOAD: 10% load – 100% load		<0.005% or 2 μA[1]
TIME: 8-hours [drift]		<0.02% or 2 μA[1]
TEMPERATURE: Per °C		<0.01%
UNPROGRAMMED OUTPUT DEVIATION:[2] (Ripple and noise)	rms	<0.02% of I_o max.
	p-p[3]	<0.1% of I_o max.

[1] Whichever is greater.
[2] One terminal grounded or connected so that the common-mode current does not flow through the load or through the sensing resistor.
[3] 20 Hz to 10 MHz.

INPUT: 105–125V a-c or 210–250V a-c [selected], 50–440 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING: -20°C to +65°C.

TEMPERATURE, STORAGE: -40°C to +85°C.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts [d-c or peak] can be connected between either output terminal and the case.

CONTROLS: Voltage limit: 0.1V to 110% E_o max.
Backup current limit: 10%–110% I_o max.

PROGRAMMING: CCP modules are fully programmable by resistance or external voltage signals. The internal current sample is 1 volt at I_o max.; the control current is [approximately] 1 milliampere. A precision external rheostat 0–1000 ohms, therefore, will control output 0–I_o max. See *Options* for the availability of a built-in current control trimmer, calibration control, and offset voltage nulling control [for precision operational programming].

MAXIMUM CAPACITIVE LOADING: 0.001 microfarads.

CURRENT RECOVERY (for step load voltage): The current recovery is given by the ratio of current setting to the tabulated output capacitance.

VOLTAGE LIMITING: Built-in adjustable limiter can be set anywhere in the range from 0.1 volt to 110% of the rated maximum voltage with provision for remote control.

REMOTE ERROR SENSING (provided for voltage limiter): Compensates for up to 0.5V per output lead.

SERIES/PARALLEL: Parallel operation of current sources may be made without restriction. Series operation is through the use of master/slave interconnection.

TERMINALS: All input, output and control connections are made via a multiterminal barrier-strip.

DIMENSIONS: 3 15/32"H x 6 3/8"W x 4 15/16"D

FINISH: Black anodized aluminum.

MOUNTING: Rack mount with adapters RA 26–1, RA 27–2 RA 28–4.

OPTIONS: [Add suffix to the model number.]

"–R" CONTROL CURRENT ADJUSTMENT: A ±10% trimmer provides for calibration of the current programming function (sets the control current to 1 mA, exactly). Add $10.00 to price.

"–E" OFFSET VOLTAGE NULLING (for operational programming): Zeros the fixed part of the control amplifier's voltage offset. Add $10.00 to price.

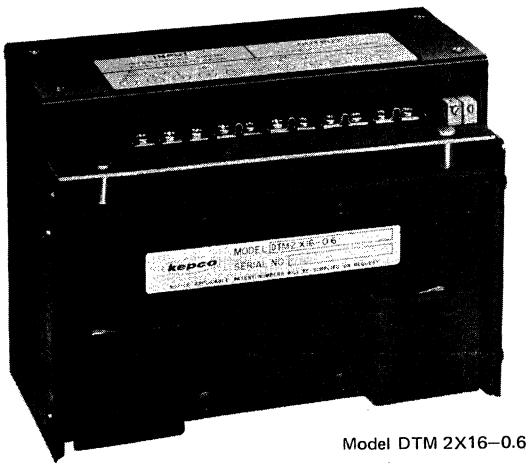
"–P" OUTPUT CURRENT CONTROL: A 0–1000 ohm rheostat adjusts the output current through rated range. Add $25.00 to price.

"–VM" REMOTE VOLTAGE MONITOR: A voltage repeater provides a reproduction of the load voltage to a terminal on the barrier-strip, load 0–1 mA without affecting the load current. Add $15.00 to price.

Data and prices subject to change without notice.

KEPCO DTM *modular* POWER SUPPLIES

The DTM models provide a tracked pair of d-c voltages for operating circuit modules, amplifiers and devices requiring matched plus and minus voltages. The circuit consists of a pair of regulators sharing a common reference and driving separate series regulators.



Model DTM 2X16–0.6

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	PRICE	SHIP WGT. lbs.	kg.
DTM 2X16–0.6	0 to +16	0 to +0.6	13 mΩ + 1 μH	$129.00	5	2.3
	0 to −16	0 to −0.6				
DTM 2X28–0.4	0 to +28	0 to +0.4	35 mΩ + 1 μH	153.00	5	2.3
	0 to −28	0 to −0.4				
DTM 2X40–0.25	0 to +40	0 to +0.25	80 mΩ + 1 μH	179.00	5	2.3
	0 to −40	0 to −0.25				

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INFLUENCE QUANTITY		VOLTAGE STABILIZER OUTPUT EFFECTS VOLTAGE No. 1 (1)	VOLTAGE No. 2
SOURCE: 105–125/210–250V a-c		<0.05% or 2 mV (2)	<0.05% or 2 mV (2)
LOAD: No load – full load		<0.05% or 2 mV (2)	<0.05% or 2 mV (2)
TIME: 8 hours [drift]		<0.05% or 4 mV (2)	<0.05% or 4 mV (2)
TEMPERATURE: Per °C		<0.05%	<0.05%
UNPROGRAMMED OUTPUT DEVIATION: (3) (Ripple and noise)	rms	<0.5 mV	<0.5 mV
	p-p (4)	<2.5 mV	<2.5 mV

(1) Voltage No. 1 is the positive output with respect to common, which serves as the master.
(2) Voltage No. 2 tracks Voltage No. 1. Whichever is greater.
(3) One terminal grounded or connected so that common-mode current does not flow through load or (in current mode) through a sensing resistor.
(4) 20 Hz to 10 MHz.

INPUT: 105–125V a-c or 210–250V a-c [selected], single phase, 0.5 amperes at 125V a-c, 50–440 Hz.

TEMPERATURE, AMBIENT OPERATING: −20°C to +71°C.

TEMPERATURE, STORAGE: −40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts [d-c or peak] can be connected between either output terminal and the case.

CONTROL/PROGRAMMING: Output is controlled by a single built-in, multiturn rheostat trimmer which adjusts both output voltages simultaneously. The minus output tracks the plus output in any ratio. They can be set to produce identical voltages, e.g., 0 to +15 and 0 to −15 volts or unequal voltages, e.g., 0 to +12 and 0 to −6 volts. Remote control may be exercised over both voltages by means of a simple external rheostat controlling the master [+] output at ≅1000 ohms per volt, not calibrated.

TRACKING: Adjustable to ±100 mV from 1V to rated maximum.

VOLTAGE RECOVERY (for step load current): <50 μseconds.

CURRENT LIMITING: Each output individually protected by independently adjusted current limiter. Range: 10% to 110% of I_o maximum. The two outputs track with *plus out* serving as master. If the plus output goes into current limiting, the negative output will follow.

REMOTE ERROR SENSING: Compensates for up to 0.5 volts drop per output lead [3 wire].

OVERSHOOT (turn-on/off): No overshoot above a 25% voltage setting. For settings below 25% of E_o max., overshoot will be negligible when preloaded to 10% minimum.

SERIES/PARALLEL: Plus and minus outputs share a common terminal. They may be loaded individually or in series; no provision for parallel operation.

TERMINALS: Input and output and control connections are made to a barrier-strip.

DIMENSIONS: 3 15/32"H x 6 3/8"W x 4 15/16"D

FINISH: Black anodized aluminum.

MOUNTING: Rack mount with adapters RA 26–1, RA 27–2 or RA 28–4 for one, two or four units respectively.

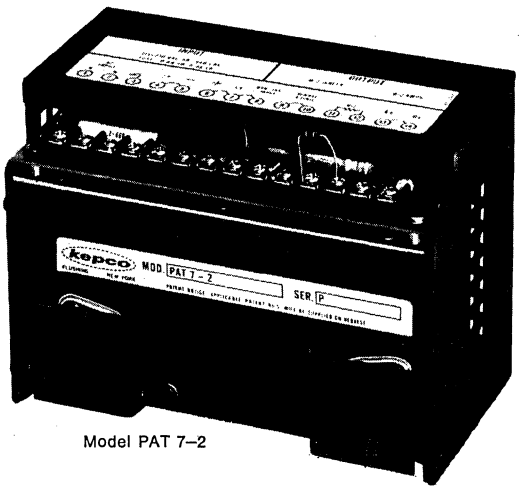
Data and prices subject to change without notice.

KEPCO PAT

MODULAR

POWER SUPPLIES

These operationally programmable power modules offer a single high-gain control channel for voltage or current stabilization, backed up by an adjustable overcurrent limiter. An I-C front-end contributes to very low offsets for accurate tracking of programming instructions.



Model PAT 7–2

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE (1) d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
PAT 7–2	0–7	0–2	0.2 mΩ + 1 μH	25 kΩ + 2.9 kμF	$135.00	6	2.7
PAT 15–1.5	0–15	0–1.5	0.5 mΩ + 1 μH	33 kΩ + 2.0 kμF	135.00	6	2.7
PAT 21–1	0–21	0–1	1 mΩ + 1 μH	50 kΩ + 1.4 kμF	135.00	6	2.7
PAT 40–0.5	0–40	0–0.5	4 mΩ + 1 μH	100 kΩ + 950 μF	135.00	6	2.7
PAT 72–0.3	0–72	0–0.3	12 mΩ + 1 μH	167 kΩ + 375 μF	135.00	6	2.7
PAT 100–0.2	0–100	0–0.2	25 mΩ + 1 μH	250 kΩ + 275 μF	135.00	6	2.7

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE (1)	OFFSET VOLTAGE ΔEio	OFFSET CURRENT Δiio	VOLTAGE REFERENCE (INTERNAL)
SOURCE: 105–125/210–250V a-c		<0.0005%	<0.005%	<10 μV	<2 nA	0.0001%
LOAD: No load – full load		<0.005% or 0.2 mV(2)	<0.01%	<200 μV	<5 nA	–
TIME: 8-hours (drift)		<0.01% or 1 mV(2)	<0.02%	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C		<0.01%(3)	<0.02%(3)	<20 μV	<5 nA	0.005%
UNPROGRAMMED OUTPUT DEVIATION:(4) (Ripple and noise)	rms	<0.1 mV	<0.02% of I_o max	–	–	–
	p-p(5)	<0.5 mV	<0.1% of I_o max	–	–	–

(1) External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.
(2) Whichever is greater.
(3) Typical temperature effect coefficients are: 0.005% per °C voltage mode; 0.01% per °C externally sensed current mode. See option "–T."
(4) One terminal grounded or connected so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.
(5) 20 Hz to 10 MHz.

INPUT: 105-125V a-c or 210-250V a-c (selected), 50-440 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING: Cased: −20°C to +71°C.

TEMPERATURE, STORAGE: −40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

PROGRAMMING: PAT is fully programmable by resistance or external voltage signals. Control current is 1 mA for 1000 ohms/V (option "–R" provides a calibration control). The positive terminal is common. *Note:* Programming resistance not supplied. For operational (amplifier) control, an offset voltage nulling control is available. See Option "–E".

OPEN LOOP d-c GAIN: $>0.5\times10^6$ volts per volt.

VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 0.005% or 2 mV of setting.

CURRENT LIMITING: Adjustable from 10% to 105% of rated full current with provision for remote control.

REMOTE ERROR SENSING: Compensates up to 0.5 volt drop per output lead.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.

SERIES/PARALLEL: Series operation to rated isolation; also master/slave capability. Current limiting design permits self-determined parallel load sharing.

TERMINALS: All input, output and control connections are made via a multi-terminal barrier strip.

DIMENSIONS: $3\frac{15}{32}$"H x $6\frac{3}{8}$"W x $4\frac{15}{16}$"D

FINISH: Black anodized aluminum.

MOUNTING: Rack mount with adapters RA 26-1, RA 27-2 or RA 28-4. *See Hardware section.*

OPTIONS: (add suffix to the model number).

"–R" CONTROL CURRENT ADJUSTMENT: ± 10% trimmer provides for programming calibration. Add $10.00 to price.

"–T" LOWER TEMPERATURE EFFECT COEFFICIENT: 0.005% per °C in voltage mode, 0.01% per °C in current mode. Add $30.00 to price.

"–E" OFFSET VOLTAGE NULLING: For operational programming. Zeros the fixed part of the control amplifier's voltage offset. Add $10.00 to price.

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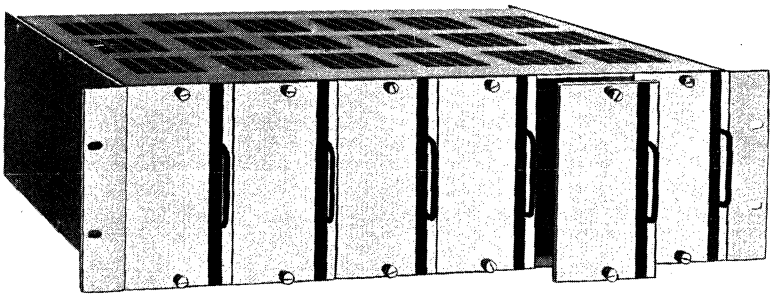
KEPCO PAX MODULAR POWER SUPPLIES



6 uncased modules mounted in RA 22-6 housing using BPA-22 slide adapters

PAX modules are low-cost, single-amplifier power supplies that can be used with voltage or current feedback. In the PAX design, a convection-cooled PNP series pass transistor is used; the negative output terminal is common to the signal input. The PAX models are thus the signal-complement of the PCX and OPS designs.

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE (2) d-c OHMS + SHUNT C	PRICE (1)	SHIP WGT. lbs.	kg.
PAX 7–1	0–7	0–1	4 mΩ + 1 μH	100 kΩ + 600 μF	$105.00	5	2.3
PAX 15–0.75	0–15	0–0.75	10 mΩ + 1 μH	130 kΩ + 400 μF	105.00	5	2.3
PAX 21–0.5	0–21	0–0.5	25 mΩ + 1 μH	200 kΩ + 625 μF	105.00	5	2.3
PAX 36–0.3	0–36	0–0.3	60 mΩ + 1 μH	330 kΩ + 200 μF	105.00	5	2.3
PAX 72–0.15	0–72	0–0.15	0.25 Ω + 1 μH	650 kΩ + 100 μF	105.00	5	2.3
PAX 100–0.1	0–100	0–0.1	0.5 Ω + 1 μH	1 MΩ + 140 μF	105.00	5	2.3

(1) For case, add Suffix "–C" to model number and $15.00 to price.

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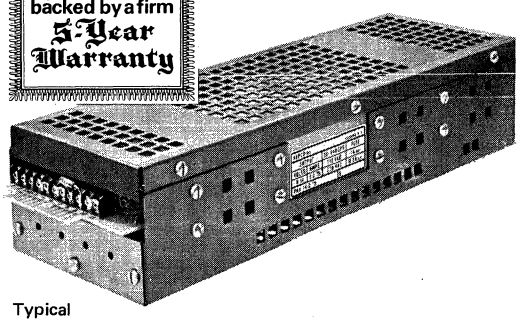

Typical Cased Module Model PAX 7–1C.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variations and sum the pertinent effects.

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE (2)
SOURCE: 105–125/210–250V a-c		<0.05% or 1 mV (3)	<0.1%
LOAD: No load – full load		<0.05% or 1 mV (3)	<0.1%
TIME: 8-hours [drift]		<0.05% or 3 mV (3)	<0.1% or 1 mA (3)
TEMPERATURE: Per °C		<0.05%	<0.1%
UNPROGRAMMED OUTPUT DEVIATION: (4) (Ripple and noise)	rms	<0.25 mV	<0.1% of I_o max
	p-p (5)	<1.25 mV	<0.5% of I_o max

(2) External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.

(3) Whichever is greater.

(4) One terminal grounded or connected so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.

(5) 20 Hz to 10 MHz.

INPUT: 105-125V a-c or 210-250V a-c (selected), 50-440 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING: –20°C to + 50°C

TEMPERATURE, STORAGE: –40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

PROGRAMMING: PAX is programmable by resistance or external voltage signals. Control current is ≅ 1 mA for 1000 ohms/V (option "–R" provides a calibration control). The negative terminal is common
Note: Programming resistance not supplied.

VOLTAGE RECOVERY (for step load current): <50 μseconds.

CURRENT LIMITING: Adjustable from 25% to 150% of rated full current.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.

SERIES/PARALLEL: Series operation to rated isolation; also master/slave capability. Current limiting design permits self-determined parallel load sharing.

TERMINALS: All input, output and control connections are made via a multi-terminal barrier strip and printed circuit connector.

FINISH: Blue anodized aluminum.

DIMENSIONS: *Uncased:* 2½"H x 3⅞"W x 12⅞"D.
Cased: (Suffix C) 2⅞"H x 4⅛"W x 13⅜"D.

MOUNTING: Cased modules may be racked with adapters RA 12-1, RA 13-4 or RA 11-16. Uncased modules with BPA-22 adapter mount in housings CA-3, CA-4, CA-5 or RA 22-6 and RA-32. See *Hardware* section.

OPTIONS: (add suffix to the model number).

"–R" CONTROL CURRENT ADJUSTMENT: ± 10% trimmer provides for programming calibration. Add $10.00 to price.

"–C" CASED ENCLOSURE: fully encloses the power supply. Add $15.00 to price (do not use with the BPA-22).

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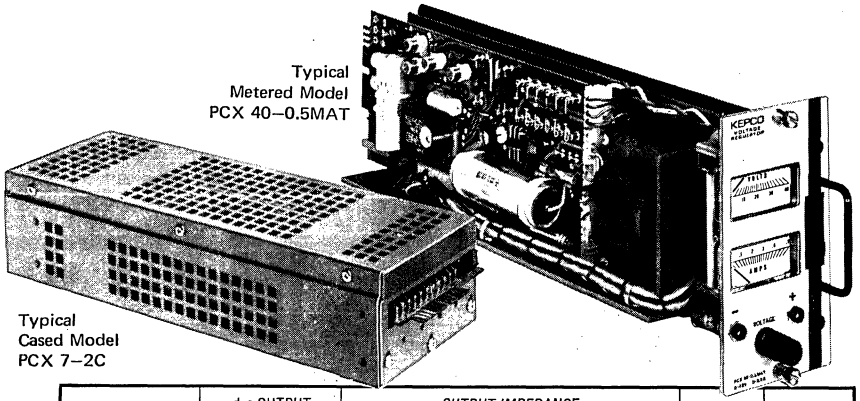
KEPCO PCX MODULAR POWER SUPPLIES



The PCX group of voltage regulators are available in two forms—as programmable modules for OEM's or (with the suffix "MAT") as metered plug-ins with a built-in, 10-turn voltage control. The regulator is a self-cooled series NPN transistor driven by Kepco's monolithic linear I-C amplifier and protected by adjustable current limiting. The regulator will control current when equipped with an external pair of sensing and feedback resistors.

FOR OVERVOLTAGE CROWBARS SEE ACCESSORIES PAGE 47

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MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE (2) d-c OHMS + SHUNT C	PRICE (1)	SHIP WGT. lbs.	kg.
PCX 7–2	0–7	0–2	0.2 mΩ + 1 μH	35 kΩ + 500 μF	$125.00	5	2.3
PCX 15–1.5	0–15	0–1.5	0.5 mΩ + 1 μH	100 kΩ + 225 μF	125.00	5	2.3
PCX 21–1	0–21	0–1	1 mΩ + 1 μH	200 kΩ + 150 μF	125.00	5	2.3
PCX 40–0.5	0–40	0–0.5	4 mΩ + 1 μH	800 kΩ + 100 μF	125.00	5	2.3
PCX 72–0.3	0–72	0–0.3	12 mΩ + 1 μH	2.4 MΩ + 50 μF	125.00	5	2.3
PCX 100–0.2	0–100	0–0.2	25 mΩ + 1 μH	5 MΩ + 40 μF	125.00	5	2.3

(1) For case, add Suffix "–C" to model number and $15.00 to price.

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE (2) d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
PCX 7–2MAT	0–7	0–2	0.2 mΩ + 1 μH	35 kΩ + 500 μF	$189.00	8	3.6
PCX 15–1.5MAT	0–15	0–1.5	0.5 mΩ + 1 μH	100 kΩ + 225 μF	189.00	8	3.6
PCX 21–1MAT	0–21	0–1	1 mΩ + 1 μH	200 kΩ + 150 μF	189.00	8	3.6
PCX 40–0.5MAT	0–40	0–0.5	4 mΩ + 1 μH	800 kΩ + 100 μF	189.00	8	3.6
PCX 72–0.3MAT	0–72	0–0.3	12 mΩ + 1 μH	2.4 MΩ + 50 μF	189.00	8	3.6
PCX 100–0.2MAT	0–100	0–0.2	25 mΩ + 1 μH	5 MΩ + 40 μF	189.00	8	3.6

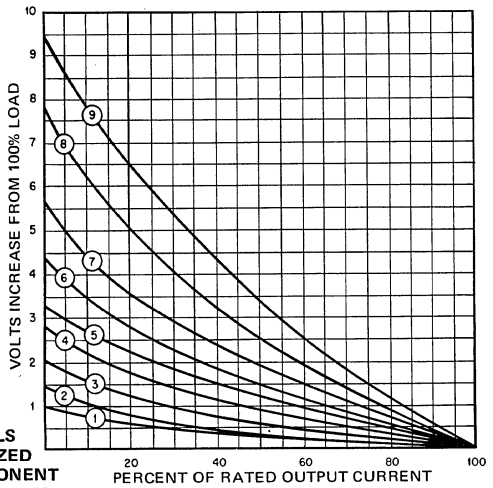
INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE	AMPLIFIER OFFSETS VOLTAGE ΔEio	CURRENT Δiio	VOLTAGE REFERENCE (INTERNAL)
SOURCE: 105–125/210–250V a-c		<0.0005%	<0.005% (2)	<10 μV	<2 nA	0.0001%
LOAD: No load – full load		<0.005% or 0.2 mV (3)	<0.01% (2)	<200 μV	<5 nA	–
TIME: 8-hours [drift]		<0.01% or 1 mV (2)	<0.02% (2)	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C		<0.01% (4)	<0.02% (2) (4)	<20 μV	<5 nA	0.005%
UNPROGRAMMED OUTPUT DEVIATION: (5) (Ripple and noise)	rms	<0.1 mV	<0.02% of I_o max.	–	–	–
	p-p (6)	<3 mV	<0.2% of I_o max.	–	–	–

(2) External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.
(3) Whichever is greater.
(4) Typical temperature effect coefficients are: 0.005% per °C voltage mode; 0.01% per °C externally sensed current mode. See option "–T."
(5) One terminal grounded or connected so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.
(6) 20 Hz to 10 MHz.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz, 1φ.
TEMPERATURE, AMBIENT OPERATING: Cased: −20°C to +65°C. Uncased: −20°C to +71°C. (no derating)
TEMPERATURE: STORAGE: −40°C to +85°C.
ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.
PROGRAMMING: PCX is fully programmable by resistance or external voltage signals. Control current is ≅1 mA for 1000 ohms/V (option "–R" provides a calibration control). The positive terminal is common. For operational (amplifier) control, an offset voltage nulling control is available, see Option "–E." Suffix "MAT" models have 10-turn voltage control built-in. Resolution: 0.05%.
OPEN LOOP d-c GAIN: $>0.5\times10^6$ volts per volt.
VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 0.005% or 2 mV of setting.
CURRENT LIMITING: Adjustable from 10% to 105% of the rated full current.
REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.
OVERSHOOT: (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.
SERIES/PARALLEL: Series operation to rated isolation; also master/slave capability. Current limiting design permits self-determined parallel load sharing.
TERMINALS: All input, output and control connections are made via a multi-terminal barrier strip and printed circuit connector.
COOLING: Convection.
DIMENSIONS: *Uncased:* 2½"H x 3 13/16"W x 12 13/16"D.
Cased: (Suffix C) 2 11/16"H x 4⅛"W x 13 3/16"D.
PCX-MAT: 5 23/32"H x 2 23/32" W x 15" D
FINISH: Blue anodized aluminum.
CASES/MOUNTING: Model number without suffix specifies an uncased open model. Add suffix "C" and $15.00 to price for wraparound case — or order Case CA-1 separately. Cased models can be rack mounted on adapters RA 12-1, RA 13-4 or RA 11-6. Uncased models can be used with BPA-22 slide adapter for plug-in mounting. These fit interchangeably with metered "MAT" — option models in Cases CA-3, CA-4, CA-5, RA 22-6 or RA-32. *See Hardware section.*
OPTIONS: (add suffix to the model number).
"–MAT" This option provides for a fully metered plug-in package with separate voltmeter and ammeter and a 10-turn output voltage control. Furnished *uncased* for mounting in single unit case CA-3, dual case CA-4 or triple case CA-5. May be rack mounted in six-unit housing Model RA-22-6, or RA-32 see *Hardware Section.*
"–R" CONTROL CURRENT ADJUSTMENT: ± 10% trimmer provides for programming calibration. Add $10.00 to price.
"–T" LOWER TEMPERATURE COEFFICIENT: 0.005% per °C in voltage mode, 0.01% per °C in current mode. Add $30.00 to price.
"–E" OFFSET VOLTAGE NULLING: For operational programming. Zero the fixed part of the control amplifier's voltage offset. Add $10.00 to price.

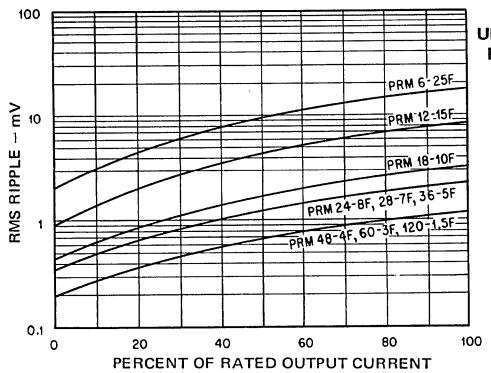
KEPCO
PRM
MODULAR
POWER SUPPLIES

The Kepco PRM voltage regulated modules are simple, reliable, efficient, fixed output sources. The design is based on a ferroresonant power transformer called Flux-O-Tran® which provides both regulating and overload current limiting. The extra-filtered models (suffix F) have a Pi section LC filter, reducing their ripple to about a tenth that of the single section capacitor-filtered models. The *dual* output models have two independent d-c circuits that may be used in series or in parallel or separately. Size "D" models feature an adjustable output tap.

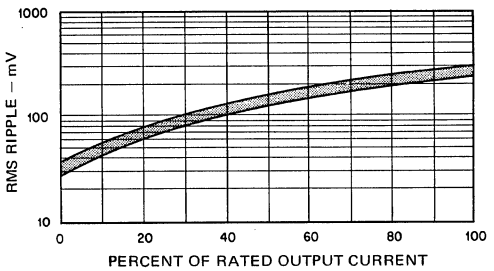


TYPICAL LOAD EFFECT CURVE FOR ALL MODELS (EXCEPT SIZE "D")

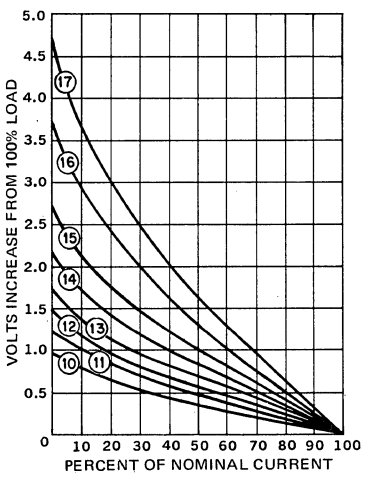
ALL PRM MODELS ARE UL RECOGNIZED UNDER THEIR COMPONENT RECOGNITION PROGRAM UL 478 and UL 114.



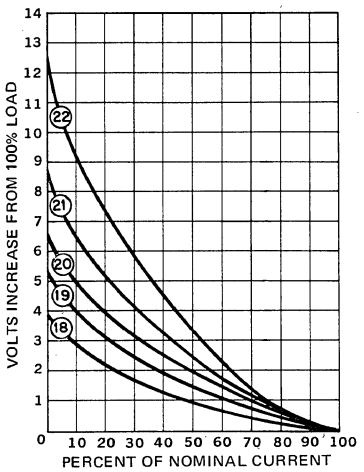
TYPICAL OUTPUT RIPPLE CURVES FOR EXTRA-FILTERED MODELS, PLOTTED AS A FUNCTION OF LOAD CURRENT



TYPICAL OUTPUT RIPPLE CURVES FOR SIZES A B and C(duals), PLOTTED AS A FUNCTION OF LOAD CURRENT



TYPICAL LOAD EFFECT CURVES FOR THE SIZE "D" PRM MODELS



This tabluation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variations and sum the pertinent effects.

INFLUENCE QUANTITY	OUTPUT EFFECTS				
	SIZE A 180 SERIES	SIZE B 120 SERIES	SIZE C—180F Extra-Filter	SIZE C—300 Dual — Output	SIZE D 60 SERIES
SOURCE: 100—130V a-c	±1%(1)	±1%(1)	±1%(1)	±1%(1)	±1%(1)
LOAD: No load — full load	See charts for maximum value; the graphs show typical performance.				
TIME: 8-hour [drift]	1% or 0.1V(2)	1% or 0.1V(2)	1% or 0.1V(2)	1% or 0.1V(2)	1% or 0.1V(2)
TEMPERATURE: Per °C	0.05%	0.05%	0.05%	0.05%	0.05%
RIPPLE: [rms]	See charts for maximum value; the graphs show typical performance.				
INPUT POWER: [at 115V a-c]	3A [280 W]	2A [190 W]	3A [280 W]	5A [465 W]	1.1A [100 W]

(1) For ±15V a-c source variation at full load. The source effect increases to ±1.5% at no load.
(2) Whichever is greater.

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INPUT: 115V a-c, ±15V a-c, 60 Hz ±5% single phase.

Overseas Models: For 50 Hz ±5%, specify suffix "–50." Inputs (selectable) are: 104 ±13.5V a-c, 115 ±15V a-c, 208 ±27V a-c or 230 ±30V a-c. Units delivered wired to the 230V a-c tap. Output current rating is decreased 20% in the 50 Hz version. Add $15.00 to the unit price.

NOTE: Input frequency variations produce an approximately equal percentage output voltage change.

TEMPERATURE, AMBIENT OPERATING: –20°C to +55°C.

TEMPERATURE, STORAGE: –40°C to +85°C.

COOLING: Convection.

OUTPUT IMPEDANCE: 1 kHz to 10 kHz: 0.05 ohms, 10 kHz to 100 kHz: 0.05 ohms + 0.5 microhenries. Below 1000 Hz, the impedance is a function of load current and may be derived from the slope of the load regulation curve $\Delta E/\Delta I$.

VOLTAGE RECOVERY (step load current, 50–100%): <400 ms.

OVERLOAD PROTECTION: Current limiting transformer restricts short circuit current to safe value. A thermal circuit breaker is employed in *dual* models.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 600 volts (d-c or peak) can be connected between either output terminal and the case (or between the outputs of dual models.)

SERIES/PARALLEL OPERATION: Identical models, or halves of a dual supply can be paralleled for approximately double current (allow for 10% imbalance). Series operation to rated isolation.

ACCESSORIES: Various rack adapters available, see hardware page. *Cases:* Size A uses CA-200; Size C uses CA-300. Sizes B and D have non-removable integral enclosures. To order a fully cased model in sizes A and C, add a suffix letter "C" to the model number.

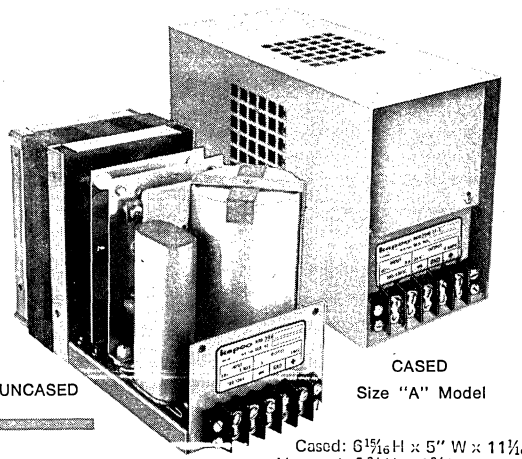
FINISH: *Cases:* royal blue.

DIMENSIONS: See model listings below.

SIZE "A" — 180 SERIES

MODEL	d-c OUTPUT (3) VOLTS	AMPS	LOAD EFFECT (1) VOLTS INCREASE 100%–50% LOAD	100%–25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS VOLTS	PRICE (2)	SHIP WGT. lbs.	kg.
PRM 5–25	5.2	0–25	0.5	0.8	1	0.4	$134.00	24	10.9
PRM 6–25	6.3	0–25	0.5	0.8	1	0.4	134.00	24	10.9
PRM 12–15	12	0–15	0.6	1.0	1	0.4	134.00	24	10.9
PRM 18–10	18	0–10	0.6	1.0	2	0.3	134.00	24	10.9
PRM 24–8	24	0–8	0.7	1.2	2	0.3	134.00	24	10.9
PRM 28–7	28	0–7	0.7	1.2	2	0.4	134.00	24	10.9
PRM 36–5	36	0–5	0.8	1.3	3	0.4	134.00	24	10.9
PRM 48–4	48	0–4	1.0	1.8	4	0.3	134.00	24	10.9
PRM 60–3	60	0–3	1.1	1.9	5	0.3	134.00	24	10.9
PRM 120–1.5	120	0–1.5	2.2	3.6	7	0.3	134.00	24	10.9

(1) Measured at 115V a-c source.
(2) For case, add Suffix "C" to model number and $15.00 to price.
(3) Accuracy ±2% or 0.25V, voltage set at 115V a-c, full load and 30°C. The initial (cold) output is 1% higher.

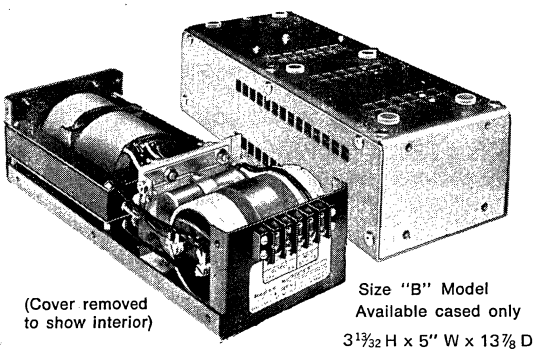


Size "A" Model
Cased: 6 15/16 H x 5" W x 11 1/16 D
Uncased: 6 3/4 H x 4 3/4 W x 10 15/16 D

SIZE "B" — 120 SERIES

MODEL	d-c OUTPUT (3) VOLTS	AMPS	LOAD EFFECT (1) VOLTS INCREASE 100%–50% LOAD	100%–25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS VOLTS	PRICE (2)	SHIP WGT. lbs.	kg.
PRM 5–15	5.2	0–15	0.5	0.8	1	0.4	$112.00	17	7.6
PRM 6–15	6.3	0–15	0.5	0.8	1	0.4	112.00	17	7.6
PRM 12–10	12	0–10	0.6	1.0	2	0.4	112.00	17	7.6
PRM 18–6.7	18	0–6.7	0.8	1.3	3	0.3	112.00	17	7.6
PRM 24–5	24	0–5	1.0	1.7	3	0.3	112.00	17	7.6
PRM 28–4.3	28	0–4.3	1.2	2.0	4	0.3	112.00	17	7.6
PRM 36–3.3	36	0–3.3	1.5	2.4	5	0.3	112.00	17	7.6
PRM 48–2.5	48	0–2.5	2.0	3.4	6	0.3	112.00	17	7.6
PRM 60–2	60	0–2	2.3	3.8	7	0.3	112.00	17	7.6
PRM 120–1	120	0–1	4.6	7.6	9	0.3	112.00	17	7.6

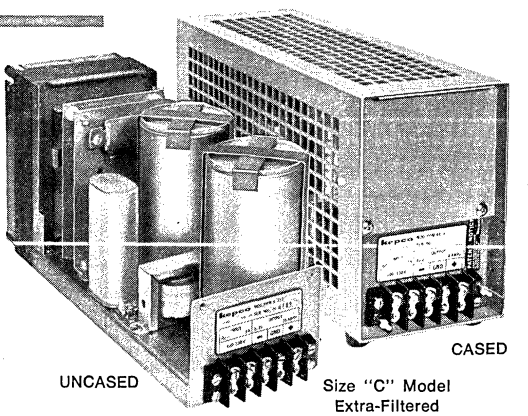
(1) Measured at 115V a-c source.
(2) Available cased only. Price includes case.
(3) Accuracy ±2% or 0.25V, voltage set at 115V a-c, full load and 30°C. The initial (cold) output is 1% higher.


(Cover removed to show interior)
Size "B" Model
Available cased only
3 13/32 H x 5" W x 13 7/8 D

SIZE "C" — 180F SERIES (Extra-Filtered)

MODEL	d-c OUTPUT (3) VOLTS	AMPS	LOAD EFFECT (1) VOLTS INCREASE 100%–50% LOAD	100%–25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS VOLTS	PRICE (2)	SHIP WGT. lbs.	kg.
PRM 5–25F	5.2	0–25	0.7	1.2	1	0.04	$191.00	30	13.5
PRM 6–25F	6.3	0–25	0.7	1.2	1	0.04	191.00	30	13.5
PRM 12–15F	12	0–15	0.9	1.4	2	0.02	191.00	30	13.5
PRM 18–10F	18	0–10	0.9	1.5	3	0.01	191.00	30	13.5
PRM 24–8F	24	0–8	1.2	2.0	3	0.005	191.00	30	13.5
PRM 28–7F	28	0–7	1.3	2.1	3	0.005	191.00	30	13.5
PRM 36–5F	36	0–5	1.5	2.4	4	0.005	191.00	30	13.5
PRM 48–4F	48	0–4	1.7	2.9	5	0.003	191.00	30	13.5
PRM 60–3F	60	0–3	2.3	3.6	6	0.003	191.00	30	13.5
PRM 120–1.5F	120	0–1.5	3.8	6.8	8	0.003	191.00	30	13.5

(1) Measured at 115V a-c source.
(2) For case, add suffix "–C" to model number and $15.00 to price.
(3) Accuracy ±2% or 0.25V, voltage set at 115V a-c, full load and 30°C. The initial (cold) output is 1% higher. Allow for extra 2% filter drop at full load.



Size "C" Model
Extra-Filtered
Cased: 6 15/16"H x 5 "W x 15 3/8"D
Uncased: 6 3/4"H x 4 3/4"W x 15 1/4"D

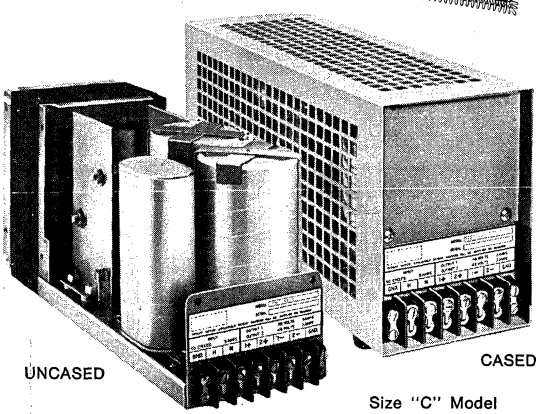
KEPCO
MODULAR POWER SUPPLIES

SIZE "C" — 300 SERIES (Dual Output)

MODEL	d-c OUTPUT (3) VOLTS	AMPS	LOAD EFFECT (1) VOLTS INCREASE 100%—50% LOAD	100%—25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS VOLTS	PRICE (2)	SHIP WGT. lbs.	kg.
PRM 2X4.5—20	4.5 4.5	0—20 0—20	0.5	0.7	1	0.3	$211.00	38	17.3
PRM 2X5—20	5.2 5.2	0—20 0—20	0.5	0.7	1	0.3	211.00	38	17.3
PRM 2X6—20	6.3 6.3	0—20 0—20	0.5	0.7	1	0.3	211.00	38	17.3
PRM 2X12—12	12 12	0—12 0—12	0.5	0.7	1	0.3	211.00	38	17.3
PRM 2X15—10	15 15	0—10 0—10	0.5	1.0	1	0.3	211.00	38	17.3
PRM 2X18—8	18 18	0—8 0—8	0.6	1.6	1	0.3	211.00	38	17.3
PRM 2X24—6	24 24	0—6 0—6	0.6	1.0	2	0.3	211.00	38	17.3
PRM 2X28—5	28 28	0—5 0—5	0.7	1.2	2	0.3	211.00	38	17.3
PRM 2X36—4	36 36	0—4 0—4	0.7	1.2	3	0.3	211.00	38	17.3
PRM 2X48—3	48 48	0—3 0—3	0.8	1.4	3	0.3	211.00	38	17.3
PRM 2X60—2.5	60 60	0—2.5 0—2.5	1.0	1.7	3	0.3	211.00	38	17.3

(1) Measured at 115V a-c source.
(2) For case, add Suffix "C" to model number and $15.00 to price.
(3) Accuracy ±2% or 0.25V, voltage set at 115V a-c, full load and 30°C. The initial (cold) output is 1% higher.

all KEPCO products are backed by a firm 5-Year Warranty

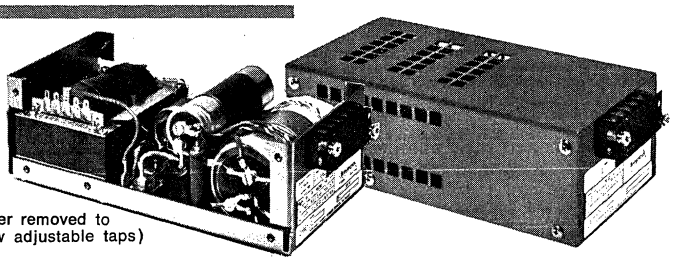


Size "C" Model
Dual Output

Cased: 6 15/16 H x 5" W x 15 3/8 D
Uncased: 6 3/4 H x 4 3/4 W x 15 1/4 D

SIZE "D" — 60 SERIES

Available cased only
3 13/32 H x 5" W x 10 7/8 D



(Cover removed to show adjustable taps)

The size D, Series 60 PRM modules are equipped with an adjustable tap arrangement, selecting two increments of voltage above the nominal output and two increments of voltage below the nominal output. In the table of voltages, the nominal (center) tap is indicated by the bold face type. The table of currents has a corresponding bold face column showing the current rating at the nominal voltage. The two adjacent columns on either side correspond to the respective voltage tap increments. The specifications are computed for the nominal (center) tap.

MODEL	VOLTS (3) −B	−A	NOM	+A	+B	AMPS −B	−A	NOM	+A	+B	LOAD EFFECT (1) VOLTS INCREASE 100%—50% LOAD	100%—25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS %	PRICE (2)	SHIP WGT. lbs.	kg.
PRM 5—10	4.2	4.6	**5.0**	5.4	5.8	12.0	11.0	**10.0**	9.3	8.6	0.5	0.8	10	0.50	$96.00	11	5.0
PRM 6.3—8	5.5	5.9	**6.3**	6.7	7.1	9.1	8.5	**8.0**	7.5	7.1	0.5	0.8	10	0.50	96.00	11	5.0
PRM 8—7	7.2	7.6	**8.0**	8.4	8.8	7.8	7.5	**7.0**	6.7	6.4	0.6	0.9	10	0.33	96.00	11	5.0
PRM 10—6	8.4	9.2	**10.0**	10.8	11.6	7.1	6.5	**6.0**	5.6	5.2	0.7	1.0	11	0.33	96.00	11	5.0
PRM 12—5	10.4	11.2	**12.0**	12.8	13.6	5.7	5.4	**5.0**	4.7	4.5	0.8	1.2	12	0.33	96.00	11	5.0
PRM 15—4	13.4	14.2	**15.0**	15.8	16.6	4.5	4.2	**4.0**	3.8	3.6	0.9	1.3	13	0.33	91.00	11	5.0
PRM 18—3.3	16.4	17.2	**18.0**	18.8	19.6	3.6	3.5	**3.3**	3.2	3.1	1.0	1.5	14	0.33	91.00	11	5.0
PRM 21—2.9	17.9	19.4	**21.0**	22.6	24.2	3.4	3.1	**2.9**	2.7	2.6	1.1	1.7	14	0.33	91.00	11	5.0
PRM 26—2.3	22	24	**26**	28	30	2.7	2.5	**2.3**	2.1	2.0	1.3	2.1	15	0.33	91.00	11	5.0
PRM 36—1.7	32	34	**36**	38	40	1.9	1.8	**1.7**	1.6	1.5	1.7	2.7	16	0.33	91.00	11	5.0
PRM 48—1.25	42	45	**48**	51	54	1.43	1.33	**1.25**	1.18	1.11	2.1	3.4	17	0.33	91.00	11	5.0
PRM 60—1	52	56	**60**	64	68	1.15	1.07	**1.00**	0.94	0.88	1.5	2.7	18	0.33	91.00	11	5.0
PRM 70—0.86	60	65	**70**	75	80	1.00	0.92	**0.86**	0.80	0.75	1.8	3.2	18	0.33	91.00	11	5.0
PRM 90—0.67	80	85	**90**	95	100	0.75	0.71	**0.67**	0.63	0.60	2.2	4.1	19	0.33	91.00	11	5.0
PRM 120—0.50	110	115	**120**	125	130	0.54	0.52	**0.50**	0.48	0.46	3.0	5.4	20	0.33	91.00	11	5.0
PRM 160—0.37	140	150	**160**	170	180	0.43	0.40	**0.37**	0.35	0.33	4.0	7.2	21	0.33	91.00	11	5.0
PRM 240—0.25	220	230	**240**	250	260	0.27	0.26	**0.25**	0.24	0.23	6.0	10.8	22	0.33	91.00	11	5.0

(1) Measured at 115V a-c source. (2) Available cased only. Price includes case.
(3) Accuracy ±2% or 0.25V, voltage set at 115V a-c, full load and 30°C. The initial (cold) output is 1% higher.

KEPCO

PTR
AUTOMATIC CROSSOVER

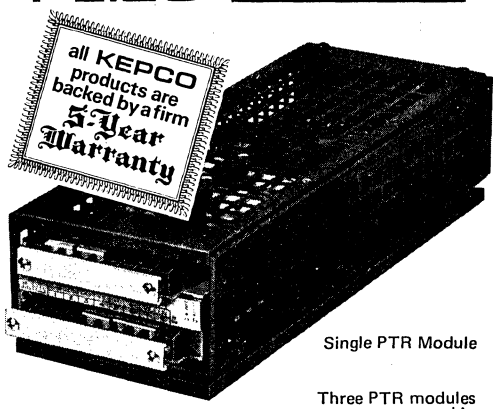
POWER SUPPLIES

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE d-c OHMS + SERIES L	CURRENT MODE(1) d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
PTR 7–5.5	0–7	0–5.5	64 μΩ + 0.5 μH	90 kΩ + 1250 μF	$225.00	11	5.0
PTR 15–3.3	0–15	0–3.3	225 μΩ + 0.5 μH	150 kΩ + 800 μF	225.00	11	5.0
PTR 21–2.5	0–21	0–2.5	420 μΩ + 0.5 μH	200 kΩ + 500 μF	225.00	11	5.0
PTR 40–1.4	0–40	0–1.4	1.4 mΩ + 0.5 μH	350 kΩ + 350 μF	225.00	11	5.0
PTR 72–0.8	0–72	0–0.8	4.5 mΩ + 0.5 μH	625 kΩ + 300 μF	225.00	11	5.0
PTR 100–0.6	0–100	0–0.6	10 mΩ + 0.5 μH	840 kΩ + 100 μF	225.00	11	5.0

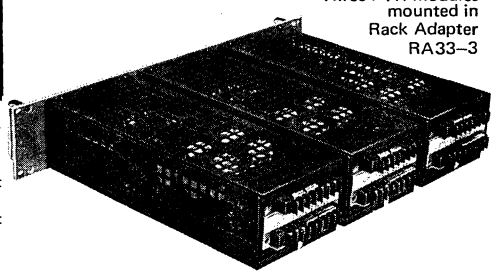
(1) d-c value is for external sensing and feedback; d-c value for internal sensing mode is E_o/5 mA.

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE(2) INTERNAL	EXTERNAL	AMPLIFIER OFFSETS ΔE_{io}	ΔI_{io}
SOURCE: 105–125/210–250V a-c		<0.001%	<0.005% or 25 μA(3)	<0.005%	<5 μV	<1 nA
LOAD: No load – full load		<0.005% or 0.1 mV(3)	<3.0 mA(4)	<0.01%	<100 μV	<5 nA
TIME: 8-hour [drift]		<0.01% or 0.2 mV(3)	<0.05% or 0.1 mA(3)	<0.02%	<20 μV	<1 nA
TEMPERATURE: Per °C(5)		<0.01%	<0.05% or 0.1 mA(3)	<0.02%	<20 μV	<2 nA
UNPROGRAMMED OUTPUT DEVIATION:(6) (Ripple and noise)	rms	<0.1 mV	<0.5 mA	<0.5 mA	–	–
	p-p(7)	<2.0 mV	<2.0 mA	<2.0 mA	–	–

(2) External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.
(3) Whichever is greater.
(4) 5 mA with "–VP" option.
(5) Typical temperature effect coefficients are: 0.005% per °C voltage mode; 0.02% per °C internally sensed current mode; 0.01% per °C externally sensed current mode. See option "–T."
(6) One terminal grounded or connected so that the common-mode current does not flow through load or (in current mode) through a sensing resistor.
(7) 20 Hz to 10 MHz.



Single PTR Module


Three PTR modules mounted in Rack Adapter RA33–3

OUTPUT RANGES

VOLTAGE MODE: 0–100% of rated voltage. (See option "–E.")

CURRENT MODE (internally sensed):
Setting range: 2% I_o max. to 110% I_o max.
Control range (that part of setting range for which the current meets its stabilization specification): 10% I_o to 100% I_o max.

CURRENT MODE (externally sensed, 1-volt sample, with current feedback to the *voltage* amplifier): 1 mA to 100% I_o max. Models equipped with option "–E" can be controlled from approximately 1 microampere current to maximum output.

MODE FLAG (a d-c signal referred to [+] sense):
Voltage mode: Flag is ≤0V d-c.
Current mode: Flag is ≥5V d-c; source impedance 5k ohms.

CONTROL/PROGRAMMING
Voltage channel: Output voltage is operationally controlled by resistance ratios functioning with either the internal or an external reference, or by a control voltage in the feedback loop, or in the noninverting input.
Current channel: The current is sampled by an internal resistance. An internal current setting potentiometer is provided. External control can be exercised by an adjustable voltage (0–0.5) or by external potentiometer.

OPEN LOOP d-c GAIN (voltage channel): ≥10^6 volts per volt.

REMOTE ERROR SENSING: Separate voltage sensing terminals permit 4-wire connections to a load; will compensate for static load effects up to 0.5V per lead.

ISOLATION FROM GROUND: The circuit of PTR is isolated from its case and ground. It may be placed in series with up to 500 volts d-c (or peak) off ground; common mode current from output to ground: <5 μA rms, 50 μA p-p at 60 Hz.

SERIES/PARALLEL: Terminals are provided for shared voltage or shared current interconnection of two or more PTR modules. (PTR models with "–VP" suffix may *not* be used in parallel.)

DYNAMICS
Voltage recovery: For step load current, the time required for stabilized voltage to recover within the load effect band (or 2 mV, whichever is greater): <50 microseconds.
Current recovery: For step load voltage, an RC time constant assuming a value for "C" as given in the table. "R" is the load resistance. For fast recovery current stabilizers, see OPS Group III.

Programming speed (voltage channel): PTR models slew at approximately 250 volts per second (depending on load). For fast-programming applications, see OPS Group III.

SOURCE POWER INPUT: 105–125V a-c or 210–250V a-c, 50–440 Hz. Switch selected. Source current ≈1.2A.

TEMPERATURE RATINGS:
Storage: -40°C to +85°C.
Operating: -20°C to +71°C.

MOUNTING: PTR modules will mount on any of its three surfaces using 8-32 hardware to recessed threaded inserts.

Rack mounting accessories:
RA 35–1 mounts a single PTR in 3½" x 19" Price: $15.00.
RA 33–3 mounts up to 3 PTR's in 3½" x 19" Price: $15.00.
RA 34–4 mounts up to 4 PTR's in 5¼" x 19" Price: $15.00.

DIMENSIONS: 3 31/32" H x 5 3/16" W x 13 3/8" D.

FINISH: Black anodized aluminum.

OPTIONS (add the identifying letters as a suffix to model number):

Suffix "–VP": The "–VP" option provides a voltage monitor to trip an SCR "crowbar," protecting your load from excess voltage.
Trigger time: <10 microseconds.
Reset: Interrupt source power and reduce excess voltage.
Setting range: 4.8V (min.) to 110% of E_o max., built-in trimmer.
Threshold: 5% E_o max. or 0.5V, whichever is greater.
Setting should account for -4% warm-up settling effect.
Temperature coefficient: -0.1% per °C.
Price "–VP" option (factory installed): $25.00.

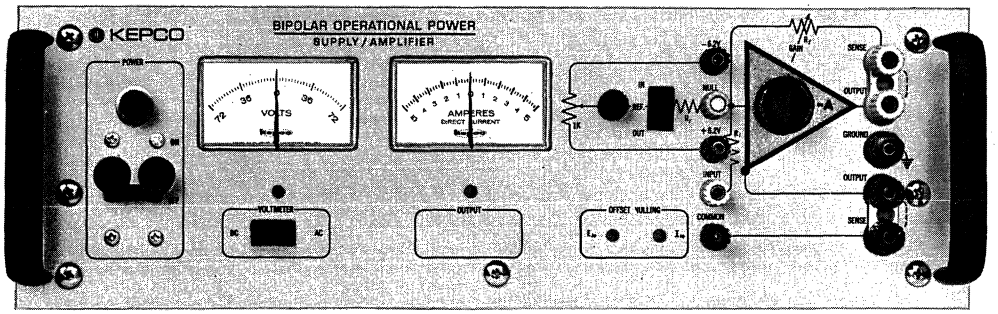
Suffix "–R": The "–R" option provides a calibrating trimmer to set the voltage channel's control current to 1.0 mA for 1000 ohms per volt resistance control. **Price for "–R" option:** $10.00.

Suffix "–E": The "–E" option provides a zeroing trimmer to control the offset voltage (E_{io}) of the voltage channel.
Range: ±10 mV. **Price for "–E" option:** $10.00.

Suffix "–T": Specify suffix "–T" for an individual certified test and report guaranteeing temperature effect coefficients:
0.005% per °C voltage mode,
0.02% per °C current mode, internal sensing,
0.01% per °C current mode, external sensing.
Price for "–T" option: $30.00.

Data and prices subject to change without notice.

KEPCO, INC. • 131-38 SANFORD AVENUE • FLUSHING, N.Y. 11352 • (212) 461-7000 • TWX #710-582-2631 • Cable: KEPCOPOWER NEWYORK



Model BOP 72–5M

KEPCO BOP

BIPOLAR OPERATIONAL POWER SUPPLIES

The Bipolar Operational Power Supply is a distinctly different sort of instrument, capable of responding to programming commands in either direction from zero. The BOP employs a d-c coupled NPN/PNP complementary-symmetry output stage, forced-cooled for efficient dissipation.

ALSO AVAILABLE IN MODULAR (UNMETERED) UNITS.

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	CURRENT SINK	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE[1] d-c OHMS + SHUNT C	SIZE	PRICE	SHIP WGT. lbs.	kg.
BOP 15–20M	+15 to −15	+20 to −20	±4A	0.2 MΩ + 25 μH	1750 Ω + 10.0 μF	A	$1,150.00	94	41.7
BOP 36–1.5M	+36 to −36	+1.5 to −1.5	±0.3A	5 MΩ + 10 μH	23 kΩ + 0.22 μF	B	562.00	27	12.3
BOP 36–5M	+36 to −36	+5 to −5	±1A	1.5 MΩ + 15 μH	7 kΩ + 0.75 μF	C	803.00	50	22.7
BOP 72–1.5M	+72 to −72	+1.5 to −1.5	±0.3A	10 MΩ + 20 μH	23 kΩ + 0.17 μF	A	1,204.00	64	29.1
BOP 72–5M	+72 to −72	+5 to −5	±1A	3 MΩ + 30 μH	7 kΩ + 0.56 μF	A	1,579.00	94	41.7

[1] External current sensing using a 1-volt current sensing sample.

INFLUENCE QUANTITY		AMPLIFIER OFFSETS VOLTAGE ΔE_{io}	CURRENT ΔI_{io}	REFERENCES 6.2V ± 5%
SOURCE: 105–125/210–250V a-c		<0.1 mV	<10 nA	0.005%
LOAD: No load – full load		<1.0 mV	<10 nA	–
TIME: 8-hours [drift]		<0.1 mV	<50 nA	0.005%
TEMPERATURE: Per °C		<0.05 mV	<50 nA	0.005%
UNPROGRAMMED OUTPUT DEVIATION:[3] (Ripple and noise)	rms	<0.01% of E_o max or 3 mV[2]		–
	p-p[4]	<0.05% of E_o max or 15 mV[2]		–

[2] Whichever is greater.
[3] One terminal grounded, or connected so that the common mode current does not flow through the load or (in current mode) through a sensing resistor.
[4] 20 Hz to 10 MHz.

a-c SPECIFICATION	MODE	BOP 15–20M	BOP 36–1.5M	BOP 36–5M	BOP 72–1.5M	BOP 72–5M
SMALL SIGNAL FREQUENCY RESPONSE frequency at which the open loop gain becomes unity	FAST	300 kHz	300 kHz	300 kHz	300 kHz	300 kHz
	SLOW	10 kHz	30 kHz	30 kHz	30 kHz	30 kHz
LARGE SIGNAL FREQUENCY RESPONSE frequency at which the fully modulated, fully loaded output reaches 3% harmonic distortion	FAST	25 kHz	30 kHz	30 kHz	20 kHz	20 kHz
	SLOW	1 kHz	3 kHz	3 kHz	2 kHz	2 kHz
AMPLIFIER SLEWING RATE	FAST	2V/μsec.	7V/μsec	7V/μsec.	9V/μsec.	9V/μsec.
	SLOW	0.1V/μsec.	0.7V/μsec	0.7V/μsec.	0.9V/μsec.	0.9V/μsec.
PROGRAMMING TIME CONSTANT input/feedback set for gain=10	FAST	12 μsec.	12 μsec.	12 μsec.	12 μsec.	12 μsec.
	SLOW	250 μsec.	150 μsec.	150 μsec.	150 μsec.	150 μsec.
VOLTAGE RECOVERY TIME CONSTANT for step load current	FAST	50 μsec.	50 μsec.	50 μsec.	50 μsec.	50 μsec.
	SLOW	500 μsec.	500 μsec.	500 μsec.	500 μsec.	500 μsec.
CURRENT RECOVERY TIME CONSTANT for step load voltage	FAST	50 μsec.	50 μsec.	50 μsec.	50 μsec.	50 μsec.
	SLOW	1 msec.	500 μsec.	500 μsec.	500 μsec.	500 μsec.

OPEN LOOP d-c GAIN: 35,000 V/V. Roll off −6dB per octave.
OUTPUT IMPEDANCE: Tabulated at d-c. Rises at 6 dB per octave. At high frequencies, include the effect of a 100 μH equivalent series inductance.
DISTORTION (for $2V_{pp}$ output, no load): Harmonic: < 0.5%
OFFSET NULLING: The fixed parts of the offset voltage and offset current can be nulled using recessed panel controls.
REFERENCES: Two, +6.2V ±5% and −6.2V ±5% available simultaneously; loading: 1mA.

PROGRAMMING: Control by the manipulation of input and feedback elements. The BOP is a bipolar inverting d-c amplifier that obeys the equation: $E_{OUT} = -E_{IN} \frac{Z_{feedback}}{Z_{input}}$
A vernier feedback rheostat and input potentiometer is provided on the bench model, along with an operational patch panel and metering. The unmetered module requires external input and feedback elements.
INPUT: 105-125/210-250V a-c, 50-65 Hz. single phase.
TEMPERATURE, AMBIENT OPERATING: −20°C to +65°C.
TEMPERATURE, STORAGE: −40°C to +85°C.
COOLING: Forced air; built-in blower.
ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) may be connected between either terminal and the case.
TERMINALS: Ten-terminal front panel patch board. Ten-terminal rear mounted barrier strip duplicates functions. Unmetered model has rear barrier strip terminals only.
DIMENSIONS: *Metered Models:*
Half-Rack: 5 7/32"H x 8 11/32"W x 13 1/8"D. (BOP 36–1.5M)
5 7/32"H x 8 11/32"W x 17 7/8"D. (BOP 36–5M)
Full-Rack: 5 7/32"H x 19"W x 18"D. (behind panel)
Unmetered (Modular) models:
Half-Rack: BOP 36–1.5 : 5"H x 8 3/32"W x 13 11/16"D
BOP 36–5 : 5"H x 8 3/32"W x 18 3/16"D
Full-Rack: 5 7/32"H x 16½"W x 18"D
FINISH: *Panel:* Light gray, Color 26440 per Fed. Std. 595.
Case: Charcoal gray texture.
MOUNTING: Full rack sized models have accessory flanges for direct installation in standard 19" racks. Unmetered BOP models are in modular form for chassis mounting, half-rack size models may be mounted in RA-24 or RA-32 by use of an adapter plate RAP 24-2B. *(See Hardware Section).*
METERS: Half rack models use a single multi-function meter for d-c volts and amperes and a-c volts. Full rack models have separate voltmeter and ammeter. The voltmeter can be switched to read d-c or a-c volts. Unmetered models are available in all sizes with a blank front panel. These models may be used as modules with external input/feedback elements connected to the rear barrier strip. To order a modular version, delete the suffix "M" from the model number and deduct $60.00 from the price.

KEPCO™
OPERATIONAL POWER SUPPLIES

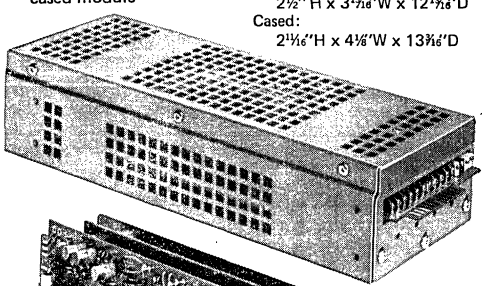
OPS group I-II

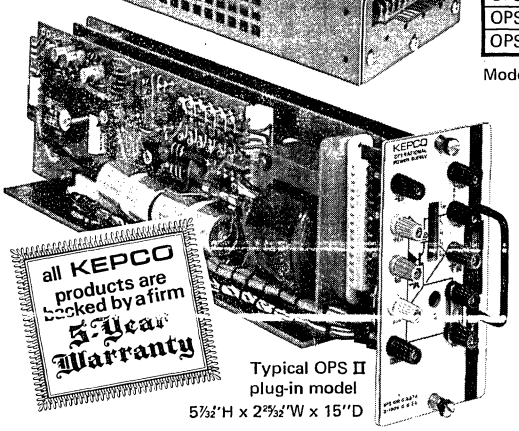
OPS group I

A high-gain, single-channel, wide-band, d-c amplifier for scaling or summing, OPS—I is in modular form for inclusion into a larger system. OPS—II is in a plug-in format with a patch board panel for bench-top or systems use. An I-C front end contributes very low offset for accurate tracking of control signals. The low shunt capacitance output allows for rapid voltage programming or fast current stabilized load recovery.

Typical OPS I cased module

Uncased: 2½"H x 3¹³⁄₁₆"W x 12¹³⁄₁₆"D
Cased: 2¹³⁄₁₆"H x 4⅛"W x 13⅜"D





Typical OPS II plug-in model
5⅞"H x 2²⁵⁄₃₂"W x 15"D

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE (1) d-c OHMS + SHUNT C	SLEWING RATE VOLTS/μ Sec.	PRICE (2)	SHIP WGT. lbs.	kg.
OPS 7—2B	0—7	0—2	0.5 mΩ + 15 μH	0.25 MΩ + 4.0 μF	0.5	$155.00	5	2.3
OPS 15—1.5B	0—15	0—1.5	1 mΩ + 15 μH	0.33 MΩ + 1.5 μF	1.0	155.00	5	2.3
OPS 21—1B	0—21	0—1	2.5 mΩ + 15 μH	0.5 MΩ + 1.0 μF	1.0	155.00	5	2.3
OPS 40—0.5B	0—40	0—0.5	8 mΩ + 15 μH	1.0 MΩ + 0.3 μF	1.5	155.00	5	2.3
OPS 72—0.3B	0—72	0—0.3	25 mΩ + 15 μH	1.65 MΩ + 0.2 μF	1.5	155.00	5	2.3
OPS 100—0.2B	0—100	0—0.2	50 mΩ + 15 μH	2.5 MΩ + 0.1 μF	2.0	155.00	5	2.3

(1) This d-c value is for current feedback to the uncommitted control channel with external (1 volt) sensing.
(2) Models OPS—I are open units, uncased. For case, add Suffix "—C" to model number and $15.00 to price.

OPS group II

OPS 7—2BTA	0—7	0—2	0.5 mΩ + 150 μH	0.25 MΩ + 8.0 μF	0.25	$199.00	8	3.6
OPS 15—1.5BTA	0—15	0—1.5	1 mΩ + 150 μH	0.33 MΩ + 6.0 μF	0.25	199.00	8	3.6
OPS 21—1BTA	0—21	0—1	2.5 mΩ + 150 μH	0.5 MΩ + 2.0 μF	0.5	199.00	8	3.6
OPS 40—0.5BTA	0—40	0—0.5	8 mΩ + 150 μH	1.0 MΩ + 0.5 μF	1.0	199.00	8	3.6
OPS 72—0.3BTA	0—72	0—0.3	25 mΩ + 150 μH	1.65 MΩ + 0.3 μF	1.0	199.00	8	3.6
OPS 100—0.2BTA	0—100	0—0.2	50 mΩ + 150 μH	2.5 MΩ + 0.13 μF	1.5	199.00	8	3.6

Models OPS—II are open. See *"Mounting"* for selection of enclosures.

INFLUENCE QUANTITY		UNCOMMITTED CONTROL CHANNEL OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	REFERENCE ±6.2V±5% NOMINAL
SOURCE: 105—125/210—250V a-c		<10 μV	<2 nA	<0.0001%
LOAD: No load — full load		<200 μV (3)	<5 nA	—
TIME: 8-hours [drift]		<20 μV	<2 nA	<0.005%
TEMPERATURE: Per °C		<20 μV	<5 nA	<0.005%
UNPROGRAMMED OUTPUT DEVIATION: (5) (Ripple and noise)	rms	<0.01% of E_o max. or 3 mV (4)		—
	p-p (6)	<0.05% of E_o max. or 10 mV (4)		—

(3) ΔE_{io} for load in current stabilization mode is ΔE_o/open-loop gain. ΔE_o is the compliance voltage change.
(4) Whichever is greater.
(5) One terminal must be grounded or connected so that common-mode current does not flow through the load or through a current-sensing resistor.
(6) 20 Hz to 10 MHz.

UNCOMMITTED CONTROL CHANNEL

OPEN LOOP d-c GAIN: >0.5 x 10^6 volts per volt.

FEEDBACK: Provision is made for feedback from the negative (−) output/sense terminal so that the OPS will function as a wide-band, inverting d-c amplifier. It is a unipolar device, producing a negative (−) output for a positive (+) input with respect to the (+) output/sense terminal which is common.

DYNAMICS

Maximum slewing rate (the fastest rate of change that can be obtained by overdriving or forcing): See table.

Programming time constant: The RC product of the feedback resistance and capacitance. The resistance is a nominal 1000 ohms per volt; the capacitance is adjustable for OPS -I: 400 pF to 1000 pF (except 800 pF to 1600 pF for Model OPS 7—2B); for OPS—II: 800 pF to 1800 pF.

Frequency response: The maximum modulation frequency is given by the expression: f max = slewing rate/$\pi E_{p\text{-}p}$. The −3 dB frequency is given by the programming time constant.

LOAD REACTANCE: Operational power supplies are restricted to capacitive loads no greater than 0.001 microfarad.

OFFSET NULLING: The initial or bias part of the uncommitted channel's voltage offset (E_{io}) can be nulled (zeroed) by a built-in trimmer.

REFERENCES: A pair of ±6.2V (±5%), 1 milliampere references are provided for offsetting or biasing purposes.

CURRENT STABILIZATION

The OPS—I and OPS—II are equipped with a built-in current sensing and feedback arrangement for protective limiting. It is controlled by an internal trimmer over the range 10% to 105% I_o max. For the precision control of current, the uncommitted control channel may be connected so as to sample the drop across an external current-sensing resistor in the plus (+) output lead. Using an external 0—1000 ohm current feedback rheostat, current can be controlled from approximately 1 microampere to 100% I_o max.

CURRENT RECOVERY (for step load voltage): The current recovery time constant is the smaller of the programming time constant or the ratio of the current setting to the tabulated output capacitance.

GENERAL

TEMPERATURE RATINGS:
Storage: −40°C to +85°C.
Operating: −20°C to +71°C. Cooling is by natural convection.

SOURCE POWER REQUIREMENT: Units are factory-wired for 105—125V a-c, 50—440 Hz power. A simple jumper change will reconfigure the input for 210—250V a-c, 50—440 Hz. Power consumption: approximately 50W; 0.9 power factor; internally fused.

ISOLATION FROM GROUND: The circuit and output terminals of OPS—I and OPS—II have no d-c connection to ground, and may be floated up to 500 volts (d-c or peak) off ground. The common mode current from output to ground is less than 5 microamperes rms, 50 microamperes p-p at 60 Hz.

TERMINALS: Source power, d-c output, sense and control connections are made through the PC plug that mates with the PC—1 or the connector in a selected housing. In the OPS—II, the amplifier summing junction (null terminal), output and sense terminals, and both references are also brought to a panel patch board for easy access for input, output and feedback connections.

MOUNTING: The OPS—II plug-in operational power supplies can be manifolded up to six abreast in the RA 22—6 housing, or intermixed in the RA—32 housing. The type CA—3, CA—4 and CA—5 bench-top cases accommodate 1, 2 or 3 units respectively with the mating plugs terminated in convenient barrier-strips for cable access. An OPS—I, with its optional case, CA—1 (suffix "—C") may be rack mounted with adapter RA 12—1, RA 13—4 or RA 11—6. The uncased OPS—I will mount interchangeably with OPS—II using the slide adapter BPA—22. See *Hardware* section.

KEPCO

OPS group III

OPS group III OPERATIONAL POWER SUPPLIES

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE d-c OHMS + SERIES L	CURRENT MODE (1) d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
OPS 7–5.5	0–7	0–5.5	64 μΩ + 20 μH	90 kΩ + 5.5 μF	$245.00	11	5.0
OPS 15–3.3	0–15	0–3.3	225 μΩ + 10 μH	150 kΩ + 3.3 μF	245.00	11	5.0
OPS 21–2.5	0–21	0–2.5	420 μΩ + 10 μH	200 kΩ + 2.5 μF	245.00	11	5.0
OPS 40–1.4	0–40	0–1.4	1.4 mΩ + 10 μH	350 kΩ + 1.4 μF	245.00	11	5.0
OPS 72–0.8	0–72	0–0.8	4.5 mΩ + 30 μH	625 kΩ + 0.8 μF	245.00	11	5.0
OPS 100–0.6	0–100	0–0.6	10 mΩ + 20 μH	840 kΩ + 0.6 μF	245.00	11	5.0

(1) This d-c value is for current feedback to the uncommitted control channel, with external (1 volt) sensing. The d-c value for the internal current control channel is $E_o/3$ mA.

INFLUENCE QUANTITY		UNCOMMITTED CONTROL CHANNEL OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	INTERNALLY SENSED CURRENT CONTROL CHANNEL	REFERENCE +6.2V ±5% NOMINAL
SOURCE: 105–125/210–250V a-c		<5 μV	<1 nA	<0.005% or 25 μA(3)	0.0005%
LOAD: No load – full load		<100 μV(2)	<5 nA	<3 mA	–
TIME: 8-hours [drift]		<20 μV	<1 nA	<0.05% or 0.1 mA(3)	0.005%
TEMPERATURE: Per °C		<20 μV	<2 nA	<0.05% or 0.1 mA(3)	0.002%
UNPROGRAMMED OUTPUT DEVIATION:(4) (Ripple and noise)	rms	<0.01% of E_o max or 3 mV(3)		<0.5 mA	–
	p-p(5)	<0.05% of E_o max or 10 mV(3)		<2.0 mA	–

(2) ΔE_{io} for load in current stabilization mode is ΔE_o/open-loop gain. ΔE_o is the compliance voltage change.
(3) Whichever is greater.
(4) One terminal must be grounded or connected so that common-mode does not flow through the load or through a current-sensing resistor.
(5) 20 Hz to 10 MHz.

A high-gain, two-channel, wide-band, d-c amplifier for scaling, summing or current control, OPS–III is in modular form for inclusion into a larger system. I-C front ends in both the uncommitted control channel and the current channel contribute very low offsets for accurate tracking of control signals. The low shunt capacitance output allows the uncommitted control channel to be programmed rapidly in voltage mode, and allows the current control channel to recover exceptionally fast from the effect of step loads.

Typical OPS III module
3½"H x 5⅛"W x 13⅜"D

UNCOMMITTED CONTROL CHANNEL

OPEN LOOP d-c GAIN: $>10^6$ volts per volt.

FEEDBACK: Provision is made for feedback from the (–) output/sense terminal so that OPS–III will function as a wideband, inverting d-c amplifier. It is a unipolar device, producing a negative (–) output for a positive (+) input with respect to the (+) plus output/sense terminal, which is common. OPS–III operational power amplifiers can be used to stabilize various physical phenomena heat, speed, force, electrochemical action ... that is, to whatever the feedback is made proportional .

DYNAMICS:

Maximum slewing rate (the fastest rate of change that can be obtained by overdriving or forcing): >1 volt per microsecond.

Programming time constant: The RC product of the feedback resistance and capacitance. The resistance is a nominal 1000 ohms per volt; the capacitance is adjustable internally from 800 pF to 1800 pF.

Frequency response: The maximum modulation frequency is given by the expression: f max = $10^6/\pi E_{p\text{-}p}$. The -3 dB frequency is given by the programming time constant.

LOAD REACTANCE: Operational power supplies are restricted to capacitive loads no greater than 0.001 microfarad. Built-in rolloff control (lag) networks will allow the OPS to drive most cable or harness capacitances up to this limit without loss of speed. To drive larger capacitances, external voltage-feedback and/or output capacitance will be required to stabilize the OPS as a conventionally filtered power supply. See Kepco's PTR design group. When driving inductive loads, diode protection is required for the back emf generated across an "L" by a programmed di/dt.

OFFSET NULLING: The initial or bias part of the uncommitted channel's voltage offset (E_{io}) can be nulled (zeroed) by a built-in trimmer.

REFERENCES: A d-c reference is provided, plus 6.2V (±5%) with respect to common, the plus (+) sense terminal, able to provide up to 1 milliampere for control or offsetting or biasing purposes.

CURRENT CONTROL CHANNEL

The output current of OPS–III is sampled by an internal resistance dropping 0.5 volt. An internal current setting potentiometer is provided. External control can be exercised by an adjustment voltage (0–0.5) or by a remote potentiometer.

Setting range: 2% I_o max to 110% I_o max.

Control range (that part of the setting range for which the current meets its stabilization specification): 10% to 100% I_o max.

Note: Using current feedback to the uncommitted control channel, based on a 1-volt sample, control can be exercised from approximately 1 μA to the maximum output current.

CURRENT RECOVERY (for step load voltage): The current recovery time constant is the smaller of the programming time constant or the ratio of the current setting to the tabulated output capacitance.

MODE FLAG (a d-c signal referred to (+) sense):

Uncommitted channel: Flag is ≤ 0V d-c.

Current control channel: Flag is ≥5V d-c, source impedance 5k ohms.

GENERAL

TEMPERATURE, ambient operating: -20°C to +71°C. Full output current at +71°C, no derating. Cooling is by natural convection, no external heat sink is required.

TEMPERATURE, storage: -40°C to +85°C.

SOURCE POWER INPUT: Units are factory wired for 105–125V a-c. A switch reconfigures the input for 210–250V a-c, 50–440 Hz. Power must be hard-wired to the provided terminals. Internally fused.. Source current: 1.2 amperes at 125V a-c. Power factor: 0.9.

ISOLATION FROM GROUND: The OPS–III circuit is isolated from its case and ground. It may be placed in series with 500 volts d-c (or peak) off ground. Common mode current, output to ground: <5 microamperes rms, 50 microamperes p-p at 60 Hz.

TERMINALS AND ADJUSTMENTS: All input, output, control and sensing connections are made via a pair of barrier-strips located on one of the small surfaces. The built-in zeroing and lag adjustments and current control are located on the same surface and are accessible for screwdriver adjustment without removing the cover.

MOUNTING: OPS–III modules will mount on any of its three surfaces using 8-32 hardware to recessed threaded inserts.

Rack mounting accessories:

RA 35–1 mounts a single OPS–III in 3½" x 19" Price: $15.00.
RA 33–3 mounts up to 3 OPS–III in 3½" x 19" Price: $15.00.
RA 34–4 mounts up to 4 OPS–III in 5¼" x 19" Price: $15.00.

FINISH: Black anodized aluminum.

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OPS group Ⅳ OPERATIONAL POWER SUPPLIES

OPS group Ⅳ-Ⅴ

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE d-c OHMS + SERIES L	CURRENT MODE(1) d-c OHMS + SHUNT C	SOURCE CURRENT at 125 V a-c	PRICE	SHIP WGT. lbs.	kg.
OPS 6–5M	0–6	0–5	60 μΩ + 20 μH	0.2 MΩ + 5.0 μF	1.4	$375.00	16	7.2
OPS 15–3M	0–15	0–3	250 μΩ + 20 μH	0.33 MΩ + 3.0 μF	1.4	375.00	16	7.2
OPS 25–2M	0–25	0–2	625 μΩ + 50 μH	0.5 MΩ + 2.0 μF	1.4	375.00	16	7.2
OPS 36–1.5M	0–36	0–1.5	1.2 mΩ + 80 μH	0.67 MΩ + 1.5 μF	1.4	375.00	16	7.2
OPS 55–1M	0–55	0–1	2.75 mΩ + 80 μH	1.0 MΩ + 1.0 μF	1.4	375.00	16	7.2
OPS 75–0.75M	0–75	0–0.75	5.4 mΩ + 80 μH	1.3 MΩ + 0.75 μF	1.4	375.00	16	7.2
OPS 100–0.5M	0–100	0–0.5	10 mΩ + 80 μH	2.0 MΩ + 0.5 μF	1.4	375.00	16	7.2

A high-gain, two-channel, wide-band, voltage/current power supply which can be configured for a variety of signal processing chores, OPS Groups Ⅳ and Ⅴ are "quarter" rack sized for systems or bench use. They are equipped with meters and 10-turn voltage and current controls. I-C front ends in both the voltage and the current control channels contribute very low offsets for accurate tracking of control signals. The low shunt output capacitance allows for rapid voltage programming or fast load recovery in the current stabilized channel.

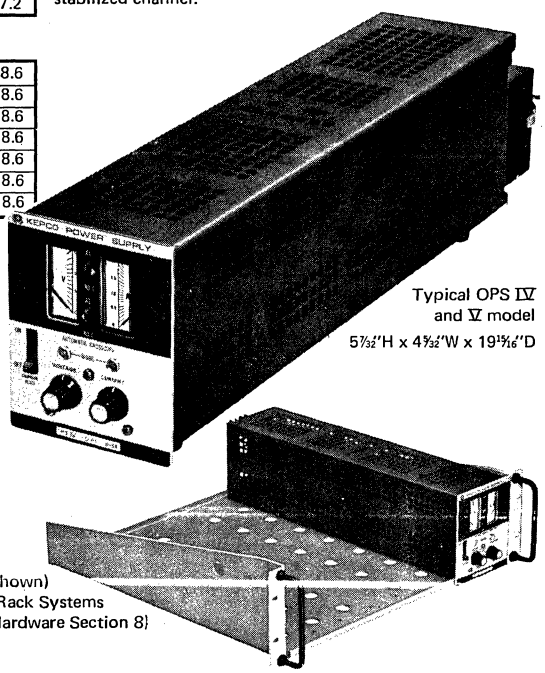
OPS group Ⅴ

OPS 6–10M	0–6	0–10	30 μΩ + 50 μH	0.1 MΩ + 10.0 μF	2.4	$445.00	19	8.6
OPS 15–6M	0–15	0–6	125 μΩ + 50 μH	0.16 MΩ + 6.0 μF	2.4	445.00	19	8.6
OPS 25–4M	0–25	0–4	312 μΩ + 50 μH	0.25 MΩ + 4.0 μF	2.4	445.00	19	8.6
OPS 36–3M	0–36	0–3	0.6 mΩ + 80 μH	0.33 MΩ + 3.0 μF	2.4	445.00	19	8.6
OPS 55–2M	0–55	0–2	1.4 mΩ + 80 μH	0.5 MΩ + 2.0 μF	2.4	445.00	19	8.6
OPS 75–1.5M	0–75	0–1.5	2.5 mΩ + 80 μH	0.65 MΩ + 1.5 μF	2.4	445.00	19	8.6
OPS 100–1M	0–100	0–1	5 mΩ + 80 μH	1.0 MΩ + 1.0 μF	2.4	445.00	19	8.6

(1) This d-c value is for current feedback to the voltage control channel with external (1 volt) sensing. The d-c value for the internal current control channel is $E_o/3$ mA.

INFLUENCE QUANTITY		UNCOMMITTED CONTROL CHANNEL OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	INTERNALLY SENSED CURRENT CONTROL CHANNEL
SOURCE: 105–125V a-c		<5 μV	<1 nA	<0.005% or 25 μA(3)
LOAD: No load – full load		<100 μV(2)	<5 nA	<3 mA
TIME: 8-hour [drift]		<20 μV	<1 nA	<0.05% or 0.1 mA(3)
TEMPERATURE: Per °C		<20 μV	<2 nA	<0.05% or 0.1 mA(3)
UNPROGRAMMED OUTPUT DEVIATION:(4) (Ripple and noise)	rms	<0.01% of E_o max. or 3 mV(3)		<0.02% or 0.5 mA(3)
	p-p(5)	<0.05% of E_o max. or 10 mV(3)		<0.08% or 2.0 mA(3)

(2) ΔE_{io} for load in current stabilization mode is ΔE_o/open-loop gain. ΔE_o is the compliance voltage change.
(3) Whichever is greater.
(4) One terminal must be grounded or connected so that common-mode does not flow through the load or through a current-sensing resistor.
(5) 20 Hz to 10 MHz.



Typical OPS Ⅳ and Ⅴ model
5⅞₂"H x 4⅜₂"W x 19⁵⁄₁₆"D

Rack mount in RA 24 (shown) or in RA 32 Rack Systems (see Hardware Section 8)

VOLTAGE CONTROL CHANNEL

OPEN LOOP d-c GAIN: $>10^6$ volts per volt.

CONTROL PROGRAMMING: A 10-turn, precision feedback rheostat senses the voltage at the (-) output/sense terminal. Both the feedback rheostat and the input 1 milliampere reference can be disconnected (by removing the jumpers on the mating plug) so that an external d-c signal can be applied as if to an inverting amplifier.

DYNAMICS

Maximum slewing rate (the fastest rate of change that can be obtained by overdriving or forcing): >1 volt per microsecond.

Programming time constant: The RC product of the feedback resistance and capacitance. The resistance is a nominal 1000 ohms per volt; the capacitance is adjustable 800 pF to 1600 pF.

LOAD REACTANCE: Operational power supplies are restricted to capacitive loads no greater than 0.001 microfarad. Built-in rolloff control (lag) networks will allow the OPS to drive most cable or harness capacitances up to this limit without loss of speed. To drive larger capacitances, external voltage-feedback and/or output capacitance will be required to stabilize the OPS as a conventionally filtered power supply. See Kepco's JMK design group. When driving inductive loads, diode protection is required for the back emf generated across an "L" by a programmed di/dt.

OFFSET NULLING: The initial or bias part of the voltage control channel's voltage offset (E_{io}) can be nulled (zeroed) by a built-in trimmer.

CURRENT CONTROL CHANNEL

Two current mode input amplifiers are provided; one is for control of the current channel by a panel-mounted, 10-turn precision potentiometer; the second is for external control by either a voltage (0–0.5 or 0–1.0 volt) or a remote potentiometer. Whichever of the input amplifiers is programmed to the lowest value of current will exercise control over the output.

Setting range: 2% I_o max. to 100% I_o max.

Control range (that part of the setting range for which the current meets its stabilization specification): 10% to 100% I_o max.

CURRENT RECOVERY (for step load voltage): The current recovery time constant is the smaller of the programming time constant or the ratio of the current setting to the tabulated output capacitance.

MODE INDICATORS: A pair of panel lamps indicate which control channel (voltage or current) is in operation. A d-c flag signal is delivered to the rear connector.

GENERAL

SOURCE POWER INPUT: Units are factory-wired for 105–125V a-c. A switch enables changeover to 210–250V a-c, 50–65 Hz, protected by a resettable circuit breaker. A 3-wire line cord is provided.

ISOLATION FROM GROUND: The circuit of OPS models in Groups Ⅳ and Ⅴ is isolated from its case and ground. It may be placed in series with up to 500 volts d-c (or peak) off ground. Common mode current from output to ground: <5 microamperes rms, 50 microamperes peak-to-peak at 60 Hz.

TEMPERATURE RATINGS:

Storage: -40°C to +85°C.

Operating: -20°C to +71°C. Cooling is aided by a built-in, sealed-bearing blower.

TERMINALS AND CONNECTIONS: All sensing and control connections to OPS models, Groups Ⅳ and Ⅴ are made via a rear-mounted plug connector. A mating connector is supplied, wired with jumpers for local control and sensing. D-C output connections are made via rear-mounted "5-way" binding posts. Source power connection is made via a detachable, 3-wire safety line cord. The mating connector is Kepco Model PC–4. Extra PC–4 connectors are $10.00 each.

METERS: Two dual range, 2" ±3% recessed meters monitor the (average) output voltage and current. Panel switches provide a 10:1 range of sensitivity.

FINISH: *Panel:* Two-tone black and light gray. (Color No. 26440, Fed. Std. 595).
Case: Textured dark charcoal gray.

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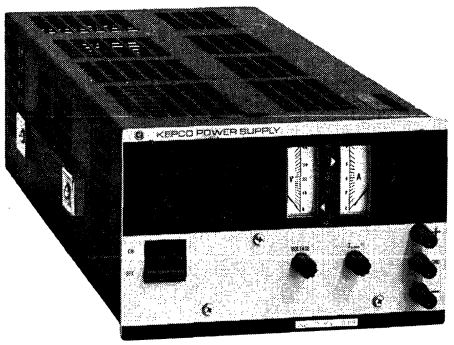


Typical OPS VI and VII
Half-rack model

all KEPCO products are backed by a firm 5-Year Warranty

OPS group VI

5⅞"H x 8¹⁵⁄₃₂"W x 17⅜"D

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE d-c OHMS + SERIES L	CURRENT MODE(1) d-c OHMS + SHUNT C	SOURCE CURRENT at 125 V a-c	PRICE	SHIP WGT. lbs.	kg.
OPS 6–22M	0–6	0–22	14 μΩ + 50 μH	22.5 kΩ + 440 μF	4.2	$639.00	42	19.1
OPS 15–12M	0–15	0–12	63 μΩ + 50 μH	33 kΩ + 120 μF	4.0	639.00	42	19.1
OPS 25–10M	0–25	0–10	125 μΩ + 50 μH	50 kΩ + 100 μF	5.3	639.00	42	19.1
OPS 36–8M	0–36	0–8	225 μΩ + 30 μH	63 kΩ + 80 μF	6.0	639.00	42	19.1
OPS 55–5M	0–55	0–5	550 μΩ + 25 μH	100 kΩ + 50 μF	5.0	639.00	42	19.1
OPS 75–3M	0–75	0–3	1.25 mΩ + 20 μH	167 kΩ + 30 μF	4.0	639.00	42	19.1
OPS 100–2.5M	0–100	0–2.5	2 mΩ + 20 μH	200 kΩ + 25 μF	4.5	639.00	42	19.1
OPS 150–1.5M	0–150	0–1.5	5 mΩ + 15 μH	330 kΩ + 15 μF	4.6	639.00	42	19.1

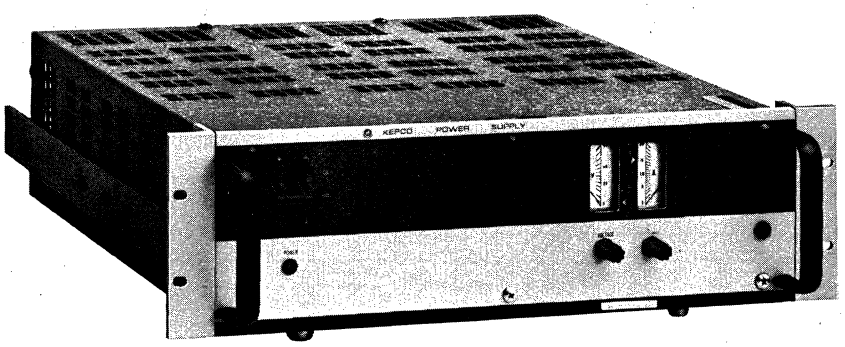
(1) Current mode using an external current sensing and feedback circuit. Impedance data based on a 1-volt sample.

OPS group VII

5⅞"H x 8¹⁵⁄₃₂"W x 17⅜"D

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE d-c OHMS + SERIES L	CURRENT MODE(1) d-c OHMS + SHUNT C	SOURCE CURRENT at 125 V a-c	PRICE	SHIP WGT. lbs.	kg.
OPS 6–45M	0–6	0–45	7 μΩ + 75 μH	11 kΩ + 900 μF	9.0	$750.00	56	25.4
OPS 15–25M	0–15	0–25	30 μΩ + 75 μH	20 kΩ + 500 μF	8.4	750.00	56	25.4
OPS 25–20M	0–25	0–20	63 μΩ + 75 μH	25 kΩ + 400 μF	10.5	750.00	56	25.4
OPS 36–15M	0–36	0–15	120 μΩ + 50 μH	33 kΩ + 150 μF	9.5	750.00	52	23.6
OPS 55–10M	0–55	0–10	275 μΩ + 50 μH	50 kΩ + 100 μF	9.0	750.00	52	23.6
OPS 75–8M	0–75	0–8	469 μΩ + 30 μH	62 kΩ + 80 μF	10.0	750.00	52	23.6
OPS 100–5M	0–100	0–5	1.25 mΩ + 25 μH	100 kΩ + 50 μF	8.4	750.00	52	23.6
OPS 150–3.5M	0–150	0–3.5	2.2 mΩ + 25 μH	142 kΩ + 35 μF	8.7	779.00	52	23.6

(1) Current mode using an external current sensing and feedback circuit. Impedance data based on a 1-volt sample.



Typical OPS VIII
Full-Rack model

OPS group VIII

5⅞"H x 16½"W x 18½"D

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE d-c OHMS + SERIES L	CURRENT MODE(1) d-c OHMS + SHUNT C	SOURCE CURRENT at 125 V a-c	PRICE	SHIP WGT. lbs.	kg.
OPS 6–90M	0–6	0–90	3.5 μΩ + 100 μH	5.5 kΩ + 1800 μF	15.7	$1150.00	103	46.8
OPS 15–50M	0–15	0–50	15 μΩ + 100 μH	10 kΩ + 1000 μF	16.6	1150.00	103	46.8
OPS 25–40M	0–25	0–40	31 μΩ + 100 μH	12.5 kΩ + 800 μF	21.0	1150.00	103	46.8
OPS 36–30M	0–36	0–30	60 μΩ + 75 μH	16.6 kΩ + 600 μF	19.0	1150.00	98	44.5
OPS 55–20M	0–55	0–20	138 μΩ + 75 μH	25 kΩ + 400 μF	18.0	1150.00	98	44.5
OPS 75–15M	0–75	0–15	250 μΩ + 50 μH	33 kΩ + 150 μF	18.0	1150.00	98	44.5
OPS 100–10M	0–100	0–10	620 μΩ + 50 μH	50 kΩ + 100 μF	17.0	1150.00	98	44.5
OPS 150–7M	0–150	0–7	1.1 mΩ + 50 μH	73 kΩ + 70 μF	18.0	1175.00	98	44.5

(1) Current mode using an external current sensing and feedback circuit. Impedance data based on a 1-volt sample.

Data and prices subject to change without notice.

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OPS VI-VII-VIII

OPERATIONAL POWER SUPPLIES

A high-gain, single-channel, wide-band power supply which can be configured for a variety of signal processing chores, OPS Groups VI and VII are "half-rack" sized, OPS Group VIII is a full (19") rack width for systems or bench use. They are equipped with meters and a 10-turn voltage control. The I-C front end in the control channel contributes very low offsets for accurate tracking of control signals. The low shunt capacitance output allows for rapid voltage programming or fast current-stabilized load recovery.

This tabulation specifies the limit of change in the amplifier offsets for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variations and sum the pertinent effects.

INFLUENCE QUANTITY		VOLTAGE CONTROL CHANNEL OFFSET VOLTAGE ΔE_{io}	VOLTAGE CONTROL CHANNEL OFFSET CURRENT ΔI_{io}	REFERENCE ±6.2V±5% NOMINAL
SOURCE: 105–125V a-c		<10 μV	<2 nA	<0.0001%
LOAD: No load – full load		<200 μV(1)	<5 nA	—
TIME: 8-hour [drift]		<20 μV	<2 nA	<0.005%
TEMPERATURE: Per °C		<20 μV	<5 nA	<0.005%
UNPROGRAMMED (3) OUTPUT DEVIATION: (Ripple and noise)	rms	<0.02% of E_o max. or 6 mV(2)		—
	p-p(4)	<0.25% of E_o max. or 50 mV(2)		—

(1) ΔE_{io} for load in current stabilization mode is ΔE_o/open-loop gain. ΔE_o is the compliance voltage change.
(2) Whichever is greater.
(3) One terminal must be grounded or connected so that common-mode current does not flow through the load or through a current-sensing resistor.
(4) 20 Hz to 10 MHz.

VOLTAGE CONTROL CHANNEL

OPEN LOOP d-c GAIN: >0.5 x 10^6 volts per volt.

CONTROL PROGRAMMING: A built-in feedback rheostat senses the voltage at the (-) output/sense terminal. OPS Groups VI, VII and VIII models have a fixed 1.0 milliampere connected to their input summing terminal. This current passes through the feedback rheostat so that output control is exercised at 1000 ohms per volt. Both the feedback rheostat and the input 1 milliampere reference can be disconnected (by removing jumpers on the rear barrier-strip) so that an external d-c signal can be applied as if to an inverting amplifier and/or the feedback can be taken from another point to stabilize various physical phenomena (heat, speed, force, electrochemical action. . .).

DYNAMICS

Maximum slewing rate (the fastest rate of change that can be obtained by overdriving or forcing): >100V per millisecond for models rated less than 20 amperes, >50V per millisecond for models rated 20 amperes and greater.

Programming time constant: The programming time constant is controlled by the RC product of the selected feedback resistance and the selected feedback capacitance. The nominal feedback resistance is 1000 ohms per volt of output. The range of capacitance available internally is 2500 pF to 3500 pF, except the 6 volt and 15 volt models are shunted by approximately 5000 pF.

LOAD REACTANCE: Operational power supplies are restricted to capacitive loads no greater than 0.001 microfarad. Built-in rolloff control (lag) networks will allow the OPS to drive most cable or harness capacitances up to this limit without loss of speed. To drive larger capacitances, external voltage feedback and/or output capacitance will be required to stabilize the OPS as a conventionally filtered power supply. See Kepco's JQE design group. When driving inductive loads, diode protection is required for the back emf generated across an "L" by a programmed di/dt.

OFFSET NULLING: The initial or bias part of the voltage control channel's voltage offset (E_{io}) can be nulled (zeroed) by a built-in trimmer.

CURRENT CONTROL CHANNEL

The output current of the OPS Groups VI, VII and VIII is *limited* by a built-in current sensing and feedback arrangement. This channel offers approximately 2% current stabilization as a maximum current limiter. A separate control channel is provided for the external control of this current limit using a small d-c control voltage with respect to the (+) output terminal, or a resistor-divider across the internal reference. When programming the current-limit, the panel current control serves as an overriding backup. For the precision control of current, the voltage control channel may be connected so as to sample the drop across an external current-sensing resistor to obtain current feedback. Based on a 1-volt sample, control can be exercised from approximately 1-microampere to the maximum output current.

CURRENT RECOVERY (for step load voltage): The current recovery time constant is the smaller of the programming time constant or the ratio of the current setting to the tabulated output capacitance.

GENERAL

SOURCE POWER INPUT: Units are factory wired for 105–125V a-c, 50–65 Hz. A simple jumper change reconfigures the input for 210–250V a-c. The input is protected with a resettable circuit breaker. A 3-wire line cord is provided.

ISOLATION FROM GROUND: The circuit of OPS models in Groups VI, VII and VIII is isolated from its case and ground. It may be placed in series with up to 500 volts d-c (or peak) off ground. Common-mode current from output to ground: <5 microamperes rms, 50 microamperes p-p at 60 Hz.

TEMPERATURE, ambient operating: -20°C to +71°C. Full output current is delivered at 71°C without derating. Cooling is aided by a built-in sealed-bearing blower, exhausting to the rear.

TEMPERATURE, storage: -40°C to +85°C.

TERMINALS AND CONNECTIONS: All sensing and control connections to OPS Group VI models are at the rear. The d-c output connections are "5-way" binding posts. The reference, feedback and signal input terminations are on a barrier-strip.

METERS: The d-c component of output voltage and current is displayed on a pair of dual range (10:1) 2-inch ±3% meters.

MOUNTING: OPS VI and VII models are "half-rack" sized 5 7/32 "H x 8 11/32"W x 17 3/8 "D, and mount up to two abreast in the Kepco RA–24 rack mounting drawer. A single "half-rack" model can be combined with up to three one-sixth width models in the RA–32 drawer. See *Hardware Section.*
OPS Group VIII models are "full-rack" sized and have accessory flanges for direct installation in standard 19-inch racks. They are predrilled for slides, Jonathan type 110QD 21-1, 22-1, 24-1.

FINISH: *Panel:* Two-tone black and light gray. (Color No. 26440, Fed. Std. 595.)
Case: Textured dark charcoal gray.

Data and prices subject to change without notice.

KEPCO™

OPERATIONAL POWER SUPPLIES

OPS group IX

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Typical OPS IX model
5 3/32"H x 8 1/32"W x 13 3/8"D

The OPS Group IX power supply/amplifier is a unique instrument comprising a high voltage, d-c voltage/current source with a high-gain, wide-band, control system suitable for a variety of signal processing chores: scaling, summing, integrating, etc. The circuit uses a transistor d-c amplifier coupled to a high-voltage vacuum tube.

OPS group IX

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
OPS 500	0–500	0–0.04	2.2Ω + 10 mH	125 MΩ + 0.04 μF	$399.00	19	8.6
OPS 1000	0–1000	0–0.02	9.0Ω + 10 mH	250 MΩ + 0.02 μF	399.00	19	8.6
OPS 2000	0–2000	0–0.01	34.0Ω + 10 mH	500 MΩ + 0.01 μF	399.00	19	8.6

INFLUENCE QUANTITY		VOLTAGE CONTROL CHANNEL OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	CURRENT CONTROL CHANNEL OUTPUT EFFECTS	REFERENCE ±6.2V±5% NOMINAL
SOURCE: 105–125/210–250V a-c		<0.1 mV	<10 nA	<10 μA	<0.0005%
LOAD: No load – full load		<1.0 mV(1)	<10 nA	<10 μA	–
TIME: 8-hours [drift]		<0.1 mV	<100 nA	<0.01% I_o max.	<0.005%
TEMPERATURE: Per °C		<0.5 mV	<100 nA	<0.01% I_o max.	<0.005%
UNPROGRAMMED OUTPUT DEVIATION:(3) (Ripple and noise)	rms	<0.01% E_o max or 3 mV(2)		<50 μA	–
	p-p(4)	<0.05% E_o max or 15 mV(2)		<250 μA	–

(1) ΔE_{io} for load in current stabilization mode is ΔE_o/open-loop gain. ΔE_o is the compliance voltage change.
(2) Whichever is greater.
(3) One terminal must be grounded or connected so that common-mode current does not flow through the load or through a current-sensing resistor.
(4) 20 Hz to 10 MHz.

VOLTAGE CONTROL CHANNEL

OPEN LOOP d-c GAIN: >0.5 x 10^6 volts per volt.

CONTROL/PROGRAMMING: A built-in, fixed feedback resistor (500 kΩ for OPS 500, 1 MΩ for OPS 1000 and 2 MΩ for OPS 2000) senses the voltage at the (-) output/sense terminal. A 0–1 milliampere control current connected to the input summing terminal, therefore, programs the d-c output throughout the rated range. This current may be externally generated–as from a function generator–or may be derived from the built-in +6.2V reference. The internal feedback resistance can be easily disconnected so that feedback can be taken from another point to stabilize various physical phenomena (heat, speed, force, current, electrochemical action . . ., etc.).

DYNAMICS

Maximum slewing rate (the fastest rate of change that can be obtained by overdriving or forcing): >1 volt per microsecond.

Programming time constant: The RC product of the feedback resistance and capacitance. The resistance is a nominal 1000 ohms per volt, the capacitance is selectable internally from 400 pF to 3900 pF.

Frequency response: The maximum output frequency is given by the expression: f max. = $10^6/\pi E_{pp}$. The -3 dB frequency is given by the programming time constant.

LOAD REACTANCE: Operational power supplies are restricted to capacitive loads no greater than 0.001 microfarad. Built-in rolloff control (lag) networks will allow the OPS to drive most cable or harness capacitances up to this limit. To drive larger capacitances, external voltage feedback and/or output capacitance will be required to stabilize the OPS as a conventionally filtered power supply.

OFFSET NULLING: The initial or bias part of the voltage control channel's voltage offset (E_{io}) and offset current (I_{io}) can be nulled (zeroed) by built-in trimmers.

CURRENT CONTROL CHANNEL

Output current is controlled by a built-in current sensing and feedback circuit, compensated to account for the shunting effect of the voltage feedback circuit. The stabilization of this channel against the four major influences is tabulated. For the precision control of current, the voltage control channel may be connected so as to sample the drop across an external current-sensing resistor to obtain current feedback. Based on a 10-volt sample, control can be exercised from approximately 100 microamperes to the maximum output current.

CURRENT RECOVERY (for step load voltage): The current recovery time constant is the smaller of the programming time constant or the ratio of the current setting to the tabulated output capacitance.

GENERAL

TEMPERATURE RATINGS:
Storage: -40°C to +85°C.
Operating: -20°C to +65°C. Cooling is by natural convection.

SOURCE POWER INPUT: Units are factory-wired for 105–125V a-c, 50–65 Hz. A simple jumper change will reconfigure the input for 210–250V a-c, 50–65 Hz. Power consumption: approximately 75 watts; 0.9 power factor; protected by a built-in fuse. A 3-wire line cord is provided.

ISOLATION FROM GROUND: The circuit and output terminals have no d-c connection to ground and may be floated up to 1000 volts (d-c or peak) off ground. The common mode current from output to ground is less than 30 microamperes rms, 300 microamperes peak-to-peak at 60 Hz.

TERMINALS: A front panel patch board of 10 binding posts provide access to the voltage control channel's summing input (null junction), the ±6.2V references, the two output connections and ground. They are arranged for ease in setting up operational manipulations. All connections are duplicated on a barrier-strip mounted at the rear.

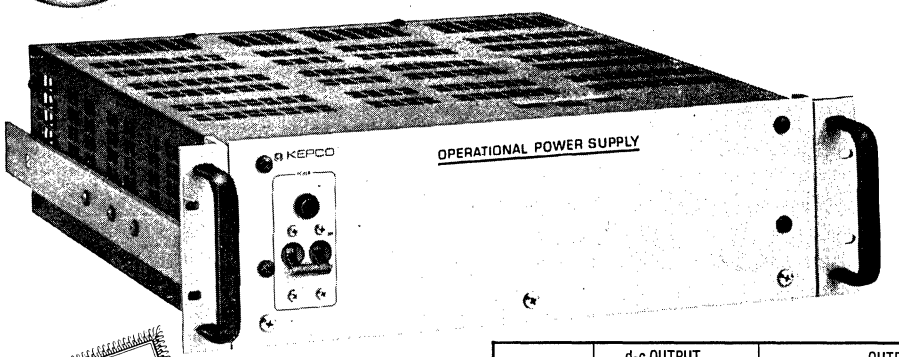
MOUNTING: OPS Group IX models are "half-rack" sized for bench-top use or rack mounting in either the RA–24, or RA–32 hardware systems.

FINISH: *Panel:* Gray Color 26440, Fed. Std. 595.
Case: Textured dark charcoal gray.

KEPCO

OPERATIONAL POWER SUPPLIES

OPS group X



Typical OPS Group X

The OPS Group X power supply/amplifier is a unique instrument comprising a high voltage, d-c voltage/current source with a high-gain, wide-band, control system suitable for a variety of signal processing chores: scaling, summing, integrating, etc. The circuit uses a transistor d-c amplifier coupled to high-voltage vacuum tubes.

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MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE FEEDBACK d-c OHMS + SERIES L	CURRENT MODE d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
OPS 3500	0–3500	0–10 mA	0.5 Ω + 0.1 H	1000 MΩ + 3.3 x 10^{-9} F	$ 940.00	45	20.3
OPS 5000	0–5000	0– 5 mA	1.6 Ω + 0.1 H	2000 MΩ + 1.6 x 10^{-9} F	1060.00	45	20.3

INFLUENCE QUANTITY		VOLTAGE CONTROL CHANNEL OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	CURRENT CONTROL CHANNEL OUTPUT EFFECTS	REFERENCE ±6.2V±5% NOMINAL
SOURCE: 105–125V a-c		<10 μV	<1 nA	<10 μA	<0.0005%
LOAD: No load – full load		<10 μV(1)	<1 nA	<10 μA	—
TIME: 8-hour [drift]		<20 μV	<1 nA	<0.01% of I_o max	<0.005%
TEMPERATURE: Per °C		<20 μV	<0.5 nA	<0.01% of I_o max	<0.005%
UNPROGRAMMED OUTPUT DEVIATION:(3) (Ripple and noise)	rms	<0.01% of E_o max or 35 mV(2)		<50 μA	—
	p-p(4)	<0.1% of E_o max or 150 mV(2)		<250 μA	—

(1) ΔE_{io} for load in current stabilization mode ΔE_o/open-loop gain. ΔE_o is the compliance voltage change.
(2) Whichever is greater.
(3) One terminal must be grounded or connected so that common-mode current does not flow through the load or through a current-sensing resistor.
(4) 20 Hz to 10 MHz.

VOLTAGE CONTROL CHANNEL

OPEN LOOP d-c GAIN: >10^6 volts per volt.

CONTROL PROGRAMMING: A built-in fixed feedback resistor (3.5 megohms for OPS 3500; 5 megohms for OPS 5000) senses the voltage at the (-) output/sense terminal. A 0–1 milliampere control current connected to the input summing terminal, therefore, programs the d-c output throughout the rated range. This current may be externally generated—as from a function generator—or may be derived from the built-in +6.2V reference. The internal feedback resistance can be easily disconnected so that feedback can be taken from another point to stabilize various physical phenomena (heat, speed, force, current, electrochemical action . . . etc.).

DYNAMICS

Maximum slewing rate (the fastest rate of change that can be obtained by overdriving or forcing): >3V per microsecond.

Programming time constant: The RC product of the feedback resistance and capacitance. The resistance is a nominal 1000 ohms per volt; the capacitance is selectable internally from 400 pF to 3900 pF.

Frequency response: The maximum modulation frequency is given by the expression: f max = 3 x $10^6/\pi E_{p\text{-}p}$. The -3 dB frequency is given by the programming time constant.

LOAD REACTANCE: Operational power supplies should be restricted to capacitive loads no greater than 0.001 microfarad. Built-in rolloff control (lag) networks will allow the OPS to drive most cable or harness capacitances up to this limit. To drive larger capacitances, external voltage feedback and/or output capacitance will be required to stabilize the OPS as a conventionally filtered power supply.

When driving inductive loads, diode protection is required for the back emf generated across an "L" by a programmed di/dt.

OFFSET NULLING: The initial or bias part of the voltage control channel's voltage offset (E_{io}) can be nulled (zeroed) by a built-in trimmer.

CURRENT CONTROL CHANNEL

Output current is controlled by a built-in current sensing and feedback circuit, compensated to account for the shunting effect of the voltage feedback circuit. The stabilization of this channel against the four major influences is tabulated. For the precision control of current, the voltage control channel may be connected so as to sample the drop across an external current-sensing resistor to obtain current feedback. Based on a 10-volt sample, control can be exercised from approximately 100 microamperes to the maximum output current.

CURRENT RECOVERY (for step load voltage): The current recovery time constant is the smaller of the programming time constant or the ratio of the current setting to the tabulated output capacitance.

GENERAL

SOURCE POWER INPUT: Units are factory-wired for 105–125V a-c, 60 Hz source power. A simple jumper change will reconfigure the input of OPS 3500 for 210–250V a-c, 50 Hz input. Model OPS 5000, which uses a resonant power transformer, will function on 60 Hz ±3 Hz only. To use in a 50 Hz service area, append the suffix "–50" to the model number for a 210–250V a-c, 50 Hz ±3 Hz source input and add $25.00 to the unit price.

ISOLATION FROM GROUND: The circuit is isolated from its case and ground. It may be placed in series with up to 1000 volts d-c (or peak) off ground. Common-mode current from output to ground is: <5 microamperes rms, 50 microamperes p-p at 60 Hz.

TEMPERATURE RATINGS

Storage: -40°C to +85°C.
Operating: -20°C to +65°C. Cooling is by natural convection.

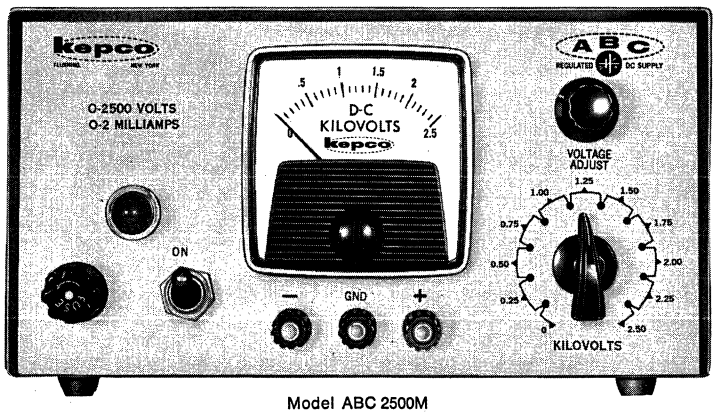
TERMINALS: D–C output, signal input, and feedback connection are made through a recessed, interlocked barrier-strip located at the rear.

MOUNTING: OPS Group X models are "full rack" sized 5⅞"H x 16½"W x 18 "D. Detachable rack mounting "ears" are provided for mounting in standard 19-inch equipment racks. The sides are drilled for equipment slides Jonathan type 110 QD 20-1, 22-1, 24-1.

FINISH: *Panel:* Gray, Color 26440, Fed. Std. 595.

KEPCO ABC® HYBRID POWER SUPPLIES

ABC Power Supplies are bench-style units made in two groups. This page describes the high voltage models, 0—200 volts to 0—2500 volts. The *General Purpose* section of this catalog lists ABC models from 0—2 volts to 0—100 volts. The high voltage ABC models have a single stabilization channel controlled by a differential transistor amplifier driving a high voltage vacuum-tube output stage.



Model ABC 2500M

MODEL	d-c OUTPUT RANGE VOLTS	mA	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE(1) d-c OHMS + SHUNT C	UNPROGRAMMED OUTPUT DEVIATION rms (mV)	p-p (mV)	PRICE	SHIP WGT. lbs.	kg.
ABC 200M	0—200	0—100	1 Ω + 2 μH	2 MΩ + 150 μF	0.5	3.0	$245.00	13	5.9
ABC 425M	0—425	0—50	4 Ω + 2 μH	8.5 MΩ + 8 μF	0.5	3.0	245.00	14	6.4
ABC 1000M	0—1000	0—20	25 Ω + 10 μH	50 MΩ + 2.75 μF	1.0	5.0	340.00	14	6.4
ABC 1500M	0—1500	0—10	75 Ω + 10 μH	150 MΩ + 1 μF	1.0	5.0	340.00	14	6.4
ABC 2500M	0—2500	0—2	625 Ω + 10 μH	1250 MΩ + 1 μF	1.0	7.0	430.00	17	7.7

(1) d-c value is for external sensing and feedback with a 10-volt sample.

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This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variations and sum the pertinent effects.

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE (External Sensing)
SOURCE: 105—125/210—250V a-c		<0.05% or 5 mV(2)	<0.1%(3)
LOAD: No load — full load		<0.05% or 5 mV(2)	<0.1%
TIME: 8-hours [drift]		<0.05% or 50 mV(2)	<0.1% or 10 μA(2)
TEMPERATURE: Per °C		<0.05%	<0.1%
UNPROGRAMMED OUTPUT DEVIATION(4) (Ripple and noise)	rms	See table	<0.1% of I_o max
	p-p(5)	See table	<0.5% of I_o max

(2) Whichever is greater.
(3) Specifications are based on external current sensing and feedback using a 10-volt sample.
(4) One terminal grounded or connected so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.
(5) 20 Hz to 10 MHz.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz single phase.

TEMPERATURE, AMBIENT OPERATING: −20°C to +55°C.

TEMPERATURE, STORAGE: −40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 1000 volts (d-c or peak) can be connected between either terminal and the case.

AC OUTPUT: 6.5V AC, 2A unregulated, available at the rear terminals of Models ABC 200M and ABC 425M.

CONTROL RESOLUTION: 0.05%, 10-turn voltage control on Models ABC 200M and ABC 425M. Resolution is 0.005% with 10-position selector and 10-turn vernier voltage control on Models ABC 1000M, ABC 1500M and ABC 2500M.

PROGRAMMING: ABC Models except Model ABC 2500 are fully programmable by resistance or external voltage signals. Model ABC 2500 can be controlled throughout its range by resistances. The control range for external voltage or current signals is restricted to the upper 2/3 of its output range. Control current is 1 mA with built-in calibrating control. (1000 ohms/V). The positive terminal is common.

VOLTAGE RECOVERY (for step load current): <50 μseconds.

CURRENT LIMITING: Single turn panel adjustment sets limit from 25% to 150% of rated full current on Models ABC 200M and ABC 425M. A fixed limit set to approximately 150% is provided on Models ABC 1000M, ABC 1500M and ABC 2500M.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.

SERIES/PARALLEL: Series operation to rated isolation; also master/slave capability. Current limiting design permits self-determined parallel load sharing.

METERS: Models are equipped with a single, dual scale 2½", 2% volt-ammeter with selector switch, for models ABC 200M and ABC 425M. Voltmeter only for Models ABC 1000M, ABC 1500M and ABC 2500M.

TERMINALS: Binding posts on front panel, plus, minus and ground. Multi-terminal barrier strip at the rear contains output and control terminals.

DIMENSIONS: 4¼"H x 8⅝"W x 9⅝"D for all models except 13⅝"D for Model ABC 2500M.

FINISH: *Panel:* Brushed aluminum. *Case:* Charcoal gray texture.

MOUNTING: Mount single unit in rack adapter RA-5, two abreast in rack adapter RA-4. *Note:* Will fit rack adapters RA-24 and RA-32 using the RAP 24-45 adapter. *See Hardware section.*

Data and prices subject to change without notice.

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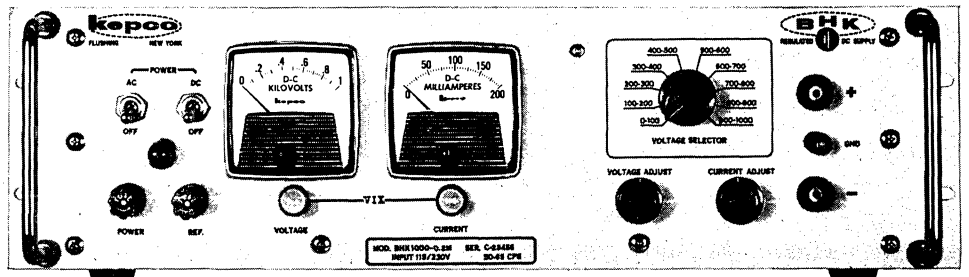
KEPCO BHK

HIGH VOLTAGE

POWER SUPPLIES



Model BHK 1000–0.2M

BHK power supplies are bench/rack style instruments offering both voltage and current stabilization with automatic crossover between the modes. Additionally, BHK power supplies can be internally strapped for high-speed voltage programming or fast-recovery current stabilization. The voltage and current stabilization channels are each controlled by differential transistor amplifiers driving a high voltage vacuum tube output stage.

MODEL	d-c OUTPUT RANGE VOLTS	d-c OUTPUT RANGE mA	OUTPUT IMPEDANCE CONVENTIONAL SPEED STRAPPING VOLTAGE MODE d-c OHMS + SERIES L	OUTPUT IMPEDANCE CONVENTIONAL SPEED STRAPPING CURRENT MODE d-c OHMS + SHUNT C	OUTPUT IMPEDANCE HIGH SPEED STRAPPING VOLTAGE MODE d-c OHMS + SERIES L	OUTPUT IMPEDANCE HIGH SPEED STRAPPING CURRENT MODE d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	SHIP WGT. kg.
BHK 500–0.4M	0–500	0–400	0.13 Ω + 0.5 μH	5 mΩ + 8 μF	0.13 Ω + 15 μH	5 mΩ + 0.8 μF	$925.00	46	20.9
BHK 1000–0.2M	0–1000	0–200	0.5 Ω + 0.5 μH	10 mΩ + 4 μF	0.5 Ω + 15 μH	10 mΩ + 0.4 μF	925.00	46	20.9
BHK 2000–0.1M	0–2000	0–100	2.0 Ω + 2.0 μH	20 mΩ + 2 μF	2.0 Ω + 30 μH	20 mΩ + 0.2 μF	965.00	46	20.9

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE (Internal Sensing)	VOLTAGE AMPLIFIER OFFSETS ΔE_{io}	VOLTAGE AMPLIFIER OFFSETS ΔI_{io}	VOLTAGE REFERENCE (Internal)
SOURCE: 105–125/210–250V a-c		<0.005% or 1 mV[1]	<100 μA	<1 mV	<10 nA	0.001%
LOAD: No load – full load		<0.01% or 1 mV[1]	<100 μA	<1 mV	<10 nA	–
TIME: 8-hours [drift]		<0.01% or 2.0 mV[1]	<0.01% or 20 μA[1]	<50 μV	<50 nA	0.005%
TEMPERATURE: Per °C		<0.01%	<0.05% of I_o max	<100 μV	<50 nA	0.005%
UNPROGRAMMED OUTPUT DEVIATION:[2] (Ripple and noise)	rms	<1 mV	<100 μA	–	–	–
	p-p[3]	<10 mV	<1 mA	–	–	–
UNPROGRAMMED OUTPUT DEVIATION:[2] (High speed mode)	rms	<50 mV	<500 μA	–	–	–
	p-p[3]	<500 mV	<5 mA	–	–	–

[1] Whichever is greater.
[2] One terminal grounded or connected so that the common mode current does not flow through load or (in current mode) through a sensing resistor.
[3] 20 Hz to 10 MHz.

AUTOMATIC CROSSOVER: Selects voltage regulation or current regulation operating mode automatically.

VIX® CIRCUIT: Voltage/Current mode indicators display operating conditions; also 115V a-c control signal (0.5A max.)

TEMPERATURE, AMBIENT OPERATING: –20°C to +55°C.

TEMPERATURE, STORAGE: –40°C to +85°C.

COOLING: Convection.

INPUT: 105-125 V a-c or 210-250V a-c (selected), 50-65 Hz single phase. Approximately 4 amperes at 125V a-c.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 1000 volts (d-c or peak) can be connected between either terminal and the case.

CONTROL RESOLUTION: Voltage: 0.005% 10-turn vernier control and 10 position selector. *Current:* 0.05% 10-turn control.

OVERSHOOT: (Turn-on/off): None above 10% voltage setting; negligible below 10% when preloaded to 10% minimum.

SERIES/PARALLEL: Automatic crossover design permits self-determined parallel load sharing, or use of master/slave connection. Series operation to rated isolation.

PROGRAMMING: BHK has independently programmable voltage and current regulators. They can be controlled by resistance or external voltage signals. Control current is 1mA with built-in calibrating controls (1000 ohms/V). The positive terminal is common.

OFFSET NULLING: The initial part of the input offset voltage and input offset current can be nulled with internal controls.

REFERENCES: Two: +6.2 volts and –6.2 volts; maximum current 1 milliampere.

OPEN LOOP d-c GAIN: $>0.5 \times 10^6$ volts per volt.

OUTPUT SLEWING RATE: *(Fast slewing connection):* Greater than 500,000 volts per second, measured as the chord to the first time constant on the exponential response. *Note:* Maximum capacitive load in fast mode is 0.001 μf.

SINUSOIDAL FREQUENCY RESPONSE:

Fast Slewing Connection: $f_{max} = \frac{160}{E_{pp}}$ kHz.

(E_{pp} is the peak-to-peak excursion).

TRANSIENT RESPONSE:

Voltage Mode, Fast Slewing: For step load current, recovery is an exponential with a 50 microsecond time constant.

Current Mode, Fast Slewing: For step load voltage, recovery is at the rate of 2 μsec. per volt.

Voltage Mode, Normal Speed: For step load current, recovery to regulation band within 50 microseconds.

OUTPUT IMPEDANCE:

Voltage Mode, Normal Speed: See table.

Voltage Mode, Fast Slewing: Above 1kHz, add the reactive impedance of 500 microhenries.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

METERS: All models are equipped with a pair of 2½", 2% meters.

TERMINALS: Safety (recessed) output connections on front panel; two multi-terminal barrier strips at the rear contain output, sensing and control functions. Fast slewing/normal strapping is internal.

DIMENSIONS: 5¾"H x 19"W x 16⅜"D (behind panel)

FINISH: Light gray, color 26440, per Fed. Std. 595.

Data and prices subject to change without notice.

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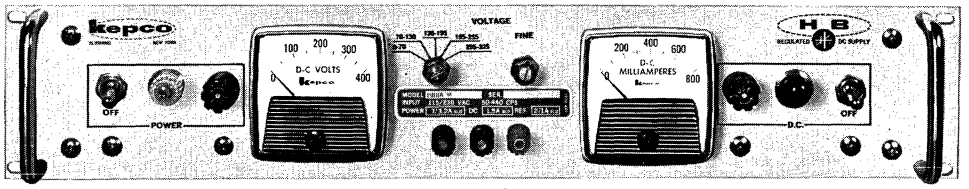


Model HB 8AM

KEPCO HB *HYBRID* POWER SUPPLIES

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE d-c OHMS + SHUNT C	MAX. INPUT AMPS at 125	PRICE	SHIP WGT. lbs.	kg.
HB 2AM	0–325	0–0.2	0.2 Ω + 0.5 μH	16 MΩ + 280 μF	2.0	**$365.00**	35	15.9
HB 4AM	0–325	0–0.4	0.1 Ω + 0.5 μH	8 MΩ + 280 μF	3.0	**410.00**	35	15.9
HB 6AM	0–325	0–0.6	0.06 Ω + 0.5 μH	5.5 MΩ + 280 μF	5.0	**445.00**	41	18.6
HB 8AM	0–325	0–0.8	0.05 Ω + 1.0 μH	4 MΩ + 280 μF	5.5	**489.00**	41	18.6
HB 525M	0–525	0–0.5	0.1 Ω + 0.8 μH	10 MΩ + 50 μF	8.0	**619.00**	41	18.6

The high voltage hybrid HB power supplies use a high gain transistor comparison amplifier to drive the series pass tube regulator. Voltage feedback is by means of a 5-position range switch and 10-turn, 20 PPM TC wire-wound vernier control with remote programming within the span of any one range (to zero with derating). Current may be regulated with external sensing and feedback using the rating chart to determine the allowable compliance range.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE (External Sensing)
SOURCE: 105–125/210–250V a-c		<0.01%	<0.1% at rated sample(1)
LOAD: No load – full load		<0.01% or 2 mV(2)	<0.01% at rated sample(1)
TIME: 8-hours [drift]		<0.01% or 2 mV(2)	<0.05% or 0.2 mA(2)
TEMPERATURE: Per ° C		<0.01%	<0.05% at rated sample(1)
UNPROGRAMMED OUTPUT DEVIATION:(3) (Ripple and noise)	rms	<1 mV	<0.01% of I_o max
	p-p(4)	<5 mV	<0.05% of I_o max

(1) Rated sample is 10 volts d-c across the external current sampling resistor, with external current control.
(2) Whichever is greater.
(3) One terminal grounded or connected so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.
(4) 20 Hz to 10 MHz.

INPUT: 105-125 V or 210-250V a-c (selected), 50–440 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING: –20°C to +55°C.

TEMPERATURE STORAGE: –40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 600 volts (d-c or peak) can be connected between either output terminal and the case.

AC OUTPUTS: Two unregulated, 6.5V a-c, 6A outputs.

CONTROL RESOLUTION: 0.02%, 5 step range selector, 10-turn vernier.

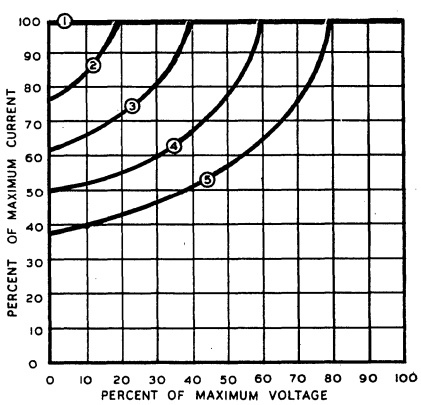
PROGRAMMING: HB is programmable by resistance or external voltage signals within the boundary of each range. By following the rating curves, programs can be executed below the range boundary. Control current is ≅ 10 mA for 100 ohms/V. The positive terminal is common.

VOLTAGE RECOVERY (for step load current): < 50 microseconds.

REMOTE ERROR SENSING: (Model HB 525M only) compensates to 0.5 volt drop per output lead.

OVERSHOOT (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded 10% minimum.

RATING CURVES: Output is designed to deliver 100% of rated current within the span of any one range. When operating outside the selected range, either by remote programming, or as the compliance voltage in current mode, use the graph to determine the maximum current that can be drawn at reduced voltage.



RATING CURVES

Curves represent the volt-ampere rating for range switch positions 1–5. To use, determine which position covers the desired voltage. Read the maximum current for each voltage on the left scale.

METERS: Suffix "M" designates a pair of 2½", 2% meters. Delete suffix for unmetered unit.

TERMINALS: Binding posts on front panel, plus, minus and ground. Multi-terminal barrier strip at the rear contains output, sensing and control terminals.

DIMENSIONS: 3½"H x 19"W x 14⅜"D (behind panel).

FINISH: Light gray, color 26440, per Fed. Std. 595.

Data and prices subject to change without notice.

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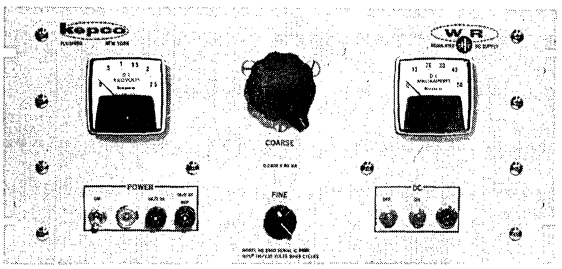
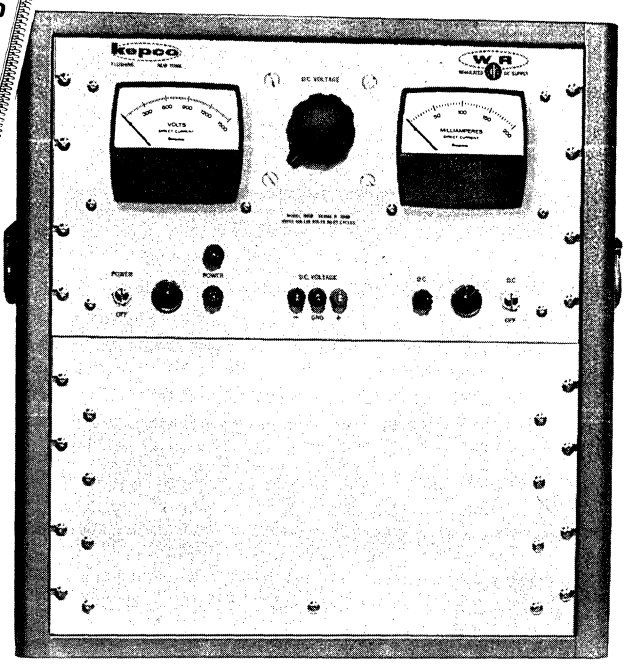
KEPCO WR
VACUUM TUBE
POWER SUPPLIES

all KEPCO products are backed by a firm 5-Year Warranty

The Kepco WR (Wide Range) design offers well regulated, high voltage in a laboratory-equipment style. Model 605 has an added bias output and an auxiliary output for filaments.



Model HB 2500



Model 1520 B

MODEL	RANGE VOLTS	RANGE mA	OUTPUT EFFECTS LOAD 0—MAX %	LOAD 0—MAX ΔV	SOURCE %	SOURCE ΔV	RIPPLE RMS mV	OUTPUT IMPEDANCE d-c OHMS + SERIES L	AUXILLIARY OUTPUT 6.3V a-c Unregulated	MAX. INPUT AMPS at 125 V a-c	PRICE(1)	SHIP WGT. lbs.	SHIP WGT. kg.
605	0—600 Bias 0—150	0—500 0—5	0.02%	0.1V	0.1%	0.4V	3 mV 1 mV	0.24 Ω + 2 μH	20A	8.0	$ 550.00	119	54.0
1250B	0—1000	0—500	0.01%	0.1V	0.05%	0.4V	3 mV	0.2 Ω + 2 μH	—	12.5	810.00	203	92.2
1520B	0—1500	0—200	0.01%	0.1V	0.05%	0.4V	3 mV	0.75 Ω + 5 μH	—	7.0	885.00	203	92.2
HB 2050	0—2000	0—500	0.005%	0.1V	0.02%	0.4V	3 mV	0.2 Ω + 5 μH	—	24.0	1,955.00	275	124.8
HB 2500	0—2500	0—50	0.005%	0.1V	0.02%	0.4V	5 mV	2.5 Ω + 5 μH	—	5.0	1,150.00	104	47.2

(1) Available metered only.

INPUT: 105-125 V a-c 50-65 Hz single phase, 400 Hz input is available on special order. Please consult the factory. Model HB 2050 will function on 60Hz power only.

TEMPERATURE, AMBIENT OPERATING: −20°C to +55°C

TEMPERATURE, STORAGE: −40°C to +85°C

COOLING: Convection

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 400 volts (d-c or peak) can be connected between either terminal or the case.

CONTROL RESOLUTION: All models except HB 2500 use a single turn control with 0.5% resolution. Model HB 2500 has coarse and fine controls. The fine control covers a 1% range with 0.005% resolution.

VOLTAGE RECOVERY STEP LOAD CURRENT: <50 micro-seconds

METERS: Each model has a separate 2% voltmeter and ammeter.

TERMINALS: Output and ground terminals are on the front panel and on the rear, except models HB 2050 and HB 2500 which have rear mounted terminals only.

FINISH: Panels light gray, color 26440 per Fed. Std. 595. Cabinets are a charcoal gray texture.

CABINETS: Models 1250B, 1520B and HB 2050 are supplied in a rack cabinet.

DIMENSIONS

MODEL	HEIGHT"	WIDTH"	DEPTH"
605	10½	19	17 7/8
1250B*	28 (26¼)	22 (19)	15½ (13⅞)
1520B*	23 (21)	22 (19)	15½ (13⅞)
HB 2050*	33½ (31½)	22 (19)	18 (17⅞)
HB 2500	8¾	19	14

*Units are supplied in a cabinet. First figure includes cabinet, second figure ( ) is the equipment dimension for mounting in separate rack.

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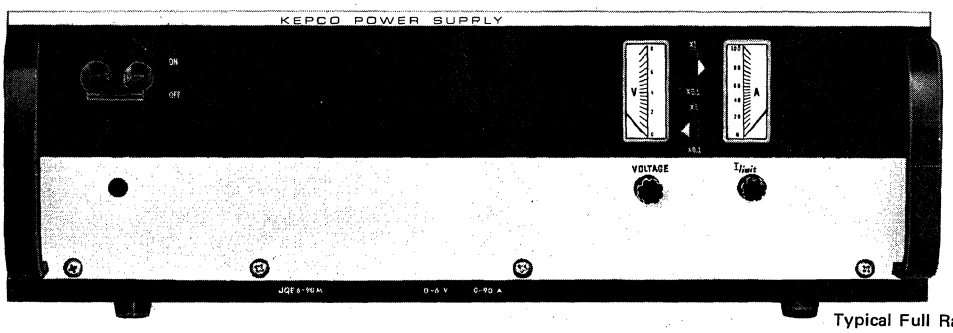


Typical Full Rack Model

KEPCO™ JQE COMPACT POWER SUPPLIES

Typical ½ Rack Model

Typical ¼ Rack Model

JQE power supplies are compact general-purpose laboratory voltage regulators. They are equipped with a panel-adjusted overload current limiter and can be converted to current regulation by using external sensing and feedback resistors. JQE models feature a linear full-dissipation series NPN transistor-regulator driven by a monolithic linear I-C amplifier. Output is fully programmable with an offset zeroing control available as an option. An overvoltage crowbar is also an optional accessory (mounts internally).

ALSO AVAILABLE AS MODULAR (UNMETERED) UNITS.(3)

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE (1) d-c OHMS + SHUNT C	MAX. INPUT AMPS at 125 V a-c	RACK SIZE (2)	PRICE (3)	VP OPTION	SHIP WGT. lbs.	kg.
JQE 6–10M	0–6	0–10	30 μΩ + 1 μH	50 kΩ + 3 kμF	2.0	1/4	$ 325.00	$ 85.00	19	8.6
JQE 6–22M	0–6	0–22	14 μΩ + 0.5 μH	23 kΩ + 5.8 kμF	4.2	1/2	570.00	110.00	42	19.1
JQE 6–45M	0–6	0–45	7 μΩ + 0.5 μH	11 kΩ + 8 kμF	9.0	1/2	675.00	115.00	56	25.4
JQE 6–90M	0–6	0–90	3.5 μΩ + 0.5 μH	3.5 kΩ + 17.6 kμF	15.7	Full	1,075.00	130.00	103	46.8
JQE 15–6M	0–15	0–6	125 μΩ + 1 μH	84 kΩ + 1 kμF	2.1	1/4	325.00	85.00	19	8.6
JQE 15–12M	0–15	0–12	63 μΩ + 0.5 μH	42 kΩ + 300 μF	4.0	1/2	570.00	110.00	42	19.1
JQE 15–25M	0–15	0–25	30 μΩ + 0.5 μH	20 kΩ + 4.5 kμF	8.4	1/2	675.00	115.00	56	25.4
JQE 15–50M	0–15	0–50	15 μΩ + 0.5 μH	10 kΩ + 12 kμF	16.6	Full	1,075.00	130.00	103	46.8
JQE 25–4M	0–25	0–4	300 μΩ + 1 μH	125 kΩ + 700 μF	2.2	1/4	325.00	85.00	19	8.6
JQE 25–10M	0–25	0–10	125 μΩ + 0.5 μH	50 kΩ + 2.4 kμF	5.3	1/2	570.00	110.00	42	19.1
JQE 25–20M	0–25	0–20	63 μΩ + 0.5 μH	25 kΩ + 4.3 kμF	10.5	1/2	675.00	115.00	56	25.4
JQE 25–40M	0–25	0–40	31 μΩ + 0.5 μH	12.5 kΩ + 14 kμF	21.0	Full	1,075.00	130.00	103	46.8
JQE 36–3M	0–36	0–3	600 μΩ + 1 μH	165 kΩ + 400 μF	2.2	1/4	325.00	85.00	19	8.6
JQE 36–8M	0–36	0–8	225 μΩ + 0.5 μH	62.5 kΩ + 1.4 kμF	6.0	1/2	570.00	110.00	42	19.1
JQE 36–15M	0–36	0–15	120 μΩ + 0.5 μH	33 kΩ + 3.6 kμF	9.5	1/2	675.00	115.00	52	23.6
JQE 36–30M	0–36	0–30	60 μΩ + 0.5 μH	16 kΩ + 11 kμF	19.0	Full	1,075.00	130.00	98	44.5
JQE 55–2M	0–55	0–2	1.4 mΩ + 1 μH	250 kΩ + 220 μF	2.3	1/4	340.00	85.00	19	8.6
JQE 55–5M	0–55	0–5	550 μΩ + 1 μH	100 kΩ + 850 μF	5.0	1/2	570.00	110.00	42	19.1
JQE 55–10M	0–55	0–10	275 μΩ + 1 μH	50 kΩ + 2.1 kμF	9.0	1/2	699.00	115.00	52	23.6
JQE 55–20M	0–55	0–20	138 μΩ + 1 μH	25 kΩ + 7.3 kμF	18.0	Full	1,099.00	130.00	98	44.5
JQE 75–1.5M	0–75	0–1.5	2.5 mΩ + 1 μH	330 kΩ + 160 μF	2.3	1/4	340.00	85.00	19	8.6
JQE 75–3M	0–75	0–3	1.25 mΩ + 1 μH	165 kΩ + 850 μF	4.0	1/2	570.00	110.00	42	19.1
JQE 75–8M	0–75	0–8	469 μΩ + 1 μH	62.5 kΩ + 1.2 kμF	10.0	1/2	699.00	115.00	52	23.6
JQE 75–15M	0–75	0–15	250 μΩ + 1 μH	33 kΩ + 4.2 kμF	18.0	Full	1,099.00	130.00	98	44.5
JQE 100–1M	0–100	0–1	5 mΩ + 2 μH	500 kΩ + 110 μF	2.1	1/4	340.00	85.00	19	8.6
JQE 100–2.5M	0–100	0–2.5	2 mΩ + 1 μH	200 kΩ + 600 μF	4.5	1/2	570.00	110.00	42	19.1
JQE 100–5M	0–100	0–5	1.25 mΩ + 1 μH	100 kΩ + 600 μF	8.4	1/2	699.00	115.00	52	23.6
JQE 100–10M	0–100	0–10	0.62 mΩ + 1 μH	50 kΩ + 2.2 kμF	17.0	Full	1,099.00	130.00	98	44.5
JQE 150–1.5M	0–150	0–1.5	5 mΩ + 2 μH	330 kΩ + 440 μF	4.6	1/2	599.00	110.00	42	19.1
JQE 150–3.5M	0–150	0–3.5	2.2 mΩ + 2 μH	140 kΩ + 440 μF	8.7	1/2	750.00	115.00	52	23.6
JQE 150–7M	0–150	0–7	1.1 mΩ + 2 μH	72 kΩ + 1 kμF	18.0	Full	1,125.00	140.00	98	44.5

(1) External current sensing to the voltage control channel, based on a 1-volt current sample.
(2) "1/4" means quarter-rack width, "1/2" is half-rack width, etc. See dimensions.
(3) Price is for the metered model, suffix "–M," without other options. Deduct $30.00 for unmetered (modular) unit (and omit the suffix "–M"). Add the cost of other options as listed. The crowbar option is tabulated separately.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variations and sum the pertinent effects.

INFLUENCE QUANTITY	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE(4)	AMPLIFIER OFFSETS VOLTAGE ΔE_{io}	AMPLIFIER OFFSETS CURRENT ΔI_{io}	REFERENCES 6.2V ± 5%
SOURCE: 105–125/210–250V a-c	<0.0005%	<0.005%	<10 μV	<2 nA	0.0001%
LOAD: No load – full load	<0.005% or 0.2 mV(5)	<0.01%	<200 μV	<5 nA	–
TIME: 8-hours [drift]	<0.01% or 1 mV(5)	<0.02%	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C	<0.01%(6)	<0.02%(6)	<20 μV	<5 nA	0.005%
UNPROGRAMMED OUTPUT DEVIATION:(7) (Ripple and noise) rms	<0.2 mV	<0.02% of I_o max	–	–	–
UNPROGRAMMED OUTPUT DEVIATION:(7) (Ripple and noise) p-p(8)	<1.0 mV	<0.1% of I_o max	–	–	–

(4) External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.
(5) Whichever is greater.
(6) Typical temperature effect coefficients are: 0.005% per °C voltage mode; 0.01% externally sensed current mode. See option "–T."
(7) One terminal grounded or connected so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.
(8) 20 Hz to 10 MHz.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-65 Hz, 1φ

TEMPERATURE, AMBIENT OPERATING: –20°C to + 71°C.

TEMPERATURE, STORAGE: –50°C to + 85°C.

COOLING: Forced air, built-in blower.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CONTROLS: *Voltage:* 10-turn wirewound rheostat, Resolution: 0.05%.
Current: Multiturn vernier potentiometer.

PROGRAMMING SPEED: JQE models can be step programmed at about 250 volts per second (depending on load.) *For fast programming applications,* please see OPS Groups VI, VII and VIII in the *High Speed* section of this catalog.

PROGRAMMING: JQE is fully programmable by resistance or external voltage signals. Control current is 1mA with built-in calibration control (1000 ohms/V). For operational (amplifier) control, an offset voltage nulling control is available, see option "–E". The positive terminal is common.

OPEN LOOP d-c GAIN: $>0.5\times10^6$ volts per volt.

VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 0.005% or 2 mV of setting.

OVERSHOOT (Turn on/off): JQE models exhibit no overshoot when set above 25% of rated voltage or at any voltage setting when loaded to 10% of rated current.

CURRENT LIMITING: Adjustable from 10% to 105% of the rated full current.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

SERIES/PARALLEL: Series operation to the rated isolation voltage. Units may be paralleled by employing their current limiters. (Consult factory concerning paralleling of models with "VP" overvoltage protector.)

METERS: Two dual range, 2-inch, ±3% recessed meters, monitor output voltage and current. 10:1 range switching. Unmetered versions available as modules, delete suffix "M" and deduct $30.00 from listed price.

DIMENSIONS:

Metered models:
¼ Rack: 5 7/32" H x 4 5/32" W x 17 3/8"D. (behind panel).
½ Rack: 5 7/32" H x 8 11/32 W x 17 3/8"D. (behind panel).
Full Rack: 5 7/32" H x 16½" W x 18 3/8"D. (behind panel).
Unmetered (modular) models:
¼ Rack: 5" H x 4 5/32" W x 17 3/8"D.
½ Rack: 5" H x 8 5/32" W x 17 3/8" D.
Full Rack: 5 7/32" H x 16½" W x 18 3/8"D.

FINISH: *Panel:* Light gray, Color 26440, per Fed. Std. 595.
Case: Charcoal gray texture.

MOUNTING: JQE ¼ rack and ½ rack size models fit the RA-24 hardware system *(see hardware section).* Full rack sized models have accessory flanges for direct installation in standard 19" racks. Unmetered JQE models are in modular form for chassis mounting – or may be mounted in RA-24 or RA-32 by use of an adapter plate RAP 24-1J for ¼ rack size; RAP 24-2J for ½ rack size. Full rack units are predrilled for Jonathan slides 110 QD 20-1, 22-1, 24-1.

OPTIONS: (add suffix to the model number)

"–VP" OVERVOLTAGE CROWBAR: Shorts output terminals through an SCR if voltage attempts to exceed preset limit.

Limit level range: 3 V d-c to 175V d-c.

Trigger time: 5-10 μsec., adjustable delay to minimize false alarms.

Threshold: 5% of output level – or 0.25 volts, whichever is greater.

"–T" LOWER TEMPERATURE EFFECT COEFFICIENT: 0.005% per °C in voltage mode, 0.01% per °C in current mode. Add $30.00 to price.

"–E" OFFSET VOLTAGE NULLING: For operational programming. Zeros the fixed part of the control amplifier's voltage offset. Add $10.00 to price.

"–Y" REMOTE CURRENT CONTROL: The "Y" option specifies a separate control channel for external programming of the current limit function. Control is exercised by a small d-c control voltage with respect to the + output terminal, or a resistor divider across the internal reference. When programming the current-limit, the panel current control serves as an overriding-backup. Price for the "–Y" option: 1-4 units $95.00 each
5 or more $50.00 each

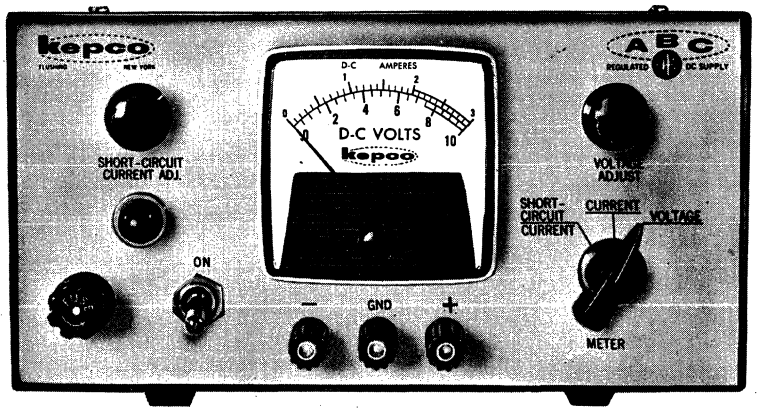
Data and prices subject to change without notice.

KEPCO ABC®

ALL-TRANSISTOR

POWER SUPPLIES

The ABC group of bench-style programmable voltage regulators span a wide range of voltages. The transistor group covers 0–2V to 0–100V; the hybrid group 0–200V to 0–2500V. All-transistor models employ a PNP series regulator, convection cooled, driven by a high gain transistor amplifier. These models feature 10-turn wirewound, 20 PPM TC voltage controls and panel-adjustable current limiting.



Model ABC 7.5–2M

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE d-c OHMS + SHUNT C	SIZE	PRICE	SHIP WGT. lbs.	kg.
ABC 2–1M	0–2	0–1	1 mΩ + 0.5 μH	400 Ω + 2.5 kμF	A	$150.00	9	4.1
ABC 7.5–2M	0–7.5	0–2	2 mΩ + 0.5 μH	750 Ω + 4.0 kμF	B	199.00	13	5.9
ABC 10–0.75M	0–10	0–0.75	7 mΩ + 1 μH	3.7 kΩ + 2.1 kμF	A	150.00	9	4.1
ABC 15–1M	0–15	0–1	8 mΩ + 0.5 μH	3 kΩ + 2.5 kμF	B	199.00	13	5.9
ABC 18–0.5M	0–18	0–0.5	20 mΩ + 1 μH	7.2 kΩ + 625.0 μF	A	150.00	9	4.1
ABC 30–0.3M	0–30	0–0.3	50 mΩ + 1 μH	20 kΩ + 500.0 μF	A	150.00	9	4.1
ABC 40–0.5M	0–40	0–0.5	40 mΩ + 0.5 μH	16 kΩ + 1.0 kμF	B	199.00	13	5.9
ABC 100–0.2M	0–100	0–0.2	250 mΩ + 1 μH	100 kΩ + 450.0 μF	B	225.00	13	5.9

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INFLUENCE QUANTITY		VOLTAGE MODE	CURRENT MODE(1)
SOURCE: 105–125/210–250V a-c		<0.05% or 1 mV(2)	<0.1%
LOAD: No load – full load		<0.05% or 1 mV(2)	<0.5%
TIME: 8-hours [drift]		<0.05% or 3 mV(2)	<0.1% or 1 mA(2)
TEMPERATURE: Per °C		<0.05%	<0.1%
UNPROGRAMMED OUTPUT DEVIATION(3) (Ripple and noise)	rms	<0 25 mV	<0.1% of I_o max.
	p-p(4)	<2.5 mV	<1% of I_o max.

(1) Current control using current feedback around the voltage channel derived from a 1 volt sample across an external current sensing resistor.
(2) Whichever is greater.
(3) One terminal must be grounded or connected so that common mode current does not flow through the load or through a current-sensing resistor.
(4) 20 Hz to 10 MHz.

INPUT: 105-125V a-c or 210-250V a-c (selected), 50-440 Hz, single phase

TEMPERATURE, AMBIENT OPERATING: –20°C to +50°C.

TEMPERATURE, STORAGE: –40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CONTROL RESOLUTION: 0.05%, 10-turn voltage control.

PROGRAMMING: ABC is fully programmable by resistance or external voltage signals. Control current is 1 mA with built-in calibration control (1000 ohms/V) — the negative terminal is common.

VOLTAGE RECOVERY (for step load current): <50 μseconds.

CURRENT LIMITING: Single turn panel adjustment sets limit from 25% to 150% of rated full current.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting. Negligible below 25% when preloaded to 10% minimum.

SERIES/PARALLEL: Series operation to rated isolation; also master/slave capability. Current limiting design permits self-determined parallel load sharing.

METERS: All models are equipped with a single, dual scale volt-ammeter, 2½", 2%, with selector switch.

TERMINALS: Binding posts on front panel, plus, minus and ground. Multi-terminal barrier strip at rear contains output, sensing and control terminals.

DIMENSIONS: 4¼"H x 8⅝"W x 9⅝"D for Models ABC 7.5-2M, ABC 15-1M, ABC 40-0.5M and ABC 100-0.2M; 4¼"H x 8⅝"W x 5⅝"D for Models ABC 2-1M, ABC 10-0.75M, ABC 18-0.5M and ABC 30-0.3M.

FINISH: *Panel:* Brushed aluminum
Case: Charcoal gray texture.

MOUNTING: Mount single unit in rack adapter RA-5, two abreast in rack adapter RA-4. *Note:* Will fit rack adapters RA-24 and RA-32 using the RAP 24-45 adapter. *See Hardware section.*

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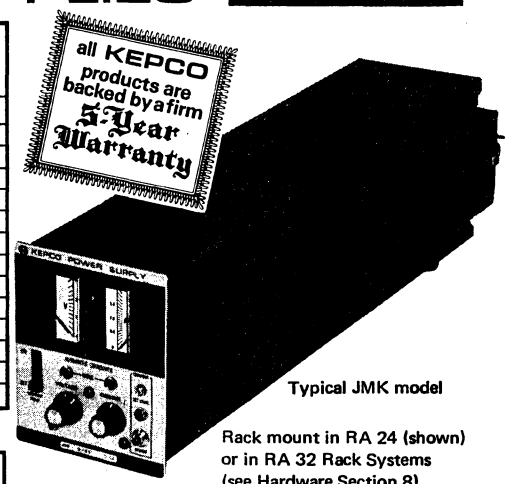
KEPCO

JMK
AUTOMATIC CROSSOVER

POWER SUPPLIES

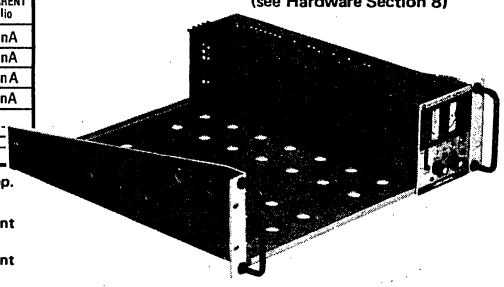
MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE (1) d-c OHMS + SHUNT C	SOURCE CURRENT at 125 V a-c	PRICE	SHIP WGT. lbs.	kg.
JMK 6–5M	0–6	0–5	60 μΩ + 1 μH	0.2 MΩ + 1000 μF	1.4A	$395.00	16	7.3
JMK 6–10M	0–6	0–10	30 μΩ + 2 μH	0.1 MΩ + 2000 μF	2.4A	465.00	19	8.6
JMK 15–3M	0–15	0–3	250 μΩ + 1 μH	0.33 MΩ + 500 μF	1.4A	395.00	16	7.3
JMK 15–6M	0–15	0–6	125 μΩ + 2 μH	0.16 MΩ + 1000 μF	2.4A	465.00	19	8.6
JMK 25–2M	0–25	0–2	625 μΩ + 1 μH	0.5 MΩ + 350 μF	1.4A	395.00	16	7.3
JMK 25–4M	0–25	0–4	312 μΩ + 2 μH	0.25 MΩ + 700 μF	2.4A	465.00	19	8.6
JMK 36–1.5M	0–36	0–1.5	1.2 mΩ + 1 μH	0.67 MΩ + 200 μF	1.4A	395.00	16	7.3
JMK 36–3M	0–36	0–3	0.6 mΩ + 2 μH	0.33 MΩ + 400 μF	2.4A	465.00	19	8.6
JMK 55–1M	0–55	0–1	2.75 mΩ + 1 μH	1.0 MΩ + 110 μF	1.4A	395.00	16	7.3
JMK 55–2M	0–55	0–2	1.4 mΩ + 2 μH	0.5 MΩ + 220 μF	2.4A	465.00	19	8.6
JMK 75–0.7M	0–75	0–0.7	5.4 mΩ + 1 μH	1.3 MΩ + 80 μF	1.4A	395.00	16	7.3
JMK 75–1.5M	0–75	0–1.5	2.5 mΩ + 2 μH	0.65 MΩ + 160 μF	2.4A	465.00	19	8.6
JMK 100–0.5M	0–100	0–0.5	10 mΩ + 1 μH	2.0 MΩ + 55 μF	1.4A	395.00	16	7.3
JMK 100–1M	0–100	0–1	5 mΩ + 2 μH	1.0 MΩ + 110 μF	2.4A	465.00	19	8.6

(1) d-c value is for external sensing and feedback; d-c value for internal-sensing mode is E_o/5 mA.



Typical JMK model

Rack mount in RA 24 (shown) or in RA 32 Rack Systems (see Hardware Section 8)



INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE INTERNAL	EXTERNAL (2)	AMPLIFIER OFFSETS VOLTAGE Δeio	CURRENT Δiio
SOURCE: 105–125/210–250V a-c		<0.0005%	<0.005% or 25 μA(3)	<0.005%	<5 μV	<1 nA
LOAD: No load – full load		<0.005% or 0.1 mV(3)	<5.0 mA	<0.01%	<100 μV	<5 nA
TIME: 8-hour [drift]		<0.01% or 0.2 mV(3)	<0.02% or 0.1 mA(3)	<0.02%	<20 μV	<1 nA
TEMPERATURE: Per °C(4)		<0.01%	<0.02% or 0.1 mA(3)	<0.02%	<20 μV	<2 nA
UNPROGRAMMED OUTPUT DEVIATION:(5) (Ripple and noise)	rms	<0.2 mV	<0.5 mA	<0.02% or 0.5 mA(3)	–	–
	p-p(6)	<2.0 mV	<2.0 mA	<0.08% or 2.0 mA(3)	–	–

(2) External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.
(3) Whichever is greater.
(4) Typical temperature effect coefficients are: 0.005% per °C voltage mode; 0.02% per °C internally sensed current mode; 0.01% per °C externally sensed current mode. See option "–T."
(5) One terminal grounded or connected so that the common-mode current does not flow through load or (in current mode) through a sensing resistor.
(6) 20 Hz to 10 MHz.

OUTPUT RANGES

VOLTAGE MODE: 0–100% of rated voltage.

CURRENT MODE (internally sensed):

Setting range: 2% I_o max. to 110% I_o max.

Control range (that part of setting range for which the current meets its stabilization specification): 10% I_o to 100% I_o max.

CURRENT MODE (externally sensed, 1-volt sample with current feedback to the *voltage* amplifier): ≈1 μA to 100% I_o max.

MODE FLAG: A pair of panel lamps operate to indicate whether the voltage channel or the internally-sensed current channels have control of the output. A d-c "flag" signal is also provided.

CONTROL/PROGRAMMING

Voltage channel: Output voltage is controlled by a panel-mounted, 10-turn rheostat. External control can be exercised by resistance (1000 ohms per volt) or by a control voltage.

Current channel (internally sensed): Output current is controlled by a panel-mounted, 10-turn potentiometer. External control of the internally-sensed current channel can be exercised by an external potentiometer or by a small control voltage.

REMOTE ERROR SENSING: Separate voltage-sensing terminals permit 4-wire connections to a load. Will compensate for static load effects up to 0.5V per lead.

ISOLATION FROM GROUND: The circuit of the JMK is isolated from its housing and ground. It may be placed in series with up to 500 volts (d-c or peak) off ground; common mode current from output to ground: <5 μA rms, 50 μA p-p, at 60 Hz.

SERIES/PARALLEL: Terminals are provided for series interconnections of two or more JMK models. NOTE: For parallel operation of crowbar-equipped JMK units, consult factory.

DYNAMICS

Voltage recovery: The time required for a stabilized voltage to recover within the load effect band (or 2 mV, whichever is greater) for step load currents is <50 microseconds.

Current recovery: For step load voltage, the current recovery is an RC time constant assuming a value for "C" as given in the table. "R" is the load resistance. For a fast recovery current stabilizer, see the OPS groups.

Programming speed (voltage channel): JMK models slew at approximately 250 volts per second (at 50% load). For fast-programming applications, see the OPS Groups.

SOURCE POWER INPUT: 105–125V a-c or 210–250V a-c switch selected 50–65 Hz, protected by a resettable circuit breaker.

TEMPERATURE, ambient operating: −20°C to +71°C.

TEMPERATURE, storage: −40°C to +85°C.

OVERVOLTAGE CROWBAR: A voltage-triggered crowbar protection circuit is included as standard equipment on *all* JMK models. The setting adjustment and indicator are located on the front panel, together with a push button that disables the crowbar so the voltage setting can be made without upsetting the output.

Trigger time: <10 microseconds.

Setting range: 4V (min.) to 110% of E_o max.

Threshold: 5% E_o max. or 0.5V, whichever is greater. Setting should account for a −2% warm-up settling effect.

Temperature coefficient: −0.1% per °C.

TERMINALS AND CONNECTIONS: All sensing and control connections to JMK are made via a rear-mounted plug connector. A mating connector is supplied, wired with jumpers for local control and sensing. Output connections are made via rear-mounted, "5-way" binding posts. Source power connection is made via a detachable 3-wire safety line cord.

Extra plug connector, Model PC–4: $10.00 each.

DIMENSIONS: 5 7/32" H x 4 9/32" W x 19 15/16" D.

FINISH: *Panel:* Two-tone, black and light gray (Color No. 26440, Fed. Std. 595).
Case: Textured dark charcoal gray.

OPTIONS (add identifying letters as a suffix to model number):

Suffix "–T": Specify suffix "–T" for an individual certified test and report guaranteeing temperature effect coefficients.
0.005% per °C voltage mode.
0.01% per °C current mode.

Price for "–T" option: $30.00.

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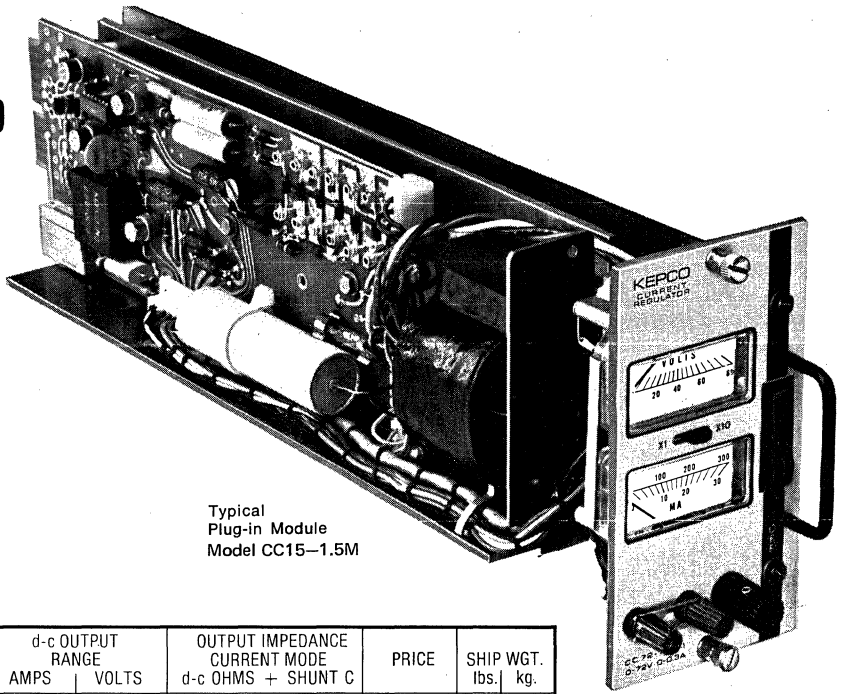
KEPCO™

CC

CONSTANT CURRENT

POWER SUPPLIES

The CC plug-in modules are current controllers with built-in dual-range, current-sensing resistors and 10-turn control. They employ Kepco's monolithic linear I-C amplifier driving a self-cooled NPN series transistor-regulator. Capacitorless output filtering ensures rapid recovery from switching or load transients. Output current ranges from true zero (no minimum) to the selected range (10% or 100% of the current rating) with 10-turn resolution. Metering is isolated by means of an I-C voltage follower.



Typical
Plug-in Module
Model CC15—1.5M

MODEL	d-c OUTPUT RANGE AMPS	VOLTS	OUTPUT IMPEDANCE CURRENT MODE d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
CC 7—2M	0—2	0—7	35 kΩ + 8.0 μF	$220.00	8	3.6
CC 15—1.5M	0—1.5	0—15	100 kΩ + 3.0 μF	220.00	8	3.6
CC 21—1M	0—1	0—21	200 kΩ + 2.0 μF	220.00	8	3.6
CC 40—0.5M	0—0.5	0—40	800 kΩ + 1.0 μF	220.00	8	3.6
CC 72—0.3M	0—0.3	0—72	2.4 MΩ + 0.6 μF	220.00	8	3.6
CC 100—0.2M	0—0.2	0—100	10 MΩ + 0.4 μF	220.00	8	3.6

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SPECIFICATION		OUTPUT EFFECTS CURRENT MODE
SOURCE: 105—125/210—250V a-c		<0.0005% or 0.2 μA[1]
LOAD: 10% load — 100% load		<0.005% or 2 μA[1]
TIME: 8-hours [drift]		<0.02% or 2 μA[1]
TEMPERATURE: Per °C		<0.01%
UNPROGRAMMED OUTPUT DEVIATION:[2] (Ripple and noise)	rms	<0.02% of selected scale
	p-p[3]	<0.1% of selected scale

[1] Whichever is greater.
[2] One terminal grounded or connected so that the common-mode current does not flow through the load or through the sensing resistor.
[3] 20 Hz to 10 MHz.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz, 1ø.

TEMPERATURE, AMBIENT OPERATING: −20°C to +65°C.

TEMPERATURE, STORAGE: −40°C to +85°C.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CONTROLS: A panel mounted output range selector switches the output either 0—100% I_o max. or 0—10% I_o max. A 10-turn precision current control operates full span through either range. Resolution: 0.05% of the full scale value. A combination on-off slide switch and pilot light provides primary power control.

PROGRAMMING: Control loop uses 0.1 milliampere, current sample is approximately 1V d-c. Supply may be programmed through either current range by a 0-10,000 ohm rheostat. (range switch is not programmable).

MAXIMUM CAPACITIVE LOADING: 0.001 microfarads.

CURRENT RECOVERY (for step load voltage): <2 μsec/volt, except Model CC 7-2M: 4 μsec/volt, measured to the first time constant on the exponential response.

VOLTAGE LIMITING: Fixed at approximately 150-200% of the rated compliance voltage.

SERIES/PARALLEL: Parallel operation of current sources may be made without restriction. Series operation through the use of master-slave interconnection.

COOLING: Convection.

METERS: Two 2% recessed meters monitor output current and compliance voltage. Current is displayed on a dual-scale meter whose range is switched with the range switch. Both meters employ an isolation amplifier to minimize the loading error.

TERMINALS: Output terminals (shorted) are located on the front panel, a-c input, output and control terminals are via a rear PC connection which mates with the connector mounted in the various housings and rack cabinets. These connectors are, in turn, wired to barrier strips for easy access.

DIMENSIONS: 5 7/32" H x 2 25/32" W x 15" D (behind panel)

FINISH: *Panel:* Light gray, color 26440, per Fed. Std. 595.
Housings: Charcoal gray texture.

MOUNTING: Power supplies are uncased, must be plugged into one of the following available housings: CA-3; single, CA-4; dual, CA-5; triple or RA 22-6 and RA-32. *(See Hardware Section).*

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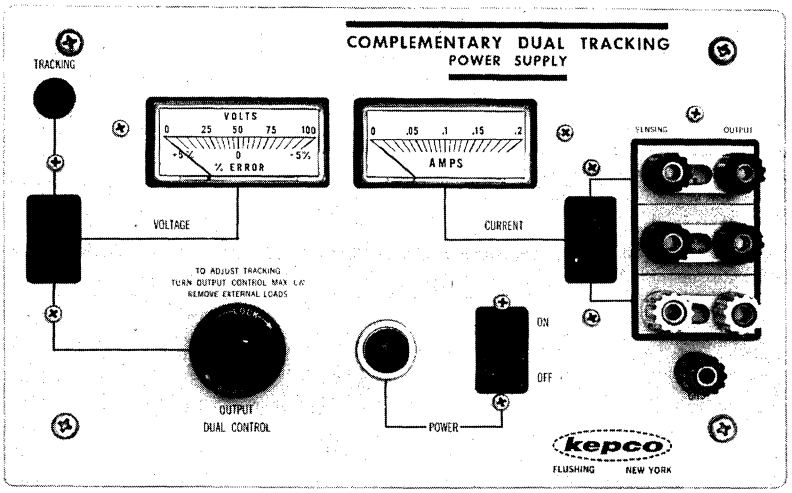
KEPCO CDT

DUAL TRACKING

POWER SUPPLIES

The complementary dual-tracking power supplies consist of two regulators coupled together in a complementary manner using a common reference and a single output voltage control. They may be used to drive independent plus (+) and minus (—) loads or may be used in series for double voltage to a single load.



Model CDT 100—0.2M

MODEL	OUTPUTS (1) COMPLEMENTARY VOLTS	COMPLEMENTARY AMPS	SERIES VOLTS	SERIES AMPS	VOLTAGE MODE dc OHMS + SERIES L	PRICE	SHIP WGT. lbs.	SHIP WGT. kg.
CDT 15—1.5M	0—±15	0—±1.5	0—30	0—1.5	1 mΩ + 1 μH	$440.00	22	10
CDT 40—0.5M	0—±40	0—±0.5	0—80	0—0.5	8 mΩ + 1 μH	440.00	22	10
CDT 100—0.2M	0—±100	0—±0.2	0—200	0—0.2	50 mΩ + 1 μH	440.00	22	10

(1) Each power supply contains two sources with a common voltage control, and may be used as complementary (plus and minus) supplies, or in series for double voltage.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE COMPLEMENTARY (2)	SERIES
SOURCE: 105—125/210—250V a-c		<0.005%	<0.005%
LOAD: No load — full load		<0.01% or 1 mV(3)	<0.01% or 2 mV(3)
TIME: 8-hours [drift]		<0.01% or 2 mV(3)	<0.01% or 4 mV(3)
TEMPERATURE: Per °C		<0.01%	<0.01%
UNPROGRAMMED OUTPUT DEVIATION:(4) (Ripple and noise)	rms	<0.25 mV	<0.5 mV
	p-p(5)	<2.5 mV	<5.0 mV

(2) Specifications are for the individual supplies. Changes in the master supply (plus output) are repeated 1:1 in the slave supply.
(3) Whichever is greater.
(4) One terminal grounded so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.
(5) 20 Hz to 10 Hz.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz.

TEMPERATURE, AMBIENT OPERATING: —20°C to +65°C.

TEMPERATURE, STORAGE: —40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

OUTPUT: The individual power supplies are wired in series, controlled with a single voltage control. They may be loaded in series or separately.

CONTROLS: A 10 turn voltage control adjusts the output of the positive supply, designated "master", this voltage in turn controls the negative supply or "slave" in a 1:1 ratio. The two power supplies are connected in series. Control resolution is 0.05%.

TRACKING: ±5% range of adjustment is controlled by a recessed front panel control. Units can be adjusted to within ±0.5% using panel meter. Closer adjustment with external instrumentation.

PROGRAMMING: The master supply can be controlled by resistance or external voltage signals. Control current is 1 mA with built-in calibration control (1000 ohms/V). The plus output terminal is the programming return.

VOLTAGE RECOVERY, (for step load current): <50 μseconds.

CURRENT LIMITING: Each supply is individually limited with a 10% to 105% range of adjustment.

REMOTE ERROR SENSING: Compensates for up to 0.5 volt drop per output lead.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting. Negligible below 25% when preloaded to 10% minimum.

METERS: Voltmeter monitors output of MASTER, or the difference between MASTER and SLAVE, displayed as a percentage error (range ±5%). Ammeter monitors current from either supply (selectable).

TERMINALS: Binding posts on the front panel for plus, common and minus outputs, also sensing terminals and separate ground. Barrier strip at the rear has duplicate output, sensing and control terminals.

DIMENSIONS: 5 7/32"H x 8 11/32"W x 17 3/8"D (behind panel)

FINISH: *Panel:* Light gray Color 26440 per Fed. Std. 595.
Case: Charcoal gray texture.

MOUNTING: Rack adapter RA-24 or RA-32.

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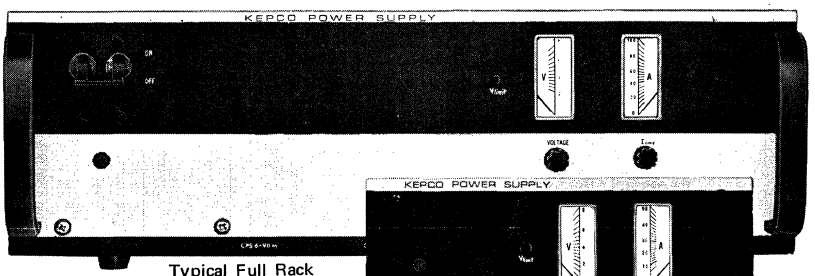
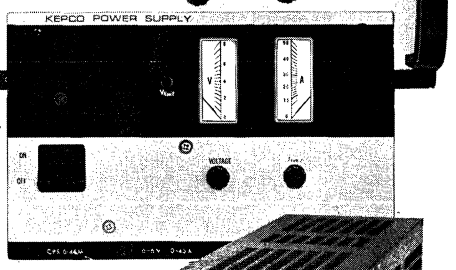
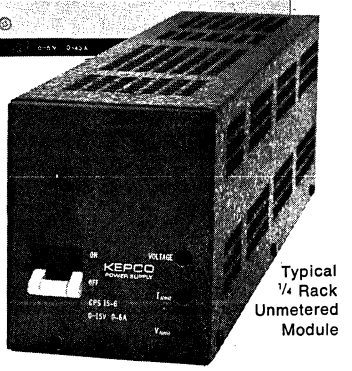
KEPCO CPS
COMPUTER I-C
POWER SUPPLIES



Typical Full Rack Model



Typical ½ Rack Model



Typical ¼ Rack Unmetered Module

CPS Power Supplies are especially designed for driving digital I-C's. They feature an integral overvoltage crowbar and a linear full-dissipation series NPN transistor-regulator driven by a monolithic linear amplifier. On/off switching and crowbar reset is accomplished by a panel-mounted circuit breaker. The metered models feature panel-mounted, 10-turn voltage controls and dual meters. The CPS Power Supplies are also available unmetered, in modular form for OEM's with controls recessed.

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE d-c OHMS + SHUNT C	SIZE	PRICE	SHIP lbs.	WGT. kg.
CPS 6–10M	0–6	0–10	30 μΩ + 1 μH	50 kΩ + 3 kμF	¼	$ 399.00	19	8.6
CPS 6–22M	0–6	0–22	14 μΩ + 1 μH	23 kΩ + 5.8 kμF	½	650.00	42	19.1
CPS 6–45M	0–6	0–45	7 μΩ + 1 μH	11 kΩ + 8 kμF	½	750.00	56	25.4
CPS 6–90M	0–6	0–90	3.5 μΩ + 1 μH	5.5 kΩ + 17.6 kμF	Full	1,150.00	103	46.8
CPS 15–6M	0–15	0–6	125 μΩ + 1 μH	83 kΩ + 1 kμF	¼	399.00	19	8.6
CPS 15–12M	0–15	0–12	63 μΩ + 1 μH	42 kΩ + 2.9 kμF	½	650.00	42	19.1
CPS 15–25M	0–15	0–25	30 μΩ + 1 μH	20 kΩ + 4.5 kμF	½	750.0	56	25.4
CPS 15–50M	0–15	0–50	15 μΩ + 1 μH	10 kΩ + 12 kμF	Full	1,150.00	103	46.8

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE (1)	OFFSET VOLTAGE ΔEio	OFFSET CURRENT Δiio	VOLTAGE REFERENCE (INTERNAL)
SOURCE: 105–125/210–250V a-c		<0.0005%	<0.005%	<10 μV	<2 nA	0.0001%
LOAD: No load – full load		<0.005% or 0.2 mV(2)	<0.01%	<200 μV	<5 nA	–
TIME: 8-hour [drift]		<0.01% or 1 mV(2)	<0.02%	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C(3)		<0.01%	<0.02%	<20 μV	<5 nA	0.005%
UNPROGRAMMED OUTPUT DEVIATION:(4) (Ripple and noise)	rms	<0.2 mV	<0.02% of I_o max	–	–	–
	p-p(5)	<2.0 mV	<0.2% I_o max	–	–	–

(1) External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.
(2) Whichever is greater.
(3) Typical temperature effect coefficients are: 0.005% per °C voltage mode; 0.01% per °C externally sensed current mode. See option "–T."
(4) One terminal grounded or connected so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.
(5) 20 Hz to 10 MHz.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) may be connected between either terminal and the case.

METERS: Two dual range, 2-inch, ±3% recessed meters, monitor output voltage and current. Unmetered versions available as modules, delete suffix "M" and deduct $30.00 from listed price (any quantity).

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-65 Hz, 1Ø.

TEMPERATURE: AMBIENT OPERATING: –20°C to +71°C

TEMPERATURE, STORAGE: –50°C to + 85°C

COOLING: Forced air, built-in blower.

CONTROLS: *Voltage:* 10-turn, wirewound rheostat.
Resolution: 0.05%.
Current: Multiturn vernier potentiometer.

Unmetered models (without suffix M) are designed for chassis mounting as modules and have their voltage control and current limit control recessed.

PROGRAMMING: Control loop uses 1 milliampere. Supply may be programmed by resistance at 1000 ohms per volt, or may be operationally controlled as an amplifier (common positive) using voltage or current signals.

VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 2 mV of setting.

OVERSHOOT (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.

CURRENT LIMITING: Adjustable from 10% to 105% of the rated full current.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

SERIES/PARALLEL: Series operation to the rated isolation voltage. CPS units not suitable for paralleling.

DIMENSIONS:
¼ Rack: 5 7/32" H x 4 5/32" W x 17 3/8" D. (behind panel).
½ Rack: 5 7/32" H x 8 11/32 W x 17 3/8" D. (behind panel).
Full Rack: 5 7/32" H x 16½" W x 18 3/8" D. (behind panel).
Unmetered (modular) models:
¼ Rack: 5" H x 4 1/32" W x 17 3/8" D.
½ Rack: 5" H x 8 3/32" W x 17 3/8" D.
Full Rack: 5 7/32" H x 16½" W x 18 3/8" D.

FINISH: (Metered models only have a panel).
Panel: Light gray, Color 26440 per Fed. Std. 595.
Case: Charcoal gray texture.

MOUNTING: Full rack sized models have accessory flanges for direct installation in standard 19" racks. Unmetered CPS models are in modular form for chassis mounting or may be mounted in RA-24 or RA-32 by use of an adapter plate RAP 24-1 (for ¼ rack size) and RAP 24-2 (for ½ rack size). Full rack units are pre-drilled for Jonathan Slides 110 QD 20-1, 22-1, 24-1.

OPTIONS: (add suffix to the model number)

"–T" LOWER TEMPERATURE EFFECT COEFFICIENT: 0.005% per °C in voltage mode, 0.01% per °C in current mode. Add $30.00 to price.

"–E" OFFSET VOLTAGE NULLING: For operational programming. Zeros the fixed part of the control amplifier's voltage offset. Add $10.00 to price.

OVERVOLTAGE PROTECTOR: (built-in) An integral overvoltage crowbar is set by means of a recessed multiturn panel control. Range is from 3V d-c to the maximum voltage rating plus 10%.

Triggering Time: 5-10 microseconds with an adjustable delay to minimize the false alarm rate.

Threshold: May be set to within 5% or 0.25 volts (whichever is greater) of the power supply's output voltage.

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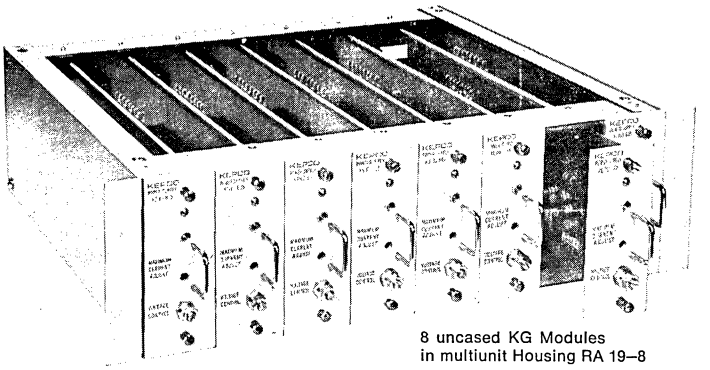
KEPCO
KG
ISOLATED
POWER SUPPLIES



8 uncased KG Modules in multiunit Housing RA 19–8

The KG isolated module is designed for driving balanced electronic circuits and bridges - often used with electromechanical transducers. The KG module offers minimal common mode line-coupled current, achieved by stringent isolation of the power transformer and line-related components, and nonmetallic, low-capacitance mounting. The modules are designed for plug-in mounting 8-abreast in a 19-inch rack or in an individual plug-in case.

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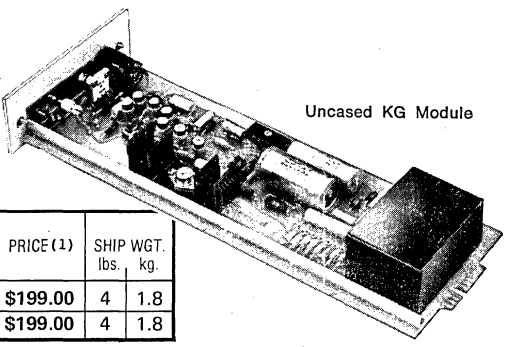
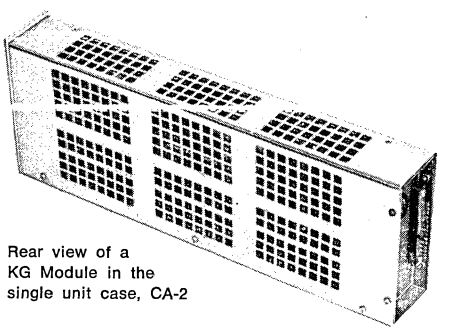


Uncased KG Module

MODEL	d-c OUTPUT RANGE VOLTS	mA	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE d-c OHMS + SHUNT C	PRICE(1)	SHIP WGT. lbs.	kg.
KG 25–0.2	0–25	0–200	0.006 Ω + 1 μH	0.5 MΩ + 500 μF	$199.00	4	1.8
KG 100–0.05	0–100	0–50	0.1 Ω + 1 μH	1.0 MΩ + 140 μF	$199.00	4	1.8

(1) Uncased, see MOUNTING below.

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	CURRENT MODE(2) (External Sensing)
SOURCE: 105–125V a-c		<0.001%	<0.001%
LOAD: No load – full load		<0.005% or 0.5 mV(3)	<0.01%
TIME: 8 hours [drift]		<0.005% or 1 mV(3)	<0.01%
TEMPERATURE: Per °C		<0.005%	<0.01%
UNPROGRAMMED OUTPUT DEVIATION:(4) (Ripple and noise)	rms	<0.1 mV	<0.01%
	p-p(5)	<1 mV	<0.1%



Rear view of a KG Module in the single unit case, CA-2

(2) At rated sample of 1 volt across the external current sensing resistor.
(3) Whichever is greater.
(4) One terminal grounded or connected so that the common-mode current does not flow through the load or (in current mode) through a sensing resistor.
(5) 20 Hz to 10 MHz.

INPUT: 105-125V a-c, 50-65 Hz, single phase.
Overseas Models: For 210-250V a-c input, consult factory.
TEMPERATURE, AMBIENT OPERATING: –20°C to +50°C.
TEMPERATURE, STORAGE: –40°C to +85°C.
COOLING: Convection.
ISOLATION: Volts: 500 volts to ground, maximum.
Ohms: 10 K megohms to ground, minimum.
Capacitance: 200 picofarads to ground, max.
LEAKAGE CURRENT TO GROUND: 100 nA rms, 1μA p-p. (115 V a-c 60 Hz source)
CONTROL RESOLUTION: 0.05%, 10-turn voltage control, screwdriver adjustment, with lock.
PROGRAMMING: KG is programmable by an external rheostat at 1000 ohms/V (option R provides a calibration control) the positive terminal is common. An offeset voltage nulling control is available, see option "E".
VOLTAGE RECOVERY (for step load current): <50 microseconds for recovery to within 0.005% or 2 mV of setting.
CURRENT LIMITING: Recessed panel adjustment from 5% to 110% of rated current.
OVERSHOOT (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.
SERIES/PARALLEL: Current limiting design permits self-determined parallel load-sharing. Series operation to rated isolation.
TERMINALS: All connections are made through printed circuit connector in housing, a-c input, d-c output, sensing and control. A blank terminal is provided which can be wired for operational control using voltage or current signals.
FINISH: Light gray, Color 26440 per Fed Std. 595.
DIMENSIONS: 5 7/32" H x 2 3/32" W x 13 19/32" D. (behind panel)
MOUNTING: The uncased KG module must be plugged into either a single unit case, CA-2 or the 8-unit rack adapter, RA 19-8. Both housings contain integral plug-in connectors. *See hardware section.*
OPTIONS: (add suffix to the model number).
"–R" CONTROL CURRENT ADJUSTMENT: ± 10% trimmer provides for programming calibration. Add $10.00 to price.
"–E" OFFSET VOLTAGE NULLING: zeros the fixed part of the control amplifier's offset voltage. Add $10.00 to price.

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KEPCO POWER SUPPLIES

KW
AUTOMATIC CROSSOVER

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE dc OHMS + SERIES L	CURRENT MODE d-c OHMS + SHUNT C	PRICE	SHIP WGT. lbs.	kg.
KW 6–600M	4–6	0–600	1 μΩ + 0.1 μH	2 kΩ + 10 kμF	$2,450.00	200	91

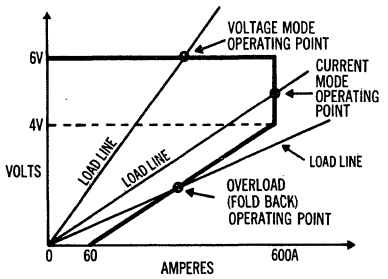


Figure 1

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE
SOURCE: 208V a-c, ±10%		<0.01%	<0.01%
LOAD: Minimum to maximum		<0.01%	<0.01%
TIME: 8-hours [drift]		<0.05%	<0.05%
TEMPERATURE: Per °C		<0.05%	<0.05%
UNPROGRAMMED OUTPUT DEVIATION[1] (Ripple and noise)	rms	<2 mV	<0.3A
	p-p[2]	<60 mV	<10A

[1] One terminal grounded, or connected so that common mode current does not flow through the load.
[2] 20 Hz to 10 MHz.

The KW is an automatic crossover, voltage/current stabilizer featuring a linear transistor *shunt* regulator functioning with a 3-phase SCR controller for exceptional efficiency. The KW has three control channels, as illustrated, a voltage control channel, a current stabilizer, and a re-entrant overload control channel. The operating mode of the power supply, a function of the load and the setting of the two controls, is signalled by means of panel-mounted LED indicators. The KW makes extensive use of plug-in linear I-C's for exceptional stability and control precision. A built-in overvoltage crowbar is standard.

VOLTAGE CONTROL CHANNEL

OUTPUT RANGE: The KW may be set or programmed over the voltage range given in the model table. For any voltage setting, KW can be operated from zero to maximum load current.

CONTROL/PROGRAMMING: Output voltage is controlled continuously through the range by a panel-mounted, 10-turn rheostat. External control can be exercised by resistance (1000 ohms per volt with a built-in calibration control) or by a control voltage. The output may be digitally controlled with an accessory Kepco type SN Digital Programmer.

REMOTE ERROR SENSING: Provision is made for a 4-terminal connnection to a load, able to compensate for static voltage drops up to 0.5 volt per lead. The voltage dropped in the power leads is subtracted from the voltage available to the load.

CURRENT STABILIZATION

The KW is equipped with a built-in current sensing and control channel for precision current stabilization with automatic crossover from and to the voltage stabilization mode.

OUTPUT RANGE: Current is controlled by a 10-turn, panel-mounted control over the range 10% I_o to 100% I_o max.

CONTROL/PROGRAMMING: Current may be externally controlled (programmed) by an external rheostat or an external resistance (5 k ohms is full scale current) or an external control voltage (5 volts d-c corresponds to full scale current).

RE-ENTRANT (FOLDBACK) OVERLOAD LIMITER: Output of the KW is bounded by a third control channel functioning as the maximum current boundary for compliance voltage less than the minimum value for current stabilization. Internally set.

MODE FLAG: KW uses three panel-mounted, light-emitting diodes (LED) annunciators to signal which mode of operation controls the output: the voltage stabilization channel, the current stabilizer, or the re-entrant foldback protector.

DYNAMICS

VOLTAGE RECOVERY FOR STEP-LOAD CURRENT:
Because the KW consists of a linear regulator combined with SCR controller, the voltage recovery time is dependent on both the size and direction of the load current step.

For a current-on step, up to 10% I_o, or a current-off step, up to 50% I_o, voltage recovery to within the load effect band (or 2 mV, whichever is greater) is less than 50 microseconds.

For a current-on step greater than 10% I_o, or a current-off step greater than 50% I_o, voltage recovery occurs in less than 50 milliseconds. Voltage overshoot amplitude for any load current-off step is limited to 0.5 volt maximum by built-in absorber circuit.

CURRENT RECOVERY FOR STEP-LOAD VOLTAGE:
A stabilized current recovers at a rate of approximately 1 second per volt of compliance change.

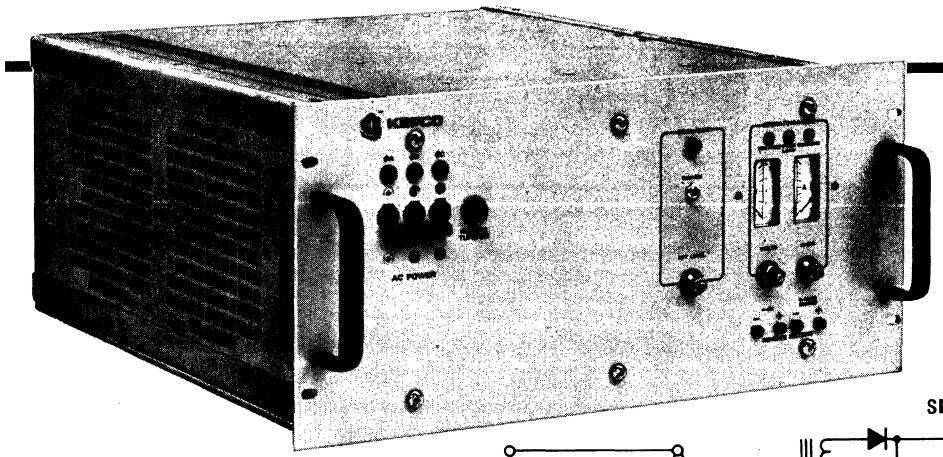
PROGRAMMING SPEED (voltage channel): KW models can be programmed at approximately 1 volt per second.

GENERAL

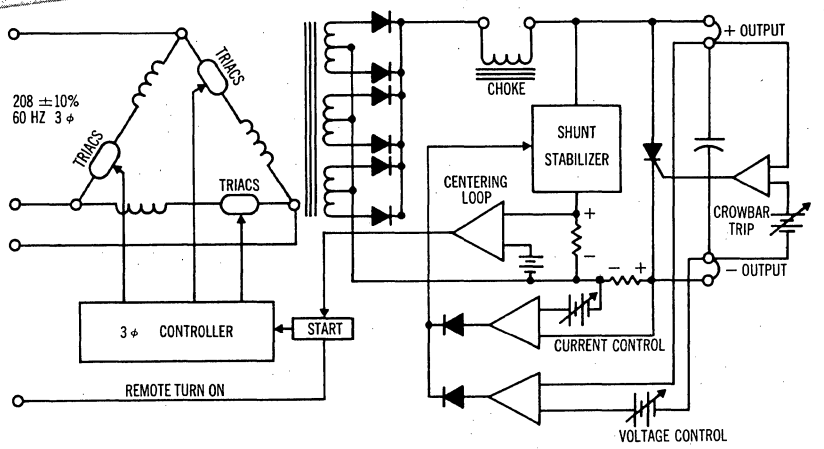
SERIES/PARALLEL: KW models can be operated together in series up to the maximum isolation-voltage. Up to 5 units can be connected in parallel. Terminals are provided for master/slave tracking and for interconnected operation of their overvoltage crowbar (necessary for parallel use).

ISOLATION FROM GROUND: The circuit and output terminals of the KW have no d-c connections to ground and may be floated up to 25 volts (d-c or peak) off ground. The common mode current from output to ground is 3 milliamperes rms, 30 milliamperes peak-to-peak at 60 Hz.

SOURCE POWER REQUIREMENTS: 208V a-c ±10%, 60 Hz ±3 Hz, 3-phase, 4-wire wye. Source power consumption is approximately 20 amperes rms per phase, 5500 watts. The KW is protected by a panel-mounted, 3-phase circuit breaker interlocked with the crowbar trip circuit. (For other source voltages consult factory.)



SIMPLIFIED SCHEMATIC DIAGRAM



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TEMPERATURE RATINGS

Storage: −40°C to +71°C.

Operating: −20°C to +71°C. Full output current is delivered at +71°C without derating. Cooling is by means of built-in, sealed-bearing blowers. The intake is on the right side (viewed from the front); the exhaust is to the left. Mounting should allow for air movement (generated by the blower) of approximately 500 CFM.

STANDARDS: KW power supplies are designed and tested in accord with the NEMA standard for stabilized power supplies, d-c output, Publication No. PY-1-1972.

TERMINALS: The main plus and minus output connections are 1½" x 2" (40 mm x 50 mm) plated copper plates fitted with 3/8" tapped inserts for the accommodation of lugs. Wire of 500,000 circular mills is recommended for the 600 ampere unit. Separate barrier-strips are provided for the a-c source power connection, for the crowbar connection, for the remote on/off connection and for the sensing and control connections.

METERS: The KW power supplies are fitted with separate 2-inch recessed ±3% voltage and current meters. Test points are provided on the panel for the connection of external measuring apparatus. The voltage monitor terminals are connected to the error-sensing point. The current monitor terminals are connected across the KW's current-sensing resistor; 50 mV equals full-scale current.

MOUNTING: KW power supplies can be rack-mounted in standard 19" equipment cabinets occupying 8 3/4" of panel height. The power supply's 200 lb. (90 kg) weight requires a rear support bracket in contact with the frame. The Kepco Model FSB Filler Support Brackets are suitable.

DIMENSIONS

English measure: 8¾"H x 19"W x 20"D (behind panel).

Metric measure: 232.3 H x 482 W x 508 mm (behind panel).

FINISH: *Panel:* Light gray Color No. 26440 per Fed. Std. 595.

OVERVOLTAGE CROWBAR/ABSORBER

A voltage-triggered crowbar/absorber is included as standard equipment on KW models. The setting adjustment and indicator are located on the front panel together with a push button that disables the absorber so that the voltage setting may be made without upsetting the output. The crowbar/absorber circuit is in two parts.

- A self-resetting absorber circuit that clamps the output at a selected level above the output setting.
- A back-up shorting crowbar that shorts the output (and turns off the circuit breaker) should the absorber circuit be unable to contain the energy of an overvoltage.

For transients, such as load-off steps greater than 50% I_o max, the absorber will clamp the maximum output amplitude to the set value—to within 0.5 volt of the output voltage setting. More durable overvoltage stresses activate the SCR crowbar and circuit breaker and require manual reset.

A feature of the KW's crowbar is the provision for remote tripping. A "trigger" terminal is provided on the rear which can be wired to as many as five other KW units in a parallel "wired-or" configuration. Any one of these crowbars tripping, simultaneously activates all of the crowbars in the system.

Crowbar/absorber setting range: 4 volts (min) to 100% E_o max. plus 0.5 volt.

Crowbar/absorber temperature effect coefficient: 0.05% per °C.

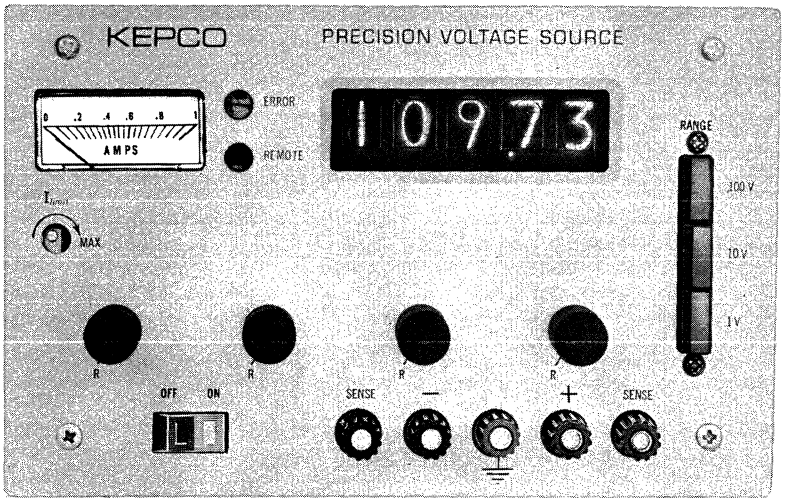
REMOTE TURN-ON: A feature of the KW is a remote turn-on circuit. With the circuit breaker "on," the KW can be activated by application of a 115V ac, 60 Hz control signal to the provided terminals; removal of this signal deactivates the KW without tripping the circuit breaker. The remote turn-on terminals can be permanently wired from one a-c line to neutral if its operation is not desired. An alternate remote turn-off technique is to short the crowbar trigger terminal-to-common. This, however, requires that the circuit breaker be reset.

KEPCO PVS

PRECISION VOLTAGE SOURCE

POWER SUPPLIES

- *4 digit output selection*
- *3 decimal range selection*
- *BCD programming (switch closures)*
- *digital display*
- *current limiting*



Model PVS 100–1M — Price: $975.00 — Ship Wgt.: 37 lbs.

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The PVS Precision Voltage Source features an extremely low drift linear amplifier driving a self-cooled NPN power transistor stage. Voltage control is by means of digitally selected (1–2–4–8 BCD) precision–low TC, high stability feedback resistors with a 3-decade oven-controlled reference. Output is displayed on a 4½ digit readout with a built-in error-detecting system to prevent false indication. Output current is metered and the limit is adjustable. A remote digital programming connector is fitted to the voltage control (BCD switch closures). The 0.02% overall accuracy qualifies the Precision Voltage Source as an instrument calibrator.

OUTPUT:	0.0000–100.00 volts
CURRENT:	0–1 ampere

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE
SOURCE: 105-125/210-250V a-c	<0.0005%
LOAD: No load – full load	<0.001% or 0.1 mV*
TIME: 8-hours (drift)	<0.01% or 1 mV*
TEMPERATURE: Per °C	<0.005% per °C
READOUT ACCURACY:	0.02% of full scale
RESOLUTION:	100 microvolts
RIPPLE: (rms)	<100μV rms
OUTPUT IMPEDANCE:	d-c–1kHz: $10^{-3}\Omega$ 1kHz–100kHz: $10^{-2}\Omega + 1\mu h$

**whichever is greater*

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz, 1Ø.

TEMPERATURE, AMBIENT OPERATING: –20°C to +55°C (no derating)

TEMPERATURE, STORAGE: –40°C to +85°C

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) may be connected between either terminal and the case.

CONTROLS: Four (4) 10-position rotary switches select voltage in conjunction with three push button decimal range selectors. A recessed current limit control is accessible through the front panel.

OVERRANGE: 10% overrange on each range; *e.g.*, 1.099V, 10.999V and 109.99 volts (derate current to 0.6 amperes at 109.99 volts).

PROGRAMMING: External switch closures will program the output in a 1-2-4-8 BCD code.

CURRENT LIMITING: Recessed multiturn trimmer adjusts the current limiting from 10% to 105% I_O max.

VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 0.005% or 2 mV of setting.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead. Error sensing terminals located on the front panel.

OVERSHOOT (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.

DISPLAY: The digital display indicates the setting of the four voltage control switches. Output current is indicated on a 2 inch, ±3% recessed ammeter.

TERMINALS: Binding posts on the front panel, plus/minus, ground and error sensing. Connections at the rear for output, error sensing and programming functions.

DIMENSIONS: 5¾" H x 8⅞" W x 17⅞" D (behind panel).

FINISH: *Panel:* Light gray, Color 26440 per Fed. Std. 595.
Case: Charcoal gray texture.

MOUNTING: Fits RA-24 and RA-32 rack adapters.

Data and prices subject to change without notice.

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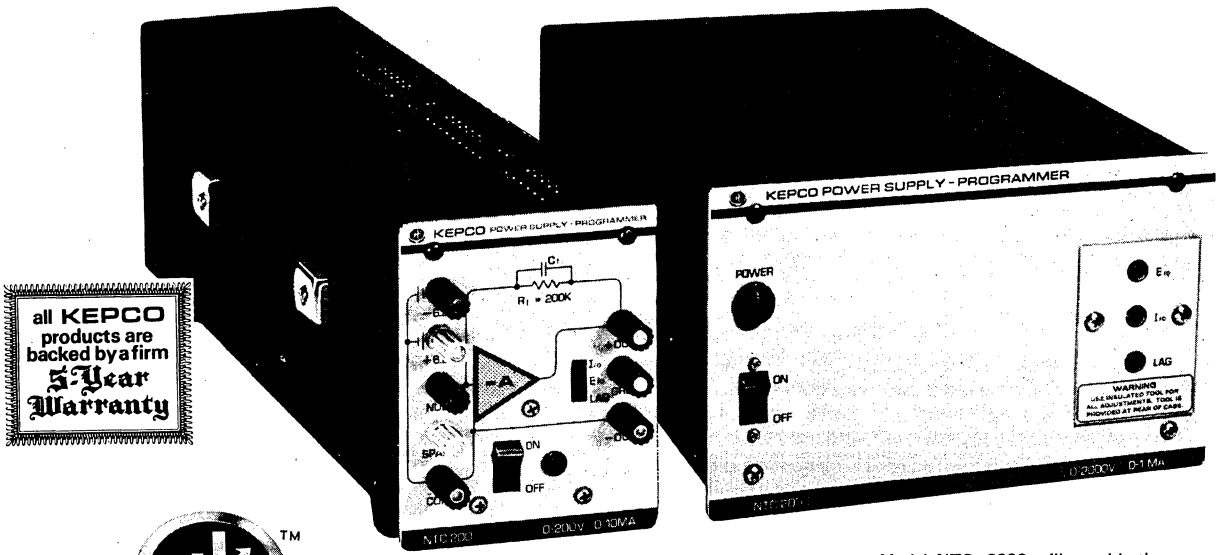


all KEPCO products are backed by a firm 5-Year Warranty

Model NTC—200 will provide the programming interface for power supplies up to 200 volts, including models in the CPS, JQE, OPS, PAT, and PCX Design Groups.

Model NTC—2000 will provide the programming interface for power supplies up to 2000 volts, including models in the ABC (Hybrid),HB,BHK,and OPS(Hybrid) Design Groups.

KEPCO NTC PROGRAMMING INTERFACE

The Kepco NTC is a power supply—to programmer interface that provides a convenient solution to the problem of mixed grounds with *common—positive* d-c power supplies. The NTC is an operational inverting amplifier which boosts a programming signal to the desired *voltage* level, then couples this signal to the noninverting voltage repeater (feedback) terminals of the power supply. By this means, the *negative* output terminal of the power supply is made electrically common to the signal source.

MODEL	d-c OUTPUT RANGE VOLTS	mA	RIPPLE rms	SLEWING RATE	MAX. INPUT AMPS at 125 V a-c	PRICE	SHIP. WGT. (lbs.)
NTC—200	0—200	0—10	0.01%*	1V/μsec.	0.25	$190.00	11
NTC—2000	0—2000	0—1	0.01%*	3V/μsec.	0.3	325.00	21

**or 5 mV, whichever is greater.*

SPECIFICATION	VOLTAGE AMPLIFIER OFFSETS ΔE_{io}	ΔI_{io}	REFERENCE (±6.2V)
SOURCE: 105—125/210—250V a-c	<100 μV	<10 nA	0.0005%
LOAD: No load — full load	<1 mV	<10 nA	——
TIME: 8-hours [drift]	<20 μV	<5 nA	0.005%
TEMPERATURE: Per °C	<20 μV	<5 nA	0.005%

Offsets and the reference contribute to output change ΔE_o, by the equation $\Delta E_o = \pm\Delta E_{ref}(R_f/R_i) \pm\Delta E_{io}(1+R_f/R_i) \pm\Delta I_{io}(R_f)$ where R_f is the feedback resistor and R_i is the input resistor from the signal reference. Use the offsets to calculate output variations when external input/feedback elements are substituted for the internal reference and voltage control in special applications.

SIGNAL INPUT: 0—1 milliampere, current driven into zero ohms. A voltage signal is connected to the NTC through a coupling resistance such that the peak input current is 1 milliampere. [Example: 0—10V signal, 10 K ohm input resistance.]

SIGNAL OUTPUT: 0—100% E_o maximum at rated current. The output of the NTC may be used directly to drive loads whose current requirements are small and can be accommodated by the respective ratings. The intended application, however, is for the NTC output to drive the voltage repeater [feedback] terminals of a suitable power supply.

OPEN LOOP d-c GAIN: $>0.5 \times 10^6$ volts per volt.

SINUSOIDAL FREQUENCY RESPONSE: [E_{pp} is the peak-to-peak voltage excursion.] $f_{max.} = \dfrac{\text{Slew Rate}}{\pi E_{pp}}$

MAXIMUM CAPACITIVE LOADING: 0.001 microfarad. Capacitance in excess of this value will slow the response, cause peaking, and reduce the stability margin. An adjustable network is provided to compensate for a small range of reactance.

REFERENCES: Two +6.2 volts [nominal] and -6.2 volts [nominal] at 1 milliampere maximum.

POWER INPUT: 105—125V a-c or 210—250V a-c [selected], 50—65 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING: -20°C to +65°C.

TEMPERATURE, STORAGE: -40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts for Model NTC—200, or 1000 volts for Model NTC—2000 (d-c or peak) can be connected between either output terminal and the case.

TERMINALS: Front panel binding posts and rear barrier-strip duplicate all functions on NTC—200. The NTC—2000 has a rear barrier-strip only.

DIMENSIONS: NTC—200: 5¾" x 4½" x 17⅜"
NTC—2000: 5¾" x 8⅝" x 12⅞"

FINISH: *Panel:* Light gray, Color 26440 per Fed. Std. 595.
Case: Charcoal gray texture.

MOUNTING: Units may be rack-mounted with Adapter RA—24 or RA-32.

to create a digitally programmed power system

with the KEPCO

DPD DPR DPK

To create a digitally programmed power system with the Kepco DPD/DPR/DPK, the first step is to decide just how much of a complete programming system you'll actually need. Then, you need the power supply, which should be selected from among the hundred or so models in Kepco's OPS or BOP groups. The OPS models are high-speed, unipolar power supplies/amplifiers; the BOP models are bipolar.

Then, depending on the range of voltage you want to control, choose a DPD (Digital Programming Decade).

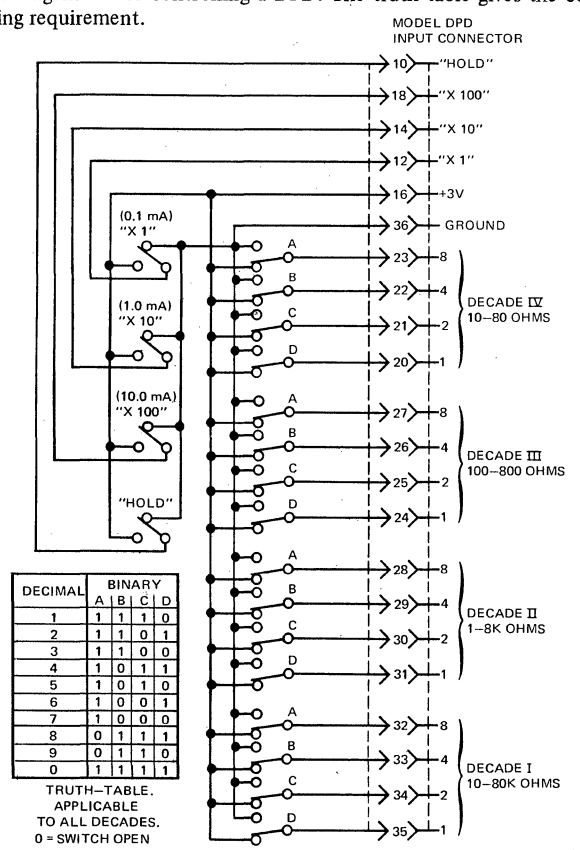
For control in the 0–10 volt range, select Model DPD–6, which offers 3½-digit resolution with three ranges.

For control in the 0–100 volt range, there's a choice:
Model DPD–5, 3½-digit resolution with three ranges.
Model DPD–2, 4½-digit resolution with three ranges.

To control power supplies in the 0–1000 volt range choose:
Model DPD–4, 3½-digit resolution with three ranges.
Model DPD–1, 4½-digit resolution with three ranges.
Model DPD–3, 5½-digit resolution with three ranges.

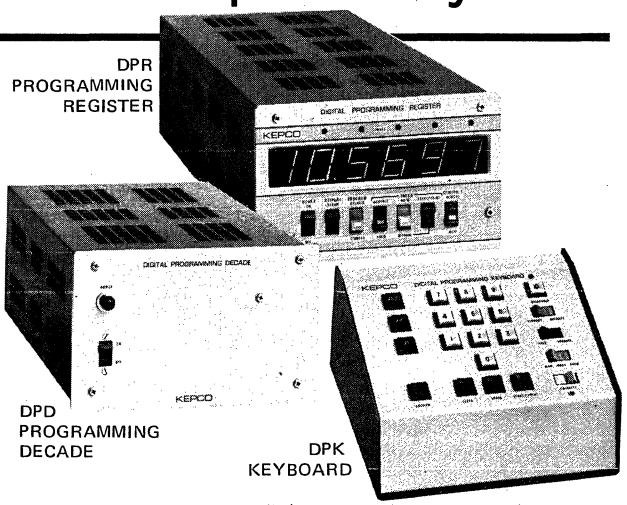
A separate Model DPD–7 is provided for controlling current. This unit offers 3½-digits of resolution with two ranges. Current is controlled indirectly, by controlling a signal which corresponds to the full scale current of the selected power supply.

If the digital signal source is—or can be arranged as—parallel data (either 3 volt logic levels or switch closures), then the selected DPD is a sufficient programmer. The figure below shows a typical switch arrangement for controlling a DPD. The truth table gives the coding requirement.

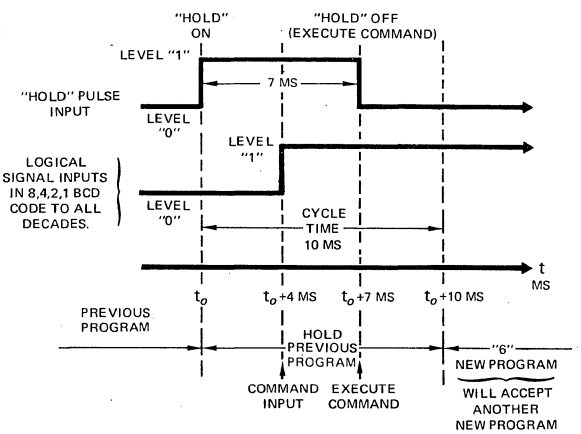


DECIMAL	BINARY A	B	C	D
1	1	1	1	0
2	1	1	0	1
3	1	1	0	0
4	1	0	1	1
5	1	0	1	0
6	1	0	0	1
7	1	0	0	0
8	0	1	1	1
9	0	1	1	0
0	1	1	1	1

TRUTH–TABLE. APPLICABLE TO ALL DECADES.
0 = SWITCH OPEN
1 = SWITCH CLOSED



To avoid switching "glitches" (overshoot or undershoot), the data signals (or switch closures) should be sequenced with a "hold" pulse which temporarily holds the previous program while the DPD is switching to a new instruction. The DPD requires approximately 10 ms to stabilize at a new level—before a new instruction can be given.



If the digital signals or data are in serial form; that is, they arrive a digit at a time as from a punched tape or keyboard, then an accumulator is necessary, one of the various DPR models. There are three of them offering 3½-, 4½-, or 5½-digit storage to work with the corresponding DPD.

The DPR features a moving index light which sequentially progresses from register to register filling it with an individual digit so as to compose a complete 3½-, 4½-, or 5½-digit numeric instruction. Normally, the index advances one space with each input—though it can be held at will to allow an operator to rapidly run through a selection of numbers for that specific digit. DPR will accept ranging instructions, will display the correct decimal place on the segmented readout, and offers such other features as a *"preview"* opportunity and an automatic stop to avoid erasing data already in storage.

The keyboard, Model DPK–1, provides a manual input for the DPR and is a recommended accessory for setting up programs outside of a machine control loop.

Together with a DPR, and DPD and, of course, a selected power supply, the keyboard provides a very effective means for keying in voltage control data. Your operator can quickly and accurately punch-up the desired number and preview it (that means you can see your program without actually controlling the power supply, allowing an edit, if neccessary). This method of selecting multi-digit numbers—or of switching between two such numbers—is much, much faster and far more accurate than knob-twiddling and frees your DVM to other more rewarding tasks.

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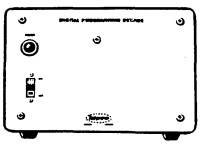
KEPCO

digital programming system



DIGITAL PROGRAMMING DECADE

A DPD accepts parallel data signals, generated by a switch matrix, or provided by the companion register, DPR, and selects the appropriate precision feedback resistor to control the voltage (or current) of the operationally programmable power supply to which it is connected. Three levels of control (bridge) current can also be called up from the built-in oven-stabilized reference to provide 3-decade ranging.

DATA INPUT: Four lines/digit, 1 line data transfer "hold," 3 lines ranging and common.

Logic "0": 0 to 0.3V d-c. **Logic "1":** 1 to 3V d-c at 3 k ohms.

NOTE: Switch closures, together with built-in 3V logic source can be used to create input data.

DATA OUTPUT: Selection of feedback resistance and control current for connection to an operationally programmable power supply in place of that power supply's internal reference and feedback elements.

MODEL	DPD OUTPUT RANGE "x1"	"x10"	"x100"	PRICE	SHIP WGT. lbs.	kg.
DPD–1 (4-Digit)	10.999 V	109.99 V	1099.9 V	$846.00	19	8.5
DPD–2 (4-Digit)	1.0999V	10.999V	109.99V	787.00	19	8.5
DPD–3 (5-Digit)	10.9999V	109.999V	1099.99V	899.00	19	8.5
DPD–4 (3-Digit)	10.99 V	109.9 V	1009.9 V	760.00	19	8.5
DPD–5 (3-Digit)	1.099 V	10.99 V	109.9 V	707.00	19	8.5
DPD–6 (3-Digit)	0.1099V	1.099V	10.99V	707.00	19	8.5
DPD–7 (Current)	0.1099V	1.099V	——	675.00	19	8.5

TIMING: The sequence of instructions to DPD require that the data transfer hold precede the change-of-data instructions, and persist for 10 milliseconds, so that the instructions are executed with "dry circuit" relays. This sequencing (which is built into the companion DPR) avoids switching glitches and contact wear.

OUTPUT RANGE: Each DPD will program a suitable power supply over the range shown in the chart–which includes a 10% overrange capability. The Model DPD–7, a 3-digit instrument for control of current, has two decimal ranges; all other units have three decimal ranges. When controlling current with a DPD–7, a *current code board* is required, compatible with the current rating of the power supply being controlled. Specify the appropriate current code board by appending a suffix number to the DPD–7 model, a number equal to the *ampere* rating of the supply being controlled. The code board is required for the numeric display of a companion DPR–3 to correspond to the actual current being programmed.

POWER REQUIREMENTS:
115V ±10V a-c or 230V ±20V a-c, 50–440 Hz single phase.

DIMENSIONS: 5 7/32"H x 8 1/32"W x 12 7/8"D.
Rack mount with Model RA–24 adapter.

DIGITAL PROGRAMMING REGISTER

FUNCTION: The registers accept serial inputs of binary coded decimal programming signals, display and store them, and provide a parallel output signal to a DPD decade for the purpose of controlling a power supply. The models DPR are used for the storage and display of digital input information within a complete Digital Programming System.

MODEL	NUMBER OF DISPLAY REGISTERS	PRICE	SHIP WGT. lbs.	kg.
DPR–3	3 + Overrange	$ 980.00	30	13.6
DPR–4	4 + Overrange	1,090.00	30	13.6
DPR–5	5 + Overrange	1,200.00	30	13.6

INPUT

Serial Format:
Logic "0": 0–0.3V.
Logic "1": 1–3V.
Input impedance: 1.5 k ohms.

Data lines:

Decimal input:	10 lines
BCD input:	5 lines
Range select:	3 lines
Function:	5 lines

OUTPUT

Parallel Format:
Logic "0": 0–0.3V.
Logic "1": 1–3V.
Output impedance: 640 ohms.

Data lines:

DPR–3:	12 + 1 common
DPR–4:	16 + 1 common
DPR–5:	20 + 1 common

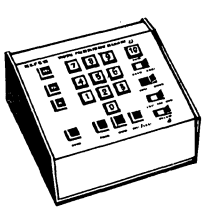
INPUTS: Inputs may be provided by a Model DPK–1 Keyboard or other inputs, such as magnetic or punched tape or code generators.

OUTPUTS: The DPR's provide parallel output data for presentation to a programming decade of the DPD Series. Simultaneously, a readout is provided on the front panel consisting of a segmented numeric display, decimal point and index indicator. The index identifies the register next in line to receive a command.
The DPR provides the logical sequencing of its companion DPD for each command change. At the instant of switching, timing signals from the DPR instruct the DPD to "hold" while new command levels are established. This sequenced action prevents discontinuities in the output.

POWER REQUIREMENTS: 115V a-c ±10V a-c or 230V a-c ±20V a-c, 50–440 Hz, single phase.

DIMENSIONS: 5 7/32"H x 8 1/32"W x 12 7/8"D. Rack mount with RA–24 adapter.

FINISH: *Panel:* Light gray, Color 26440 per Fed. Std. 595.
Cover: Charcoal gray texture.



DIGITAL PROGRAMMING KEYBOARD

FUNCTION: To control the output of a regulated d-c power supply with a keyboard through the DPR logic and DPD Programming Decade. DPK–1 is a manual input–in serial form–for the DPR registers.

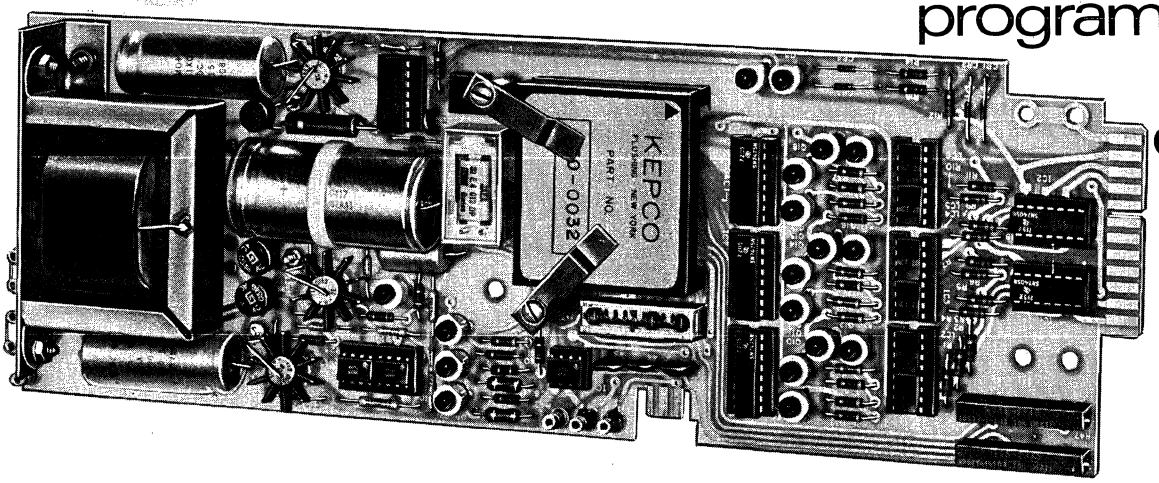
DESCRIPTION: The DPK–1 uses keys to generate decimal code and register control signals, which are shaped and processed for delivery to the DPR storage register. Model DPK–1 will program registers DPR–3, DPR–4 and DPR–5.

POWER: Supplied from DPR.

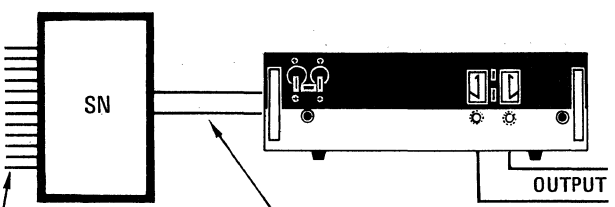
COMMANDS: Ten-digit decimal signals, three ranges, Space, Clear, Start/Print, Index, Hold/Advance, Standby/Operate, Preview, Polarity.

DIMENSIONS: 4 5/16"H x 8 1/32"W x 7 5/8"D. Ship. wgt: 7 lbs./3.2 kg.
Rack mount with RA 29–1. **Price: $247.00.**

the KEPCO SN programmer on a card



The SN System for digital control of power supplies is comprised of a single printed circuit card containing a line-powered, digital-to-analog converter (DAC) isolated by means of opto-couplers from the data input lines, plus data storage facilities and analog ranging provisions.



SN's are available with 2- or 3-digit BCD input or 8-, 10-, and 12-bit binary resolution.

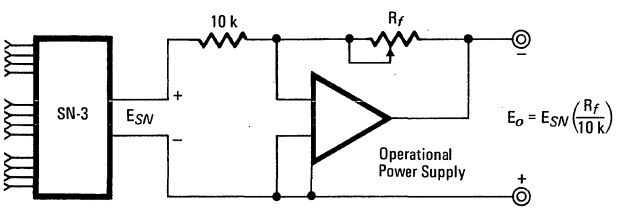
A simple 2-wire connection communicates with the selected power supply.

The selected SN (there are five units, different by reason of their resolution and data coding) can control any operationally programmable power supply—or other instrument—by producing an analog voltage (0 to 10 volts or ±10 volts) which the power supply "amplifies" as a d-c amplifier to any desired full-scale value. A big feature of the SN's is their speed: 26 microseconds (including a 6-microsecond deglitching delay). So, a logical choice of power supply would be from among Kepco's wide variety of OPS and/or BOP models, whose response to a step instruction ranges from 50 to 100 volts per millisecond up to 9 volts per microsecond! If speed is not a consideration, the SN will successfully drive any programmable conventionally filtered power supply with substantial output capacitance.

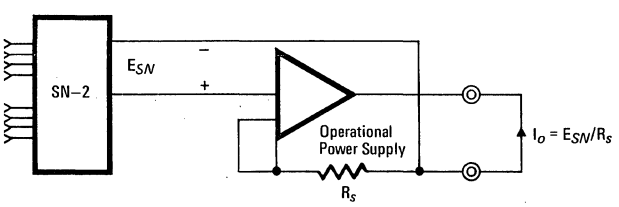
The 1000 volts of optically-derived isolation in an SN programmer allows you to ground either side of a power supply's d-c output without concern for the grounding of the digital side.

Your selection of the proper SN is based on resolution requirements and the nature of the data coding available. There are two models for binary coded decimal, SN–2 (2-digit) and SN–3 (3-digit), offering 1% and 0.1% resolution, respectively. Three binary models are also offered, Models SN–8, SN–10 and SN–12, 8-bit, 10-bit and 12-bit, respectively. (12-bits correspond to 0.0244% resolution.)

PROGRAMMING VOLTAGE WITH AN SN AND AN OPERATIONAL POWER SUPPLY



PROGRAMMING CURRENT WITH AN SN AND AN OPERATIONAL POWER SUPPLY



The binary models can be *offset* for bipolar control of the Kepco bipolar power supplies in the BOP series; This is accomplished by an internal selector which expands the range to −10 volts to +10 volts. The most significant bit (which selects half output) provides the zero selection. Resolution in either the positive half or the negative half of the output range is, therefore, reduced by one bit.

Ranging: All models contain an internal selector to provide for either 0–10 volt, 0–1 volt or 0–0.5 volt full scale output (plus the ±10 volt range available in the binary models only). This selection allows you to use an SN for the control of a power supply's current. In Kepco power supplies where the current control channel is programmable, a 0–1 volt or 0–0.5 volt signal is typically used for external control (0–1 volt for models less than 5 amperes, 0–0.5 volt for models 5 amperes and over).

Additionally, the SN–3, SN–10 and SN–12 models have a logic-programmable 10:1 range selector which can be used to provide a movable decimal point for expanded low-range resolution.

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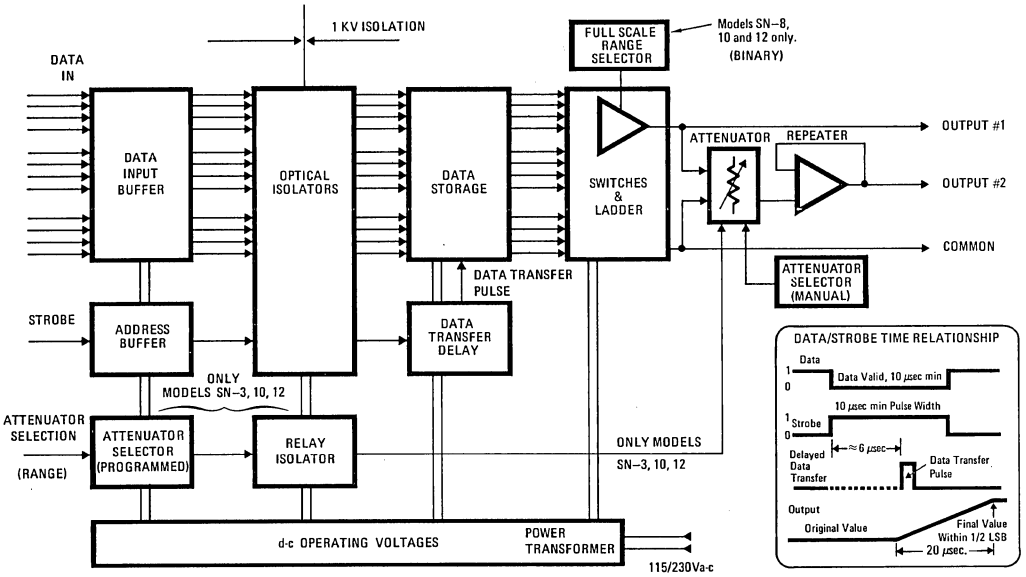
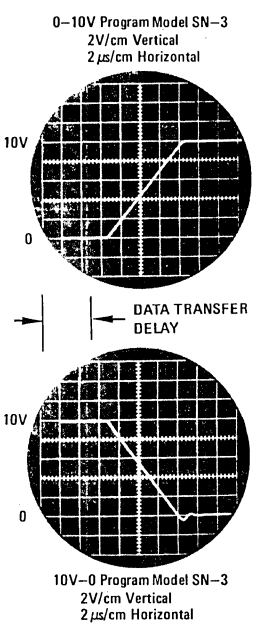




SPECIFICATIONS	MODEL SN–2	MODEL SN–3	MODEL SN–8	MODEL SN–10	MODEL SN–12
RESOLUTION	2-Digit	3-Digit	8-Bit	10-Bit	12-Bit
INPUT DATA CODING	Complementary Binary Coded Decimal 4 Lines per Digit 8–4–2–1		Bipolar Output: Complementary Offset Binary Unipolar Output: Complementary Binary		
OUTPUT NO. 1	0 to +10V	0 to +10V	0 to +10V	0 to +10V	0 to +10V
FULL SCALE RANGE SELECTOR	–	–	±10V; ±5V	±10V; ±5V	±10V; ±5V
OUTPUT NO. 2	Output No. 2 is equal to Output No. 1 (whichever scale selected) multiplied by selected or programmed attenuation ratio.				
ATTENUATOR SELECTOR (Manual)	1:1;		10:1;		20:1
PROGRAMMABLE RANGING	–	1:1; 10:1	–	1:1; 10:1	1:1; 10:1
ACCURACY @ 25°C (% of full scale reading) SCALE FACTOR ERROR[1]	±0.2%	±0.1%	±0.1%	±0.1%	±0.05%
ZERO OFFSET	Zeroing Trimmer is Built-In.				
LINEARITY	±0.2%	±0.05%	±0.2%	±0.05%	±0.01%
TEMPERATURE EFFECT per °C (% of full scale reading) ON SCALE FACTOR	±0.005%	±0.005%	±0.005%	±0.005%	±0.002%
ON ZERO OFFSET	±0.005%	±0.005%	±0.005%	±0.005%	±0.002%
ON LINEARITY	±0.002%	±0.002%	±0.002%	±0.002%	±0.002%
DRIFT per 1000 HOURS (% of full scale reading)	±0.2%	±0.2%	±0.2%	±0.2%	±0.1%
PRICE	$305.00	$440.00	$305.00	$387.00	$472.00

[1] May be calibrated with optional trimmer. Option "–R" – Price: $10.00. Add the option letter as a suffix to the model number.

DIGITAL INPUT

DATA CONFIGURATION: 1 line/bit DTL/TTL.
Data validity: 10 microsecond minimum.
Data loading: 1 TTL load/line.
Logic "1": +2.4 volts to +5.5 volts.
Logic "0": 0 to +0.4 volt.

STROBE: 10 microsecond minimum pulse width. 1 TTL load.

RANGE PROGRAMMING: (Models SN–3, SN–10, and SN–12 only): Relay-isolated attenuator selector. 1 TTL load.

DATA STORAGE: The SN converters require parallel data inputs (all digits or bits presented simultaneously and for at least 10 microseconds to the data input terminals). Data transfer is effected by a 10 microsecond logical "1" strobe to the address buffer. A logic "0" at the address input inhibits further data transfer. The previous data is stored (and presented as an analog output) indefinitely—or so long as source power is maintained.

RANGE PROGRAMMING TIME (Models SN–3, SN–10, and SN–12): Less than 2 milliseconds.

NOISE, OUTPUT (20 Hz–10 MHz): Less than 1 millivolt peak-to-peak.

GENERAL

ISOLATION BETWEEN THE DIGITAL INPUT AND ANALOG OUTPUT: 1000 volts optically isolated.

TEMPERATURE RATINGS
Storage: −25°C to +85°C.
Operating: 0 to +70°C.

SOURCE POWER REQUIREMENT: SN cards are factory-wired for 105–125V a-c, 50–440 Hz. A simple jumper change will reconfigure the input for 210–250V a-c. Power consumption approximately 5 watts.

SIZE: 3 15/16"H x 11 23/32"W x 1½"D.

ANALOG OUTPUTS

OUTPUT #1: Direct 0 to +10V or ±10V or ±5V (see table). 0–4 milliampere load.

OUTPUT #2: ,Routed through an attenuator amplifier. 0–4 milliampere load.

In SN–2 and SN–8, an on-board selector (10:1 and 20:1) allows you to choose 0 to 1V or 0 to 0.5V output for control of current in one range.

In SN–3, SN–10, and SN–12, a programmable range selector provides 1:1 and 10:1 decimal ranging for control of voltage in two ranges.

MAXIMUM CAPACITANCE LOAD: 1000 pF.

OUTPUT IMPEDANCE (at d-c): Less than 0.1 ohm.

OUTPUT SETTLING TIME (to 1/2 least significant bit): Less than 20 microseconds following the 6 microsecond data transfer delay.

KEPCO SN SYSTEM ACCESSORIES

The SN cards may be used "as is" inside your equipment, or in a mounting structure of your own design. They are self-contained and electrically complete with built-in power supplies. You will need a 24-terminal connector to access the digital data input—Kepco PC–4 or CINCH 251-12-30-160 or equivalent. Plug connectors can also be used for analog output and a-c line power, though solder lugs are also provided for these connections.

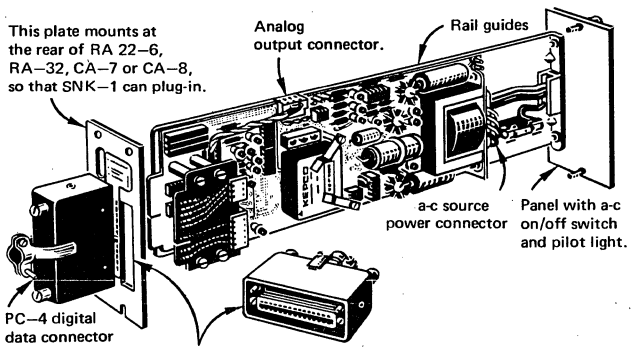
PC–4, 24-terminal digital data connector. *Price:* $10.00.

PC–5, a-c source power cord connector, 6-terminals, crimped, three 18-inch leads. *Price:* $ 3.00.

PC–6, analog output cord connector, 3-terminals, crimped, three 18-inch leads. *Price:* $ 3.00.

The SN card can be mounted in either of two basic Kepco hardware systems.

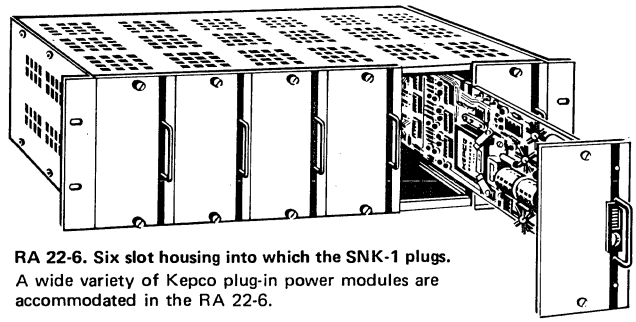
1. A PLUG-IN MOUNT (SNK–1) occupying a 1/6 rack width slot.



SNK–1 slide adapter with SN–3 card mounted in place.

The plug-in mount requires a type SNK–1 slide adapter kit which configures the SN card to fit the plug-in slots of 19-inch rack adapters: RA 22–6 or RA–32. An SN, mounted on the SNK–1, can also be plugged into bench-style housings: Model CA–7 (dual) and CA–8 (triple). Refer to *Hardware Section* for a complete description of these rack adapters and bench housings.

SNK–1 includes all of the internal and external connectors and hardware to mount and access *one* SN size card. *Price:* $70.00.

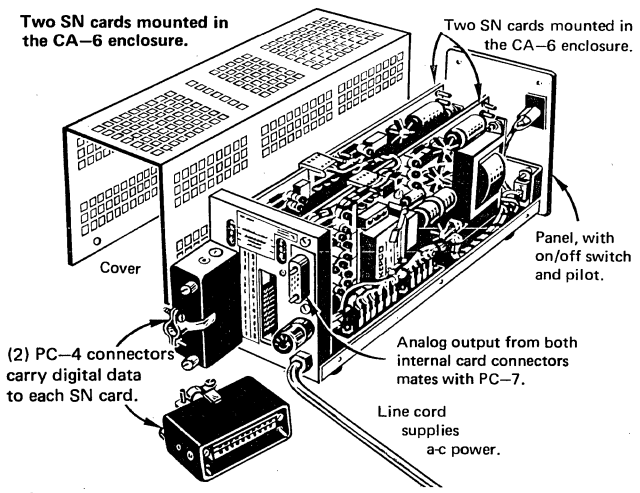


RA 22-6. Six slot housing into which the SNK-1 plugs. A wide variety of Kepco plug-in power modules are accommodated in the RA 22-6.

2. A PERMANENT MOUNT (CA–6) in a 1/4 rack width package that accommodates up to two SN size cards.

Up to two SN cards may be permanently mounted in a type CA–6 bench/rack enclosure. The CA–6 is a "quarter-rack width" size to fit such rack adapters as RA–24 and RA–32. CA–6 is equipped with removable feet for placement on your bench-top. CA–6 has space and includes all of the internal and external connectors to mount and access *two* SN size cards. *Price:* $110.00.

Two SN cards mounted in the CA–6 enclosure.

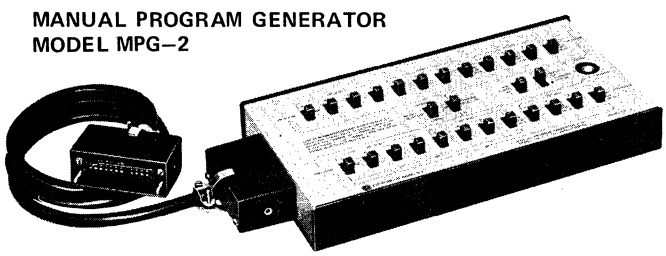


SPARE CONNECTORS:

Type PC–4, 24-terminal digital data. *Price:* $10.00.
PC–4 is used for both digital and analog connections from SNK–1 and is the digital input connector for CA–6.

Type PC–7, A 14-terminal analog signal connector used to carry the two analog outputs from SN cards in the CA–6. *Price:* $10.00.

MANUAL PROGRAM GENERATOR MODEL MPG–2

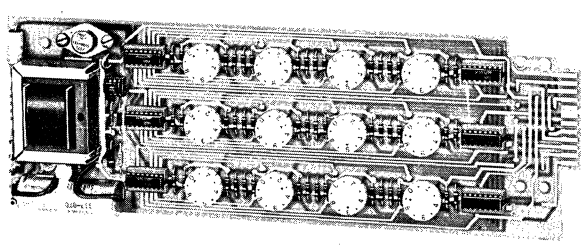


Manual Program Generator for the Kepco SN series of digital programmers, the MPG–2 consists of two sets of twelve slide switches with which you can establish two independent programs in either BCD or straight binary format.

Cable: A 3-foot cable is supplied, terminated at both ends with a Model PC–4 Digital Data Connector.

Size: 5⅞" W x 12" L x 1 9/16" H. *Price:* $120.00.

MANUAL PROGRAM GENERATOR MODEL MPG–4



MPG–4 is sized to fit the place of a single SN card in either the CA–6 or SNK–1. It provides for the establishment of four independent, 3-digit programs which can be selected by logic instructions on two programming lines.

SIZE: 3 5/16"H x 11 27/32"W x 1½"D. *Price:* $270.00.

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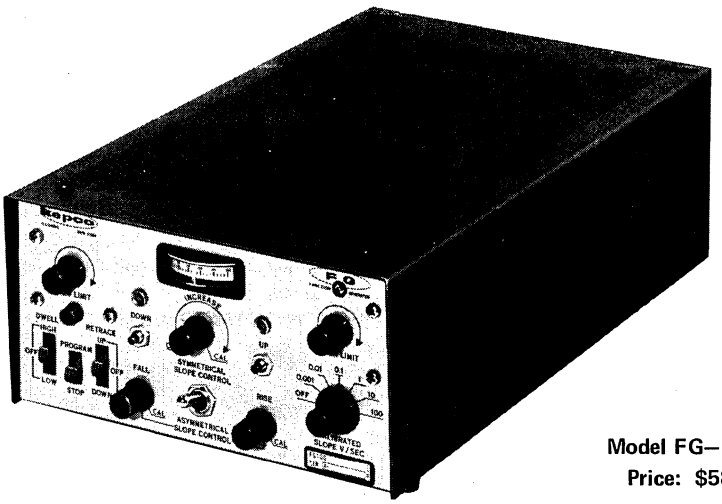
function generator

FG-100A



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Model FG—100A
Price: $580.00

CALIBRATED RAMP RATE[1] V/SEC	MAXIMUM TIME BASE SEC	RETRACE SPEED V/SEC	STOPPED DRIFT mV/hour	RAMP LINEARITY %	RAMP LINEARITY TEMP. EFFECT %/°C	UNPROGRAMMED OUTPUT DEVIATION (ripple & noise) rms	p-p[2]
0.001	20,000	10	50	1.5	0.25	0.2 mV	5 mV
0.01	2,000	10	50	0.15	0.025	0.2 mV	5 mV
0.1	200	10	50	0.015	0.0025	0.2 mV	5 mV
1	20	10	50	0.01	0.001	0.2 mV	5 mV
10	2	100	500	0.01	0.001	2.0 mV	15 mV
100	0.2	200	500	0.01	0.001	2.0 mV	15 mV

[1] Tolerance ±15%.
[2] 20 Hz to 10 MHz.

GENERAL DESCRIPTION:

The Kepco Model FG—100A is a successor to the FG—100, offering extended slow speed operation and provision for single ramp operation through the addition of dwell and retrace controls. It is an integrating-type, ramp generator, using an FET-input amplifier. Adjustable high and low sweep reversal controls permit the generation of repetitive triangular waveforms.

RANGES: The range switch selects one of six ramp rates. Panel controls allow continuous adjustment of the rates:

Symmetrical control: from 10% to 100% of selected ramp.

Asymmetrical controls: from 0 to 100% of selected ramp.

OUTPUT: 0—20 volts up to 20 mA. Built-in 2000 ohm and 20,000 ohm resistors allow for the programming of 1 milliampere (1000 ohms per volt) voltage-programmed power supplies and 10 milliampere (100 ohms per volt) voltage programmed power supplies.

LIMITS: The upper and lower ramp reversal voltages are independently adjustable by 10-turn panel controls so that FG—100A can be set up to sweep repeatedly between any two selected points. A pair of manual sweep-reversal push buttons override the panel set limits and permit you to reverse the direction of the ramp at any point in its cycle.

DWELL: A slide switch allows you to stop the integration at either the high limit or the low limit. A manual override switch allows you to stop at any point in the cycle. When stopped, the voltage output of FG—100A holds with a residual drift rate of less than 50 millivolts per hour (500 millivolts per hour for the two fastest ranges).

RETRACE: A quick retrace in either the up or the down direction may be selected by a switch. This feature allows you to quickly reset long duration sweeps.

METER: A 2½" edgewise meter, calibrated with a 0—100% logging scale—corresponding to the 0—20 volt output range (or 0—1 mA or 0—10 mA) allows you to monitor the sweep and set the limits.

REMOTES: Timing and limit-setting connections are brought out to a rear barrier-strip for remote setting. A 3-volt sync signal is available at this terminal strip for synchronizing other instruments.

SOURCE POWER REQUIREMENT: 105—125V a-c or 210—250V a-c, 50—440 Hz, single phase. ≈15 VA.

OPERATING TEMPERATURE RANGE: 0 to +55°C.

STORAGE TEMPERATURE RANGE: -40°C to +85°C.

DIMENSIONS: 4¼" H x 8$\frac{5}{32}$" W x 13$\frac{5}{8}$" D.

MOUNTING: FG—100A may be rack mounted using either RA—5 (single unit) or RA—4 (two units side-by-side) in a 5¼" x 19" rack panel. Adapter RA 24—45 allows it to fit the Kepco RA—24 hardware system.

FINISH: *Panel:* Satin finished, brushed aluminum.
Case: Textured dark charcoal gray.

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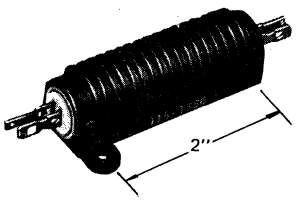
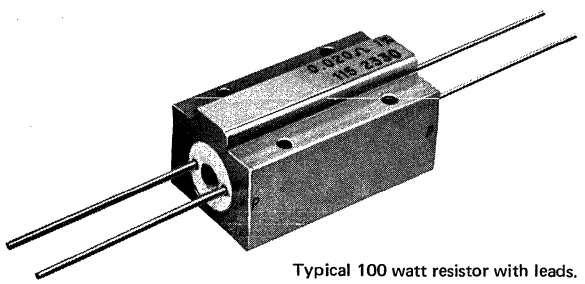
ACCESSORY EQUIPMENT

CURRENT SENSING RESISTORS

These precision, wirewound sensing resistors may be used to provide a voltage drop proportional to load current for use in providing current feedback. Select a resistance to drop as close to 1V d-c as possible at the maximum desired current setting; e.g., for 0–20 ampere service, select the 0.5 ohm resistor. For best stability, the resistors should be mounted to a heat sink and/or air or oil cooled to minimize the temperature rise. Use Kepco Model KT–1304, the 1000 ohm rheostat, to provide the current feedback. All sensing resistors are 4-terminal devices with separate current and potential connections.



Typical 50 watt resistor with lugs.



Typical 100 watt resistor with leads.

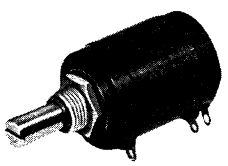
SENSING RESISTORS

MODEL	RESISTANCE OHMS	TERMINATION	MAXIMUM DISSIPATION WATTS(1)	PRICE	SHIP WGT. lbs.	SHIP WGT. kg.
KT–1915	1.0 Ω	lugs	50 W	**$15.00**	2 oz.	0.06
KT–1385	0.667 Ω	lugs	50 W	**15.00**	2 oz.	0.06
KT–1399	0.5 Ω	lugs	50 W	**15.00**	2 oz.	0.06
KT–1386	0.333 Ω	lugs	50 W	**15.00**	2 oz.	0.06
KT–1598	0.2 Ω	lugs	50 W	**15.00**	2 oz.	0.06
KT–1387	0.1 Ω	lugs	50 W	**15.00**	2 oz.	0.06
KT–2537	0.0625 Ω	leads	100 W	**25.00**	3 oz.	0.09
KT–2536	0.05 Ω	leads	100 W	**25.00**	3 oz.	0.09
KT–2480	0.033 Ω	leads	100 W	**25.00**	3 oz.	0.09
KT–2330	0.02 Ω	leads	100 W	**25.00**	3 oz.	0.09
KT–2325	0.01 Ω	leads	100 W	**25.00**	3 oz.	0.09

(1) Recommended Heat Sink: 144 square inch, 1/4" aluminum or equivalent (950 square cm x 0.5 cm). Power rating based on 275°C max. hot spot temperature in 25°C ambient, derate to 80% power in 71°C ambient.

CURRENT CONTROL RHEOSTAT

KT–1304	0–1000 Ω (Rheostat Connected)	lugs	1 W	**18.75**	3 oz.	0.03



1000Ω current feedback control.

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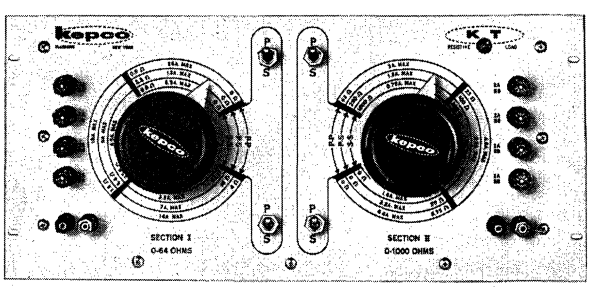
Variable Rheostat Load Bank



Model KT 6212 — Price: $650.00 — Shp. Wgt. 47 lbs.

The Model KT 6212 is a multiganged, eight-section group of dual-wound power rheostats used in the testing of regulated power supplies.

Model KT 6212 consists of two independent gangs of four rheostats apiece, 0-64 ohms and 0-1000 ohms. The rheostats can be switched for parallel, series parallel and series operation. Each rheostat has heavy and light windings so that the maximum load current changes at approximately each third rotation point around the dial.

CONTROLS:
Switches select series and parallel combinations of the four ganged rheostats with the corresponding resistance and current rating designated by concentric bands.

Each band defines the resistance range for its particular connection with zero ohms (maximum current) in the clockwise position. The bands are divided into three sections that correspond to the position of the heavy and light windings, respectively. The maximum current in each section is shown on the corresponding portion of the band.

FUSING:
Each rheostat in the 0-64 ohm gang is fused at 7 amperes. Each rheostat of the 0-1000 ohm gang is fused for 2 amperes.

TERMINALS:
A pair of 5-way binding posts is provided at each gang for connection to the power source under test. These connections are duplicated at the rear.

EXTERNAL POWER REQUIREMENTS:
None. The Model KT 6212 is a passive device.

DIMENSIONS:
8¾"H x 19"W x 13⅝"D. The Model KT 6212 resistive load is designed for mounting in standard 19" equipment racks.

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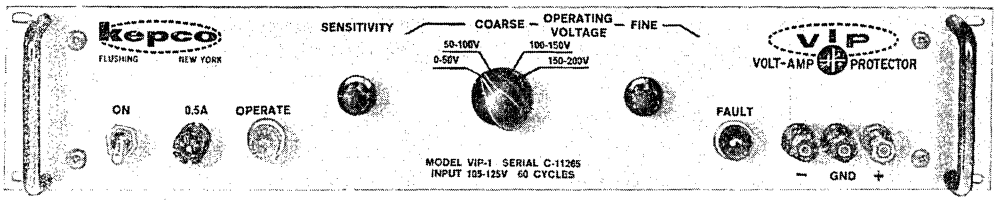
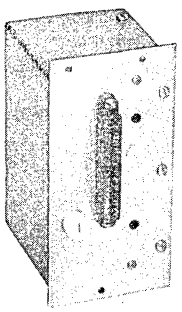
ACCESSORY EQUIPMENT

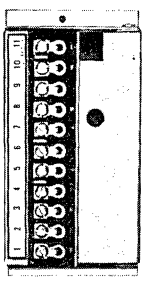
OVERVOLTAGE CROWBARS



Model VIP-1
3 15/32" H x 19" W x 11 11/16" D.

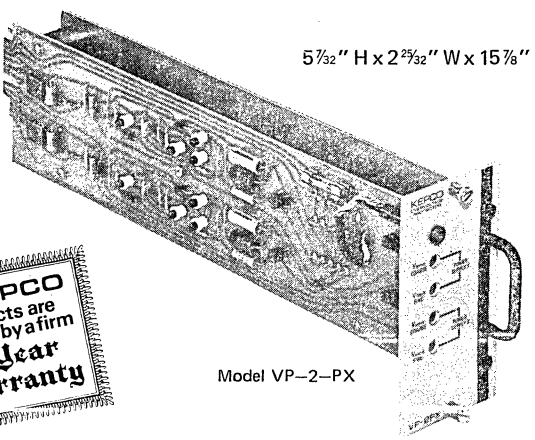


Front View



Rear View

Model VP–PX
5 7/32" H x 2 19/32" W x 3 1/8" D.



5 7/32" H x 2 25/32" W x 15 7/8" D.

Model VP–2–PX

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MODEL	VOLTS	AMPS	TRIP TIME	DESCRIPTION	PRICE	SHIP WGT. lbs.	kg.
VIP–1	5–200(1)	30	50 μs	Stand alone overvoltage/current	$150.00	21	9.5
VIP–3	5–200(1)	30	50 μs	Stand alone over- and undervoltage/current	275.00	21	9.5
VIP–4	5–50	200	50 μs	Stand alone overvoltage/current	340.00	21	9.5
VP–PX	3–110	3(1)	10 μs	Bolt-on (RA 22–6) overvoltage	90.00	3	1.4
VP–1–PX	3–110	3(2)	10 μs	Plug-in (1/6 slot) overvoltage	99.00	4	1.8
VP–2–PX	3–110	3(2)	10 μs	Plug-in (1/6 slot) dual overvoltage	125.00	4	1.8

(1) Ranges: 5–50V, 50–100V, 100–150V, 150–200V.

(2) 25 watts, maximum.

The Kepco VIP (stand alone or rack mount) and the VP (bolt-on or plug-in) protectors are independently powered voltage monitors. The VIP models have provision so that they can monitor either voltage or current. A voltage excursion above the static trigger level (or below, in the case of VIP–3, the undervoltage protector) initiates crowbar conduction to clamp the supply terminals.

The VIP models provide a simultaneous relay contact break which is used to remove the a-c source power from the power supply being monitored. The VP models which are used with 20–50 watt Kepco models do not require this interlock.

Reset is accomplished by interrupting the source power.

VP–1–PX and VP–2–PX are mounted on a one-sixth width slide assembly that plugs into a single slot in such housings as RA 22–6, RA–32, CA–4 or CA–5. The VP–1–PX is a single protector, the VP–2–PX will monitor and crowbar two independent supplies.

SENSITIVITY

VIP models: 1% of the operating voltage or 0.1V.

VP model: 5% of the operating voltage or 0.25V, whichever is greater.

VIP–1 & –3 current sensitivity: 5% of the operating current producing a 1-volt drop across an external sensing resistor.

TEMPERATURE COEFFICIENT: 0.1% or 0.1V per °C (whichever is greater). Initial setting tolerance should account for the combined power supply and protector temperature and warm-up effects.

REMOTE ERROR SENSING: Compensates for up to 1 volt per output lead.

FINISH: VIP and the VP–1–PX and VP–2–PX panels are painted light gray, Color 26440, per Fed. Std. 595.

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KEPCO

HARDWARE AND MOUNTING EQUIPMENT

All Kepco power supply modules can be mounted in standard 19-inch equipment housings using simple adapter panels described below. In most instances, a variety of adapter panels are offered to accommodate either a single power supply—or several together. Source power, output, and control connection must be hard-wired to the power units.

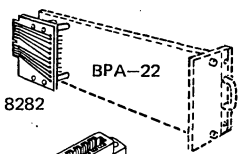
For systems and laboratory-type power supplies, two distinct mounting systems are offered:

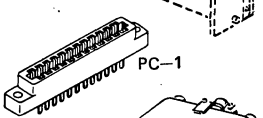
The RA—24 System: This system consists of a mounting drawer, with provision for chassis slides, in which Kepco's quarter-rack and half-rack power supplies can be mounted. Mounting is of a semi-permanent nature, employing coarse threaded (8-18) screws into nylon expansion bushings provided for that purpose in each power supply. A variety of filler panels are available to complete the installation. The RA—24 system occupies 5¼ inches of panel space in a standard 19-inch equipment rack, exclusive of possible filler-support brackets that might be wanted to support very heavy loads. Source power may be hard-wired to supplies in modular form or supplied via a standard 3-wire line cord (see page 753 for connector patterns). D-C output and control circuits are wired to barrier-strips or binding posts—except for the Kepco JMK models which are equipped with a PC—4 connector for quick access.

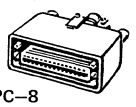
The RA 22—6 System: This system consists of a mounting frame containing guides for the slip-in mounting of equipment in the one-sixth rack width format. The panels of such equipment contain captive thumb screws which fasten to the upper and lower lips of the frame. All source power, output, and control connections are hard-wired to rear-mounted socket adapter, PC—2 which mates with the male PC plugs at the rear of each unit, and which allows the individual models to be unfastened and slipped out of the RA 22—6 enclosure from the front.

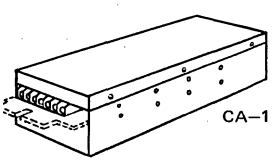
Single-, dual-, and triple-slot bench housings include Models CA—3, CA—4, and CA—5, which include nondetachable plug-to-barrier-strip connections. They accept any of the OPS—II, PCX—MAT or CC plug-in power supplies, and include a line cord. Cases CA—7 (dual) and CA—8 (triple) employ detachable (type PC—2) connectors which can be interchanged with SNK—1 connectors to mount type SN digital programmers, or can be interchanged with a PC—8 connector for a cable interface.

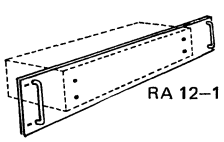
HARDWARE FOR PLUG-IN MODELS OPS—II, PCX—MAT AND CC POWER SUPPLIES.
OPS—I, PAX and PCX models can also be mounted using BPA—22 Adapter.

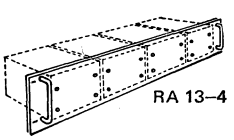


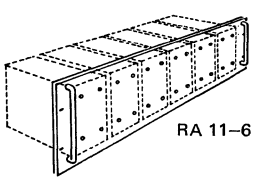












MODEL	DESCRIPTION	DIMENSIONS(2) H	W	D	PRICE	SHIP WGT. lbs.	kg.
RA 22—6(1)	Six-slot rack housing including (6) PC—2 connectors.	5 7/32 132.6	19 482.6	16 3/8 416.0	$99.00	23	10.4
BPA—22	Blank panel assembly with slide plate	5 7/32 132.6	2 25/32 70.5	14 5/8 371.5	15.00	3	1.4
RFP 22—1	Single filler panel	5 7/32 132.6	2 25/32 70.5	—	10.00	½	0.2
RFP 22—2	Double filler panel	5 7/32 132.6	5 9/16 141.2	—	10.00	½	0.2
RFP 22—3	Triple filler panel	5 7/32 132.6	8 3/8 212.5	—	10.00	½	0.2
CA—3	Single-slot housing with connector	5 7/32 132.6	2 25/32 70.5	16 406.4	25.00	6	2.7
CA—4	Double-slot housing with connectors	5 7/32 132.6	5 9/16 141.2	16 406.4	35.00	8	3.6
CA—5	Triple-slot housing with connectors	5 7/32 132.6	8 3/8 212.5	16 406.4	45.00	10	4.5
CA—7 (1)	Dual plug-in bench housing with (2) detachable PC—2 connectors	5 7/32 132.6	5 9/16 141.2	16 406.4	35.00	7	3.2
CA—8 (1)	Triple plug-in bench housing with (3) detachable PC—2 connectors	5 7/32 132.6	8 3/8 212.6	16 406.4	45.00	8	3.6
PC—2 (1)	Edge-connector to barrier-strip interface	5 7/32 132.6	2 21/32 67.5	—	10.00	½	0.2
PC—8	Edge-connector to cable interface	—	—	—	10.00	½	0.2
8282	Plug-in kit for BPA—22	—	—	—	10.00	½	0.2

(1) RA 22—6, RA—32, CA—7 and CA—8 are provided complete with a PC—2 connector mounted in each plug-in slot. PC—2 provides a edge connector-to-barrier-strip interface. Order Model SNK—1 mounting kit to adapt the SN programmer to the plug-in format. Model PC—8 may be ordered to adapt the mounting to a cable connector rather than a barrier-strip.

(2) Upper dimensions in inches; lower dimensions in millimeters.

CHASSIS MOUNTING TYPES OPS—B, PAX, AND PCX MODELS CAN BE ENCASED WITH CASE CA—1, FITTED WITH PLUG PC—1 OR PC—8 FOR QUICK-DISCONNECT AND RACK MOUNTED, IF DESIRED.

CA—1	Chassis mounting case (single)	2 11/16 68.4	4 1/8 104.8	13 3/16 378.0	$15.00	2	0.9
PC—1	Connector	—	—	—	8.00	½	0.2
RA 12—1	1 cased unit rack adapter	3 15/32 88.1	19 482.6	—	15.00	2	0.9
RA 13—4	4 cased unit rack adapter	3 15/32 88.1	19 482.6	—	15.00	2	0.9
RA 11—6	6 cased unit rack adapter	5 7/32 132.6	19 482.6	—	15.00	3	1.5

Data and prices subject to change without notice.

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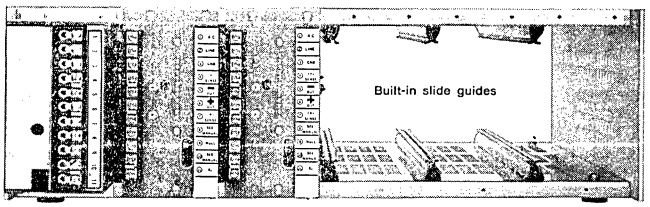
KEPCO

ENCLOSURES AND HARDWARE SYSTEMS FOR PLUG IN MODULES

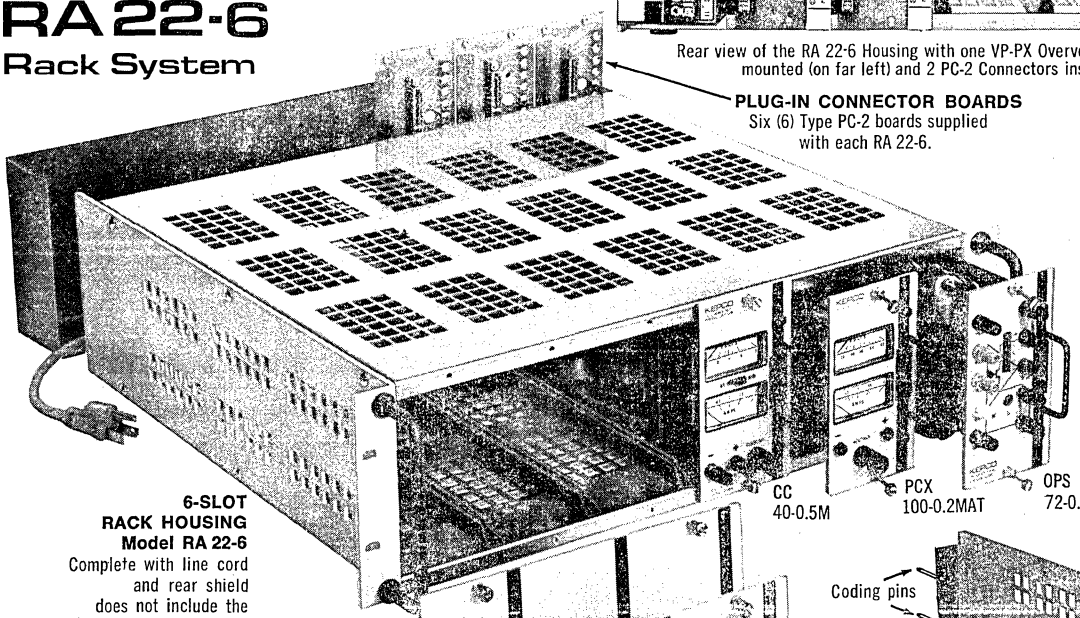
RA 22-6

Rack System



Rear view of the RA 22-6 Housing with one VP-PX Overvoltage Protector mounted (on far left) and 2 PC-2 Connectors installed.

PLUG-IN CONNECTOR BOARDS
Six (6) Type PC-2 boards supplied with each RA 22-6.



CC 40-0.5M

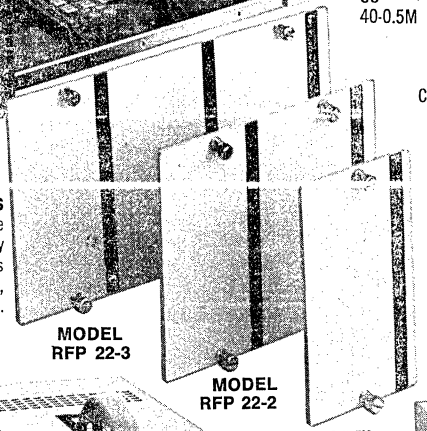
PCX 100-0.2MAT

OPS 72-0.3BTA

6-SLOT RACK HOUSING Model RA 22-6
Complete with line cord and rear shield does not include the mating rear connectors.

all KEPCO products are backed by a firm 5-Year Warranty

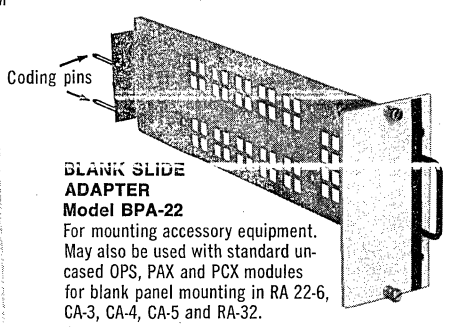
FILLER PANELS
(supplied without slide assembly and handle), may be used to fill unused slots in CA-3, CA-4, CA-5, RA 22-6, and RA-32.



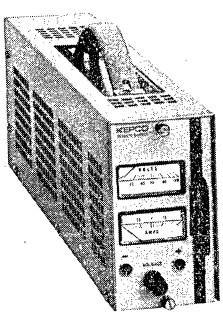
MODEL RFP 22-3

MODEL RFP 22-2

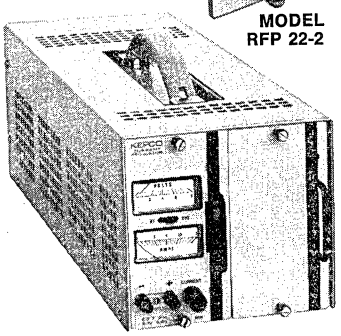
MODEL RFP 22-1



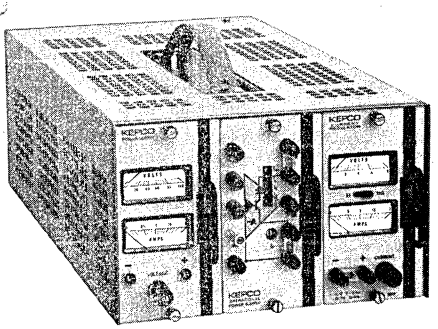
BLANK SLIDE ADAPTER Model BPA-22
For mounting accessory equipment. May also be used with standard uncased OPS, PAX and PCX modules for blank panel mounting in RA 22-6, CA-3, CA-4, CA-5 and RA-32.



SINGLE UNIT HOUSING Model CA-3
Supplied complete with a built-in rear connector.*

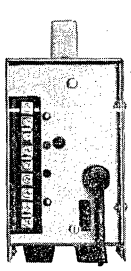


DOUBLE UNIT HOUSING Model CA-4
Supplied complete with a built-in dual rear connector.*

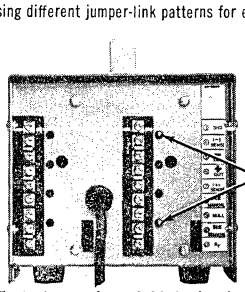


TRIPLE UNIT HOUSING Model CA-5
Supplied complete with a triple rear connector.*

*Connector will mate with OPS/PCX/CC models using different jumper-link patterns for each. Does not mount the SN Digital Programmer. See Page 750 for Models CA-7 and CA-8.



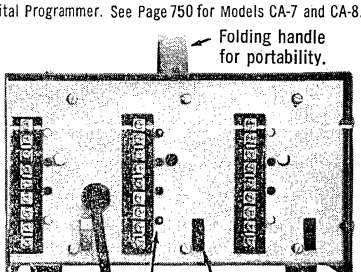
Typical rear view of CA-3, showing access terminals and connector.



Typical rear view of CA-4, showing integral connector.

All plug-in models and the BPA-22 are supplied with two coding pins that can be arranged in 6 different patterns to key the housing slots.

Folding handle for portability.



Typical rear view of CA-5, showing coding pins, connectors and line cord.

Slot provides access to internal adjustments in mounted supplies.

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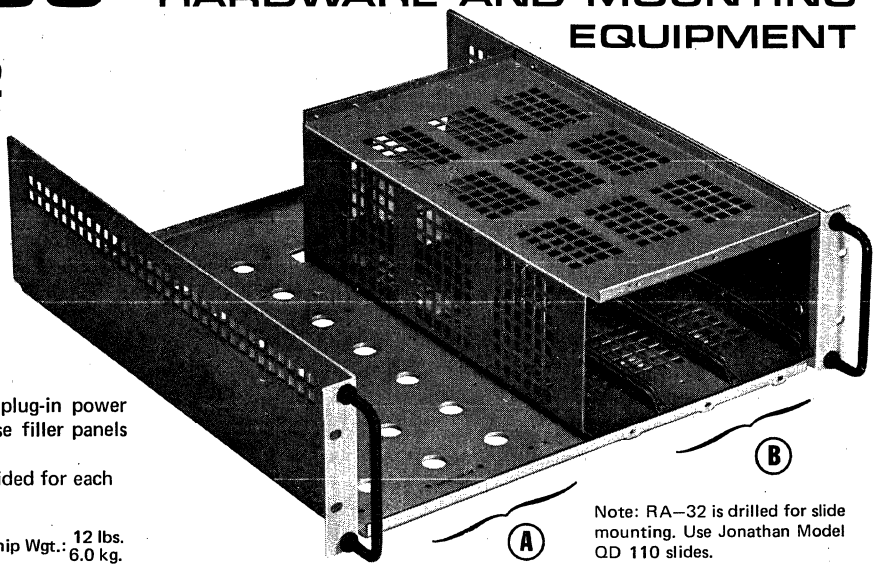
KEPCO™ HARDWARE AND MOUNTING EQUIPMENT

RA-32 Rack System

Price: $75.00



Note: RA—32 is drilled for slide mounting. Use Jonathan Model QD 110 slides.

(A) This section will mount any single "½ rack sized" Kepco power supply or two "¼ rack sized" models. Use filler panels from the RA—24 hardware system.

(B) This section will accept up to three plug-in power units in the one-sixth rack format. Use filler panels from the RA 22—6 hardware system.
NOTE: A type PC—2 connector is provided for each of the (3) plug-in slots.

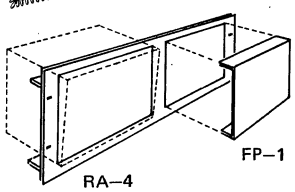
Dimensions: 5 7/32 H x 19 W x 18 7/8 D.(1) 132.6 H x 482.6 W x 454 D. Ship Wgt.: 12 lbs. 6.0 kg.

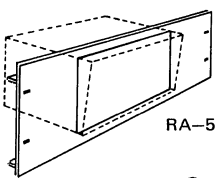
all KEPCO products are backed by a firm 5-Year Warranty

RACK ADAPTERS

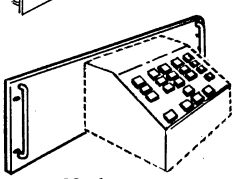
Adapt bench style, modular and half-rack power supplies to the standard 19" wide equipment rack or cabinet. Panels and rack adapters are finished light gray Color 26440 per Fed. Std. 595.

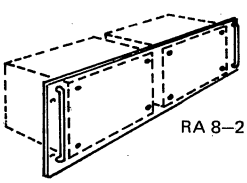
ABC and FG—100A





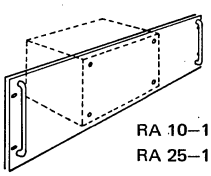
MODEL	DESCRIPTION	DIMENSIONS (1) H	W	D	PRICE	SHIP WGT. lbs.	kg.
RA—4	Dual adapter	5 7/32 132.6	19 482.6	—	$20.00	3	1.4
RA—5	Single unit adapter	5 7/32 132.6	19 482.6	—	20.00	4	1.8
FP—1	Filler panel for RA—4	4 1/4 108.0	8 5/32 207.2	—	6.00	½	0.2

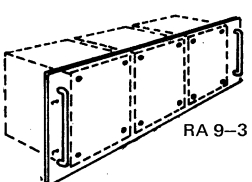


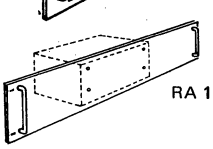


RA 29—1	Rack adapter for DPK-1	5 7/32 132.6	19 482.6	—	15.00	3	1.4

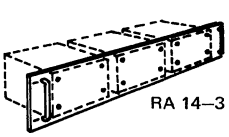
BKF II and PRM Size "A" — 180 Series

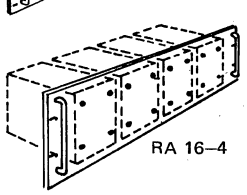




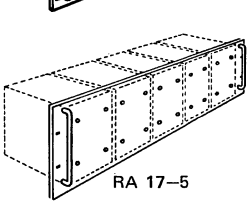


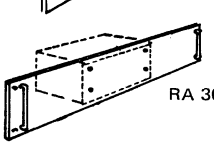
CA—200	Case	6 15/16 176.2	5 127.0	10 7/16 265.1	15.00	5	2.3
RA 8—2	2 unit rack adapter	5 7/32 132.6	19 482.6	—	15.00	3	1.4
RA 9—3	3 unit rack adapter	6 3/32 177.0	19 482.6	—	15.00	4	1.8
RA 10—1	1 PRM unit adapter	5 7/32 132.6	19 482.6	—	15.00	3	1.4
RA 25—1	1 BKF II unit adapter	5 7/32 132.6	19 482.6	—	15.00	3	1.4





PRM Size "B" — 120 Series and Size "D" — 60 Series





RA 14—3	3 unit rack adapter	3 15/32 88.1	19 482.6	—	15.00	2	0.9
RA 15—1	1 Size "B" unit adapter	3 15/32 88.1	19 482.6	—	15.00	2	0.9
RA 16—4	4 unit rack adapter	5 7/32 132.6	19 482.6	—	15.00	3	1.4
RA 17—5	5 unit rack adapter	5 7/32 132.6	19 482.6	—	15.00	3	1.4
RA 30—1	1 Size "D" unit adapter	3 15/32 88.1	19 482.6	—	15.00	2	0.9

(1) Upper dimensions are in inches; lower dimensions in millimeters.

Data and prices subject to change without notice.

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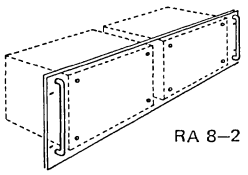
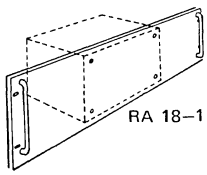
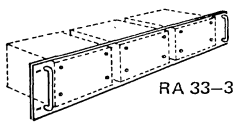
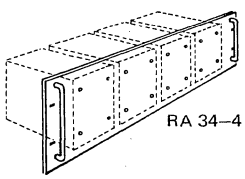
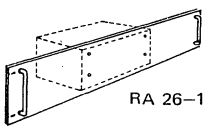
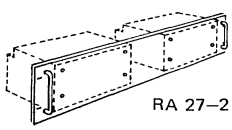

RA 8–2


RA 18–1


RA 33–3

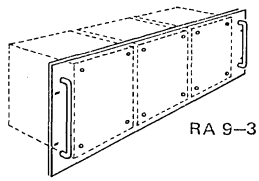

RA 34–4

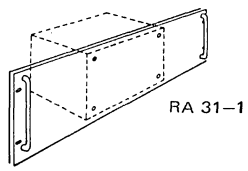

RA 26–1


RA 27–2

PRM Size "C" — Dual Output and Extra-Filtered

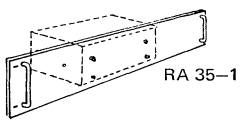
MODEL	DESCRIPTION	DIMENSIONS (1) H	W	D	PRICE	SHIP WGT. lbs.	kg.
CA–300	Case	6 15/16 176.2	5 127.0	14 7/16 366.7	15.00	7	3.2
RA 8–2	2 unit rack adapter	5 7/32 132.6	19 482.6	—	15.00	3	1.4
RA 9–3	3 unit rack adapter	6 31/32 177.0	19 482.6	—	15.00	4	1.8
RA 18–1	1 unit rack adapter for Extra-Filtered	5 7/32 132.6	19 482.6	—	15.00	3	1.4
RA 31–1	1 unit rack adapter for Dual Output	5 7/32 132.6	19 482.6	—	15.00	3	1.4


RA 9–3


RA 31–1

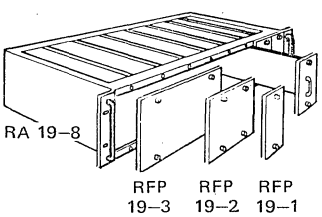
PTR GROUP

RA 35–1	1 unit rack adapter	3 1/2 88.9	19 482.6	—	15.00	3	1.4
RA 33–3	3 unit rack adapter	3 1/2 88.9	19 482.6	—	15.00	3	1.4
RA 34–4	4 unit rack adapter	5 1/4 133.4	19 482.6	—	15.00	3	1.4


RA 35–1

KG GROUP

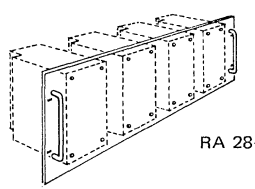
CA–2	Single unit housing	5 1/32 127.8	2 3/16 55.6	14 355.6	25.00	4	1.8
RA 19–8	Multi-unit housing (8)	5 1/4 133.4	19 482.6	14 355.6	99.00	16	7.3
RFP 19–1	Single filler panel	5 7/32 132.6	2 3/16 55.6	—	10.00	1/2	0.2
RFP 19–2	Double filler panel	5 7/32 132.6	4 3/16 106.4	—	10.00	1/2	0.2
RFP 19–3	Triple filler panel	5 7/32 132.6	6 5/16 160.3	—	10.00	1/2	0.2


RA 19–8

RFP 19–3 RFP 19–2 RFP 19–1

BKF I, CCP, DTM and PAT GROUPS

RA 26–1	1 unit rack adapter	3 15/32 88.1	19 482.6	—	15.00	2	0.9
RA 27–2	2 unit rack adapter	3 15/32 88.1	19 482.6	—	15.00	2	0.9
RA 28–4	4 unit rack adapter	6 31/32 177.0	19 482.6	—	15.00	3	1.5


RA 28–4

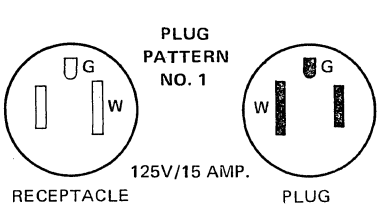
SN SYSTEM

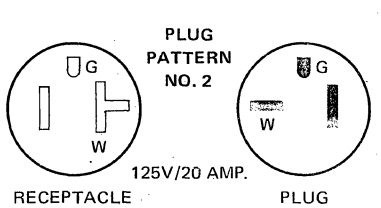
SNK–1	Slide adapter (complete with connectors)	70.00	3½	1.6
CA–6	Enclosure case, accommodates 2 SN cards (includes connectors)	110.00	7	3.2
PC–4	24-terminal digital data connector	10.00	½	0.2
PC–5	a-c source power connector	3.00	½	0.2
PC–6	Analog output connector	3.00	½	0.2
PC–7	14-terminal analog signal connector	10.00	½	0.2

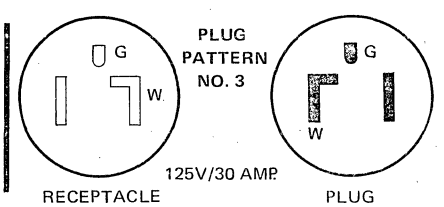
(1) Upper dimensions are in inches; lower dimensions in millimeters.
PANEL MOUNTING HOLES ARE PRE-DRILLED IN STANDARD E.I.A. PATTERN

Plugs and Receptacles

Those Kepco power supplies equipped with a line cord (all models other than the *modules* group) are fitted with a male plug in one of the following patterns:







Data and prices subject to change without notice.

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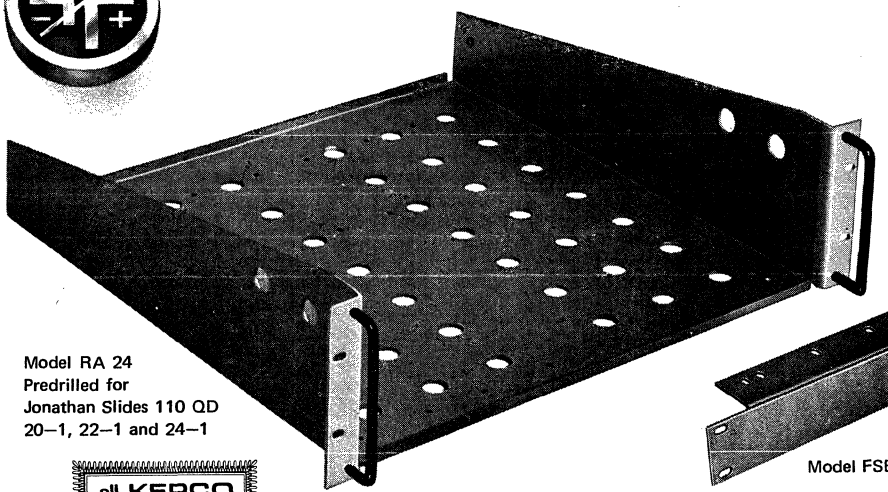
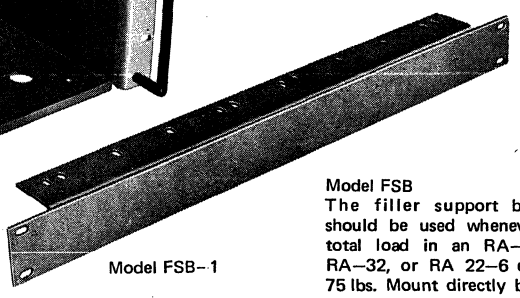
HARDWARE AND MOUNTING EQUIPMENT

RA 24
Rack System



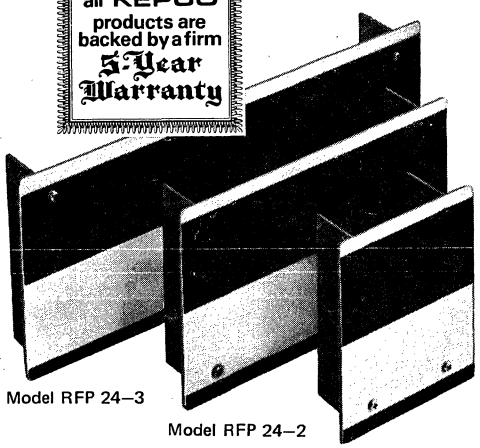
Model RA 24
Predrilled for
Jonathan Slides 110 QD
20–1, 22–1 and 24–1



Model FSB–1

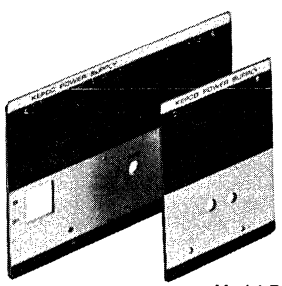
Model FSB
The filler support brackets should be used whenever the total load in an RA–24, or RA–32, or RA 22–6 exceeds 75 lbs. Mount directly beneath the lower front edge of the housing and fasten to the rack edge. The FSB can also be used to support the rear edge of the housings in cabinets where suitable mounting channels or angle irons are available.

all KEPCO products are backed by a firm 5-Year Warranty



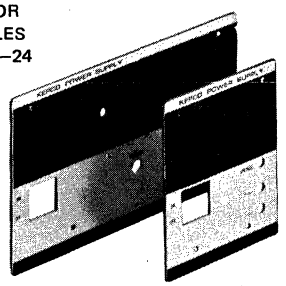
Model RFP 24–3
Model RFP 24–2
Model RFP 24–1

BLANK FILLER PANELS
are finished with a matching stripe on one side and solid gray on the other.
Color 26440 per Fed. Std. 595.



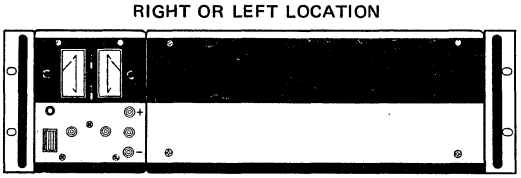
Model RAP 24–2J
Model RAP 24–1J

CUTOUT PANELS FOR METERLESS MODULES (USE TO FINISH RA–24 (INSTALLATION).



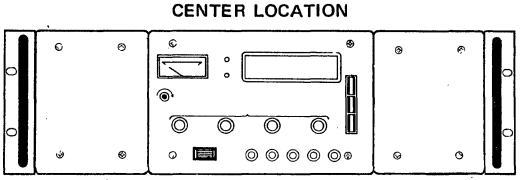
Model RAP 24–2
Model RAP 24–1

RIGHT OR LEFT LOCATION



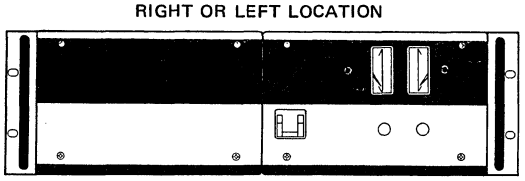
JQE 6–10M
RFP 24–3

CENTER LOCATION



RFP 24–1
PVS 100–1M
RFP 24–1

RIGHT OR LEFT LOCATION



RFP 24–2
CPS 6–22M

½ & ¼ RACK POWER SUPPLIES AND PROGRAMMERS CAN BE MOUNTED TOGETHER OR WITH FILLER PANELS IN RA–24.

THE RA–24 WILL HOUSE ¼ & ½ RACK SIZED MODELS IN THE FOLLOWING GROUPS:
ABC*, BOP, CDT, CPS, DPD, DPR, FG*, JMK, JQE, OPS IX & PVS

MODEL	DESCRIPTION	DIMENSIONS (1) H	DIMENSIONS (1) W	PRICE	SHIP WGT. lbs.	SHIP WGT. kg.
RA–24	Rack adapter for (2) ½ or (4) ¼ rack models, 17⅞" deep	5 7/32 132.6	19" 482.6	$25.00	7	3.2
RAP 24–1	Adapter for unmetered ¼ rack CPS models	5 7/32 132.6	4 5/32 105.6	10.00	½	0.2
RAP 24–2	Adapter for unmetered ½ rack CPS models	5 7/32 132.6	8 11/32 211.9	10.00	½	0.2
RAP 24–1J	Adapter for unmetered ¼ rack JQE models	5 7/32 132.6	4 5/32 105.6	10.00	½	0.2
RAP 24–2B	Adapter for unmetered ½ rack BOP models	5 7/32 132.6	8 11/32 211.9	10.00	½	0.2
RAP 24–2J	Adapter for unmetered ½ rack JQE models	5 7/32 132.6	8 11/32 211.9	10.00	½	0.2
*RAP 24–45	Rack adapter for ABC, FG	—	—	15.00	½	0.2
RFP 24–1	¼ filler panel for RA–24	5 7/32 132.6	4 5/32 105.6	10.00	½	0.2
RFP 24–2	½ filler panel for RA–24	5 7/32 132.6	8 11/32 211.9	10.00	2	0.9
RFP 24–3	¾ filler panel for RA–24	5 7/32 132.6	11 3/16 284.2	10.00	3	1.4
FSB–1	Filler support bracket	1 23/32 43.6	19" 482.6	15.00	5	2.3
FSB–3	Filler support bracket	3 13/32 88.1	19" 482.6	15.00	6	2.7
FSB–5	Filler support bracket	5 7/32 132.6	19" 482.6	15.00	7	3.2

(1) Upper dimensions are in inches; lower dimensions in millimeters.

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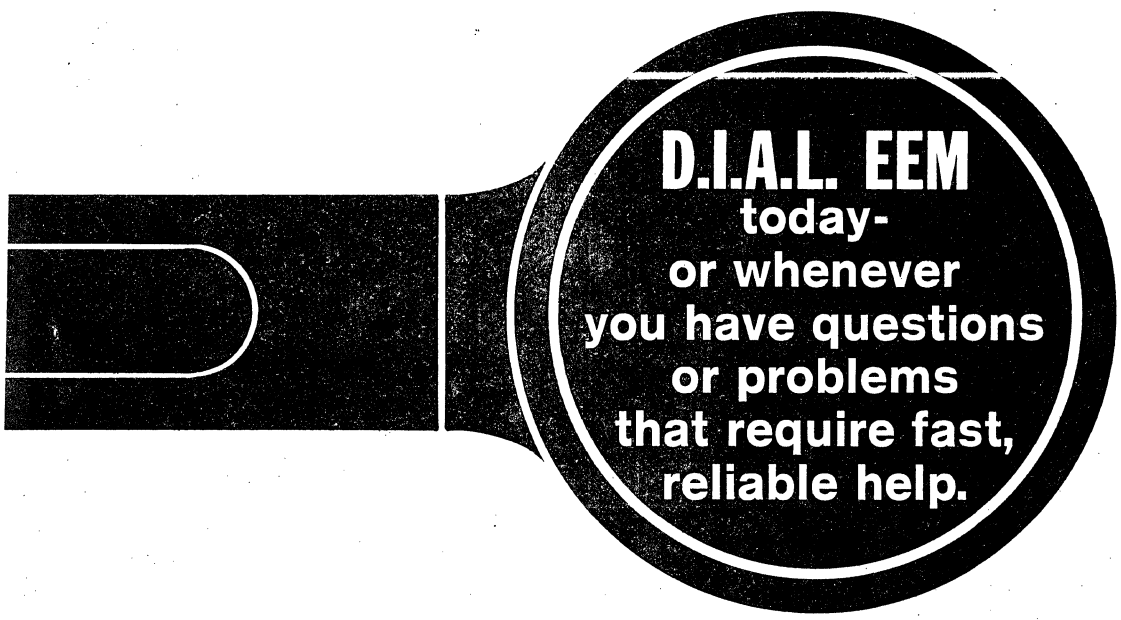

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KILOVOLT CORPORATION

HIGH VOLTAGE

POWER SUPPLIES • INSULATION TESTERS ACCESSORIES • POWER PACKS

A pioneer in high voltage techniques, KILOVOLT CORPORATION designs and manufactures a wide variety of power supplies and insulation testers and power packs ranging from 1,000 to 1,000,000 volts. These units are soundly engineered, ruggedly constructed and conservatively rated. Units are custom designed for all types of industrial processing as well as experimental laboratory work.

In addition, KILOVOLT CORPORATION can furnish anti-corona hardware devices, isolating resistors, high voltage voltmeters and high voltage spark gaps. Why not check us for all your high voltage requirements.

HIGH VOLTAGE D.C. POWER SUPPLIES FOR INDUSTRY

FEATURES

- **Reversible Polarity Output (most models)**
- **Continuously Variable Output Control**
- **Adjustable Over-Current Shut-Off**
- **Adjustable Over-Voltage Shut-off**
- **Safety Interlock on H.V. Cabinet Door**
- **Zero-Start Interlock**
- **Dual Range Voltage and Current Meter**
- **Fail-Safe Output Shorting Mechanism**
- **Circuit-Breaker Operation**
- **Functional Pilot Lamps**
- **Surge Limiting Resistor**
- **External Interlock**

OUTPUT KV	OUTPUT MA	MODEL NUMBER	OUTPUT KV	OUTPUT MA	MODEL NUMBER	OUTPUT KV	OUTPUT MA	MODEL NUMBER	OUTPUT KV	OUTPUT MA	MODEL NUMBER
0-1	500	KV1-500	0-10	30	KV10-30	0-30	500	KV30-500	0-150	500	KV150-500
0-1	1,000	KV1-1,000	0-10	50	KV10-50	0-30	1,000	KV30-1,000	0-200	5	KV200-5
0-1	3,000	KV1-3,000	0-10	100	KV10-100	0-50	50	KV50-50	0-200	10	KV200-10
0-1	5,000	KV1-5,000	0-10	250	KV10-250	0-50	100	KV50-100	0-250	2	KV250-2
0-1	15,000	KV1-15,000	0-10	500	KV10-500	0-50	300	KV50-300	0-250	5	KV250-5
0-3	200	KV3-200	0-10	1,500	KV10-1,500	0-50	1,000	KV50-1,000	0-250	10	KV250-10
0-3	1,000	KV3-1,000	0-20	10	KV20-10	0-60	10	KV60-10	0-250	25	KV250-25
0-3	2,000	KV3-2,000	0-20	50	KV20-50	0-120	5	KV120-5	0-350	2	KV350-2
0-3	5,000	KV3-5,000	0-20	150	KV20-150	0-120	10	KV120-10	0-350	5	KV350-5
0-3	10,000	KV3-10,000	0-20	300	KV20-300	0-120	30	KV120-30	0-500	2	KV500-2
0-5	100	KV5-100	0-20	800	KV20-800	0-120	100	KV120-100	0-500	20	KV500-20
0-5	500	KV5-500	0-30	20	KV30-20	0-150	5	KV150-5	0-600	2	KV600-2
0-5	1,000	KV5-1,000	0-30	50	KV30-50	0-150	10	KV150-10	0-600	5	KV600-5
0-5	2,000	KV5-2,000	0-30	100	KV30-100	0-150	30	KV150-30	0-600	20	KV600-20
0-5	3,000	KV5-3,000	0-30	200	KV30-200	0-150	100	KV150-100	0-1,000	5	KV1,000-5

ELECTRO-MECHANICAL REGULATION. The above models may be ordered with either voltage regulation, current regulation, or both by means of a servo regulating system.

SATURABLE REACTOR CONSTANT CURRENT. By use of a saturable reactor in conjunction with any of the standard models above, the output current can be held constant to within approximately 10% of the preset level for load variations from short circuit to full load and to within 3% for a half-load to full load change.

REGULATED HIGH VOLTAGE D.C. POWER SUPPLIES

Highly regulated against input line variations or changes in load, these power supplies employ fast response electronic regulation.

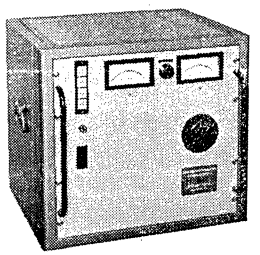
FEATURES

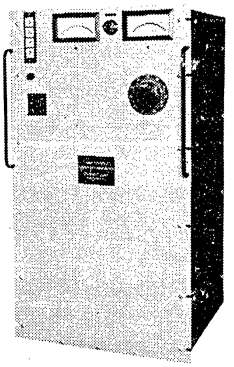
- **Continuously Variable Output**
- **Overload Protection**
- **Zero-Start Interlock**
- **Cabinet Interlock**
- **Provisions for External Interlock**
- **Reversible Polarity Output (most models)**
- **Circuit Breaker Operation**
- **Monitoring Pilot Lamps**
- **Electronically Protected 4½" Meters**

OUTPUT (MAX.) KV	OUTPUT (MAX.) MA	MODEL NUMBER	OUTPUT (MAX.) KV	OUTPUT (MAX.) MA	MODEL NUMBER
1.5	100	KVR1.5-100	10	250	KVR10-250
1.5	200	KVR1.5-200	10	500	KVR10-500
1.5	500	KVR1.5-500	10	1000	KVR10-1000
1.5	1000	KVR1.5-1000	15	7	KVR15-7
3	100	KVR3-100	15	45	KVR15-45
3	200	KVR3-200	15	150	KVR15-150
3	500	KVR3-500	15	250	KVR15-250
3	1000	KVR3-1000	15	750	KVR15-750
7	100	KVR7-100	20	10	KVR20-10
7	250	KVR7-250	20	50	KVR20-50
7	500	KVR7-500	20	150	KVR20-150
7.5	1000	KVR7.5-1000	20	500	KVR20-500
10	50	KVR10-50	20	750	KVR20-750
10	100	KVR10-100	24	10	KVR24-10

REGULATED HIGH VOLTAGE D.C. POWER SUPPLIES (cont'd.)

OUTPUT (MAX.) KV	MA	MODEL NUMBER	OUTPUT (MAX.) KV	MA	MODEL NUMBER
24	45	KVR24-45	50	100	KVR50-100
24	200	KVR24-200	75	5	KVR75-5
24	500	KVR24-500	75	10	KVR75-10
24	1000	KVR24-1000	75	50	KVR75-50
30	1	KVR30-1	75	100	KVR75-100
30	10	KVR30-10	100	5	KVR100-5
30	45	KVR30-45	100	25	KVR100-25
30	100	KVR30-100	150	5	KVR150-5
30	200	KVR30-200	150	15	KVR150-15
30	400	KVR30-400	200	5	KVR200-5
30	800	KVR30-800	200	12	KVR200-12
50	5	KVR50-5	250	5	KVR250-5
50	15	KVR50-15	250	10	KVR250-10
50	50	KVR50-50			





CURRENT REGULATION. Voltage regulated power supplies can be provided with current regulation capability on special order.

HIGH-VOLTAGE D.C. INSULATION TESTERS

FEATURES

- Reversible Polarity Output (most models)
- Continuously Variable Output Control with Vernier Adjust
- Adjustable Overcurrent and Overvoltage Shutoffs
- Safety Interlock
- Provision for External Interlock
- Zero-Start Interlock
- Triple Range Current Meters
- Triple Range Voltage Meters
- Fail-Safe Output Shorting Mechanism
- Meters Electronically Protected
- Functional Pilot Lamps
- Selenium Rectifiers
- Surge Limiting Resistor
- Circuit Breaker Operation

OUTPUT KV	MA	MODEL NO.	OUTPUT KV	MA	MODEL NO.
0-30	5	DC 30-5	0-250	5	DC 250-5
0-60	5	DC 60-5	0-350	5	DC 350-5
0-120	5	DC 120-5	0-600	5	DC 600-5
0-150	5	DC 150-5	0-1,000	5	DC 1,000-5

HIGH VOLTAGE A.C. INSULATION TESTERS

for Dielectric Testing under ASTM, MIL and Federal Specs.

FEATURES

• Motor-Driven output control with adjustable speeds permits selection of proper rate-of-rise for various specification testing. • Plexiglas, Safety-Interlocked Access Door • 4½" Memory-type Voltage Meter • Functional Pilot Lamps • Dual Range Circuit Breaker Operation • Plug-in Test Jigs available, most models.

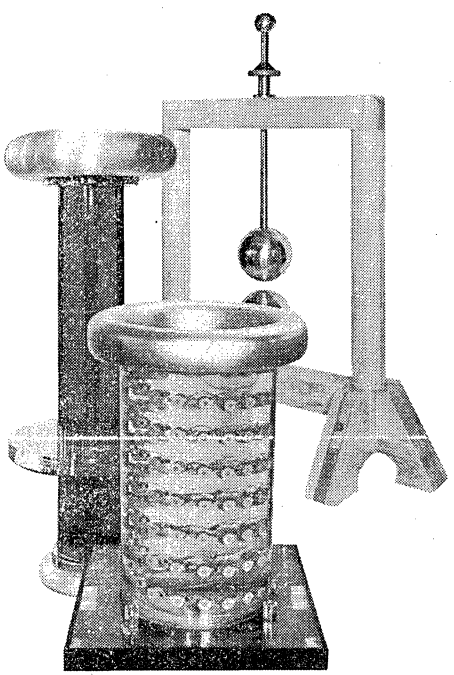
OUTPUT KV	KVA	MODEL NO.
0-15	5	AC 15-5
0-25	2.5	AC 25-2.5
0-25	5	AC 25-5
0-60	2.5	AC 60-2.5
0-100	5	AC 100-5

HIGH VOLTAGE A.C./D.C. INSULATION TESTERS

FEATURES

• Reversible Polarity D.C. Output (most models) • Continuously Variable Voltage Output Control • Adjustable D.C. Over-Current Shut-Off • Zero-Start Interlock • Safety Interlock on High Voltage Cabinet Door • Provision for External Interlock • Electrônically-Protected Meters • Fail-Safe Output Shorting Mechanism • Functional Pilot Lamps • Circuit-Breaker Operation • Surge-Limiting Resistor.

OUTPUT KV Peak AC	KV DC	MA AC	MA DC	MODEL NO.
15	30	20	5	DAC 15/30-20-5
30	60	20	5	DAC 30/60-20/5
75	150	20	5	DAC 75/150-20/5
125	250	20	5	DAC125/250-20/5



HIGH VOLTAGE D.C. POWER PACKS

These units are high voltage sections of standard power supplies minus meters and controls and contain the basic components described for standard power supplies — filter system, fail-safe mechanism, surge resistor, meter multiplier, primary gaps, etc.

HIGH VOLTAGE HARDWARE AND ACCESSORIES

MULTIPLIERS AND DIVIDERS. High voltage resistance strings, accurate to 0.15% or better with division ratios which may be specified. Stability is 25 PPM/°C; current drain 1 ma. Accuracy traceable to NBS standards as an option.

ELECTRONIC CROWBAR designed to protect Klystron or other sensitive loads from damage by discharge of power supply energy can be manufactured into your custom-built power supply or provided as separate devices. A typical unit has a response time of 3-5 microseconds and is capable of discharging five microfarads in approximately one millisecond at 20 KV.

CALIBRATED SPARK GAPS provided with micrometer calibration and may be used for determining crest voltage.

HIGH VOLTAGE OUTPUT BUSHING. Oil filled and terminated with anti-corona toroids, these devices are designed for oil-to-air outlet of very high voltages; available in two ratings, 300 and 600 KV D.C.

Call or write for a copy of our latest catalog.

KILOVOLT CORPORATION
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Switching Regulator Power Supplies 250–300–500 Watt Series

Specifications:

Input: 115 VAC ±10% or 230 VAC ±10%, 47-440 Hz.

Line Regulation: ±0.05%.

Load Regulation: ±.05% from zero to full load.

Conducted Ripple and Noise: 50 MV P-P.

Overshoot and Undershoot: 1% maximum deviation for a step load change of 25%.

Output Polarity: Either output may be grounded or left floating up to 100V off chassis ground.

Remote Sensing: Provided to eliminate voltage loss due to power distribution.

Over-Voltage Protection: OVP is standard on 5V output models and is factory set at 6.2V ±5%. OVP for other outputs is available as an option.

Current Limit: With 'Fold-Back' current limiting.

Temperature Coefficient: ±0.02%/°C.

Operating Temperature: 0° to +70°C.

Storage Temperature: −55° to +85°C.

Response Time: 200 μS for a step load change of 25%.

Drop-Out Time: Supply will remain in regulation for 20 MS after removal of AC power.

Output Connections: Heavy duty output connections are provided by using ¼ x 20 threaded buss.

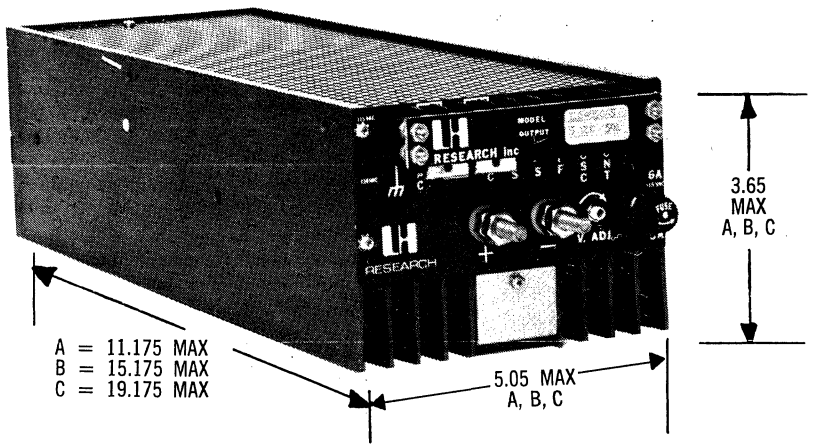
Input Connections: AC input is provided through a Cinch Jones type 140Y barrier strip.

Finish: Blue anodized aluminum.

Optional Features:

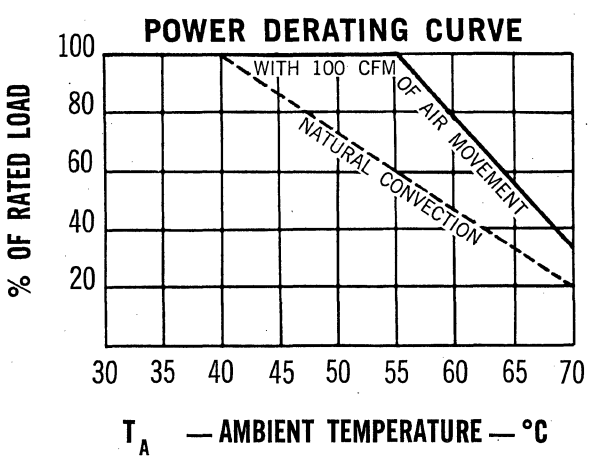
Inputs: DC and three phase.

Outputs: Any output voltage.
Power Fail Detection.
Remote On/Off Control.



Outputs	Model Number	Case	Weight	Price
5V at 50A	LHS-250-5	A	7 lbs.	$360
12V at 21A	LHS-250-12	A	7 lbs.	$360
15V at 17A	LHS-250-15	A	7 lbs.	$360
18V at 14A	LHS-250-18	A	7 lbs.	$360
24V at 10A	LHS-250-24	A	7 lbs.	$360
+12V at 15A, −12V at 10A	LHD-300-12 *	B	9 lbs.	$435
+15V at 15A, −15V at 10A	LHD-300-15 *	B	9 lbs.	$435
+18V at 15A, −18V at 10A	LHD-300-18 *	B	9 lbs.	$435
5V 50A, ±12V 10A	LHT-300-12 *†	B	9½ lbs.	$460
5V 50A, ±12V 10A	LHT-300-12R*	B	9½ lbs.	$520
5V 50A, ±15V 10A	LHT-300-15 *†	B	9½ lbs.	$460
5V 50A, ±15V 10A	LHT-300-15R*	B	9½ lbs.	$520
5V 50A, ±18V 8A	LHT-300-18 *†	B	9½ lbs.	$460
5V 50A, ±18V 8A	LHT-300-18R*	B	9½ lbs.	$520
5V at 100A	LHS-500-5	C	12 lbs.	$510
12V at 42A	LHS-500-12	C	12 lbs.	$510
15V at 34A	LHS-500-15	C	12 lbs.	$510
18V at 28A	LHS-500-18	C	12 lbs.	$510
24V at 20A	LHS-500-24	C	12 lbs.	$510

* Total output power not to exceed 300 watts.
† Output section semi-regulated.



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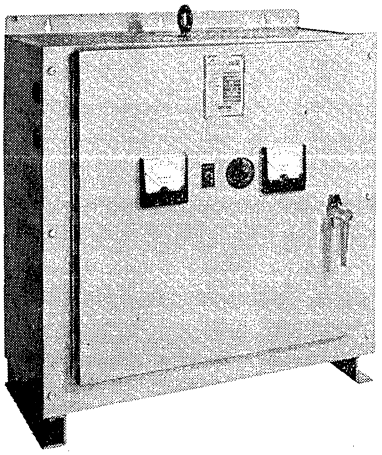


FLOAT BATTERY CHARGERS

LA MARCHE

GENERAL DESCRIPTION

The model A-11 Float Battery Charger is a completely automatic, solid state, constant voltage device having:

A.C. VOLTAGE COMPENSATION — D.C. VOLTAGE REGULATION — CURRENT LIMITING

The model (A-11) charger is designed and built to carry continuous and intermittent loads up to its maximum rated output. The A-11 is current limited at 140% of rated output. Each unit is designed and built to charge a specific type of battery containing a specific number of cells.

The La Marche Transistor Controlled magnetic-amplifier circuits provide continuous taper charging. Maintains rated output voltage within ±1% from no load to full load with A.C. input variations of ±10%. Silicon diodes are used for rectification.

The model A-11 charger floats lead-acid batteries at 2.17 volts per cell and by means of a front panel switch equalizes at 2.33 volts per cell. Both float and equalize voltages are adjustable to meet battery manufacturers recommendations. This type of charging imparts the longest battery life and is the accepted method for charging batteries used in standby service.

DESIGN FEATURES

1. Quality parts throughout. Silicon diode rectifiers and transistor magnetic amplifiers used exclusively.
2. A.C. power loss relay, output voltmeter/ammeter and fused input-output are standard on all models.
3. Eighty sizes available in five input voltages.
4. Adjustable equalize and float levels; float/equalize controls located on face panel for easy operation.
5. Design and operation tested and approved by battery manufacturers, utilities, railroads and military.

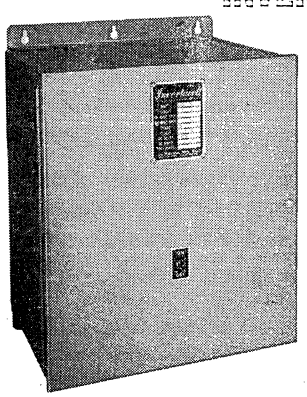
SPECIFICATIONS

STANDARD ACCESSORIES SUPPLIED:

1. Potentiometer for desired float and equalize charge voltage adjustments.
2. Quality D.C. ammeter and voltmeter with 50 millivolt movement, 2% accuracy.
3. Power failure relay with terminals for connections to a remote alarm system.
4. Fused A.C. input and D.C. output for complete protection.
5. Convenient switch to transfer from float charge to high rate equalize charge.
6. Internal terminal board for easy connection of A.C. input, D.C. output and power failure equipment.

INVERTERS

DC to AC Power Source with Regulated Sine Wave Output



DESCRIPTION

The La Marche MODEL A-51 is a completely solid state SCR inverter which provides a regulated, sine wave output for such applications as:

- Boiler Controls
- Telephone and Microwave Communications
- Burglar Alarms
- Supervisory Control Equipment
- Data Processing and Telemetering Equipment
- Nuclear and Missile Installations
- P.A. Systems
- Fire Alarms

MODEL A-51-120 VOLT A.C. — 60 HZ SINE WAVE OUTPUT

SPECIFICATIONS

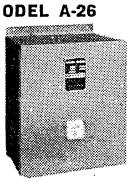
AC OUTPUT VOLTAGE	120 Volts Nominal
LINE REGULATION	±1% for ±15% DC Change
LOAD REGULATION	±2% No Load to Full Load
FREQUENCY	60 Cycle Nominal
FREQUENCY STABILITY	±1% for Load, Input Voltage and Temperature Variations
WAVE SHAPE	Sine Wave
DISTORTION	Approximately 7%
OVERALL EFFICIENCY	Approximately 65%
AMBIENT TEMPERATURE	−20° to 60°C (0° to 140°F)

ORDERING SPECIFICATIONS

1. La Marche model number.
2. Number and type of battery cells.
3. Ampere hour capacity of batteries.
4. AC loads.
5. Application.
6. Type and capacity of charging equipment.
7. Type of mounting, wall or rack mount.
8. Optional accessories.

FILTERED D.C. POWER SUPPLIES

MODEL A-26

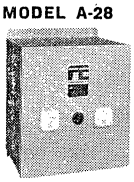


DESIGN FEATURES

1. Automatic in operation and self-regulating.
2. No moving parts. Nothing to arc or wear out.
3. No external controls. Cannot be tampered with.

The La Marche A-26 power supply features automatic load regulation and semi-automatic current limiting. The model A-26 is filtered to 10% ripple. There are no controls to be set for different applications because the amount of loading determines the current output.

MODEL A-28



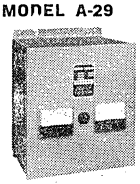
DESIGN FEATURES

- silicon diode rectifiers.
- Current limiting circuit.
- Automatic A.C. voltage compensation.
- D.C. voltage regulation.
- Output ammeter and voltmeter.

The model (A-28) is a solid state, fully automatic, constant voltage D.C. power supply designed for all regulated applications.

Standard features include automatic A.C. line compensation, D.C. voltage regulation and current limiting. The La Marche transistor controlled magnetic amplifier circuit is designed to automatically provide a D.C. output regulation of ±5″ from no load to full rated output. Accurate output regulation is maintained with A.C. line variations of ±10%. The A-28 is offered in a wide range of sizes and voltages.

MODEL A-29



ORDER SPECIFICATIONS

1. La Marche model number
2. A.C. input voltage, cycles, phase
3. Intermittent D.C. loads and duration
4. Continuous D.C. load
5. Amount of filtering — measured how?

The model (A-29) is a solid state, fully automatic, constant voltage D.C. power supply designed for all regulated applications.

Standard features include automatic A.C. line compensation, D.C. voltage regulation and current limiting. The La Marche transistor controlled magnetic amplifier circuit is designed to automatically provide a D.C. output regulation of ±1% from no load to full rated output. Accurate outputs regulation is maintained with A.C. line variations of ±10%. The A-29 is offered in a wide range of sizes and voltages.

CALL FOR COMPLETE INFORMATION ON OUR VOLTAGE SENSING RELAYS & D.C. TO D.C. CONVERTERS

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ADJUSTABLE POWER SUPPLIES AC or DC, Regulated or Unregulated, "Multi-Range" Constant Power. Ratings to 1 Megavolt. Powers to 250 KW. **BULLETIN No. DCA-1000**

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AC INSULATION TESTERS Ratings to 400 KV/1000 KVA. Features Memory Meter which indicates voltage breakdown, high speed overload. Options include Corona Free, Automatic Voltage Sequencing, Constant Power, Variable Speed Control. **BULLETIN No. ACI-3000**

DIVIDERS Accuracies of 0.01%, 0.1%, 1.0%. DC/ACP, DC, AC RMS, PULSE. Traceable to NBS. **BULLETIN No. DCP-4000**

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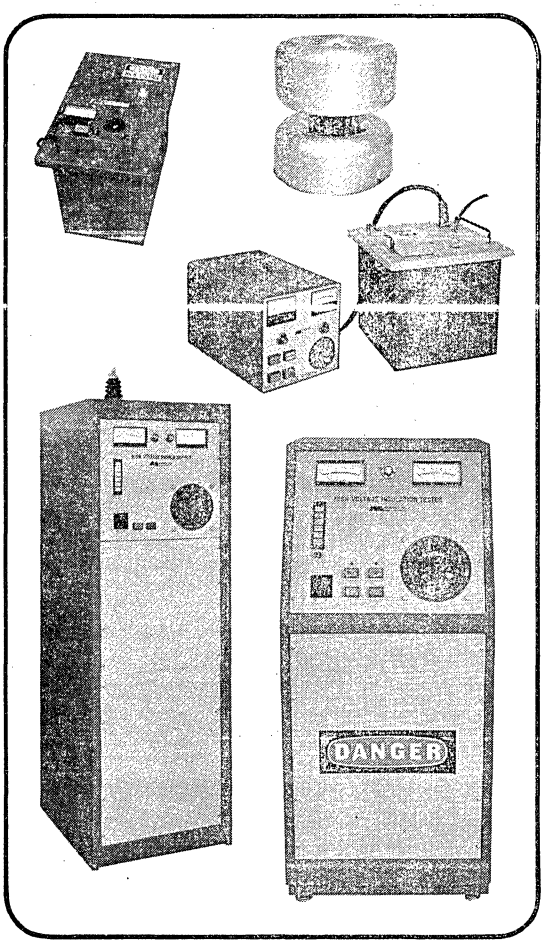
TYPICAL APPLICATIONS Dielectric Heating • Electro Static Cooling • Carbon Deposition • Beam Separator • X-Ray Thickness Gauge • Pulse Charging Lines • Capacitor Charging • Air Purifying • Paint Spraying • Fiber Flocking • Mineral Separation • Grain Cleansing • Recovery of Precious Metal Dust • Electron and Field Ion Microscopy • Testing Large Rotating Machinery • Cloud Chamber • Vacuum Arc Experiments • Removal of Liquid Fuel Contaminants • Killing Bacteria • Electron Beam Welding and Machining • Zone Heating • Testing Liquid and Solid Dielectrics • Processing Razor-Blades • Processing Vegetables • Spectroscopy • Spark Chamber • Processing Synthetic Rubber • Charging Electrostatic Antennae for Cloud Study • Ion Propulsion Engines • Injection and Focusing Devices on High Energy Accelerators • Sparking of Cathode Ray Tubes • Life Testing and Processing of Vacuum Tubes • Energizing Laser Devices • Charging Paper for Xerography Printing • Radar • Image Intensifier • Sputtering Processes • Impulse Testing • Explosive Forming • Electrophoresis.



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- Standard Models Easily Modified for Custom Design.

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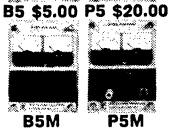
MIC Modular Power Supply System

RA5-1 $35.00

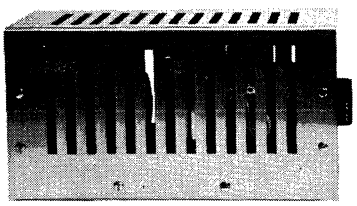
B5 $5.00 P5 $20.00



B5M $35.00 P5M $40.00

Features

- Low Cost
- .02% Load Regulation
- Parallel or Series Operation
- .02% Line Regulation
- Full Repairability
- 500 Microvolts Ripple
- Remote Sensing
- 0-50°/71°C Operation
- Integrated Circuit Control



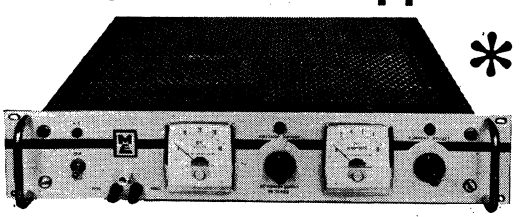
Model Number	Output Volts	Output Amps	Price	Model Number	Output Volts	Output Amps	Price	Model Number	Output Volts	Output Amps	Price	Model Number	Output Volts	Output Amps	Price
MIC A3	3	6.0	$129.00	MIC B3	3	12.0	$179.00	MIC D3	3	18.0	$239.00	MIC E3	3	9.0	$135.00
MIC A5	5	5.8	129.00	MIC B5	5	11.6	179.00	MIC D5	5	17.4	239.00	MIC E5	5	8.7	135.00
MIC A6	6	5.5	129.00	MIC B6	6	11.0	179.00	MIC D6	6	16.5	239.00	MIC E6	6	8.2	135.00
MIC A8	8	5.0	129.00	MIC B8	8	10.0	179.00	MIC D8	8	15.0	239.00	MIC E8	8	7.5	135.00
MIC A10	10	4.7	129.00	MIC B10	10	9.4	179.00	MIC D10	10	14.1	239.00	MIC E10	10	7.0	135.00
MIC A12	12	4.4	129.00	MIC B12	12	8.8	179.00	MIC D12	12	13.2	239.00	MIC E12	12	6.6	135.00
MIC A15	15	3.9	129.00	MIC B15	15	7.8	179.00	MIC D15	15	11.7	239.00	MIC E15	15	5.8	135.00
MIC A18	18	3.5	129.00	MIC B18	18	7.0	179.00	MIC D18	18	10.5	239.00	MIC E18	18	5.2	135.00
MIC A24	24	2.9	129.00	MIC B24	24	5.8	179.00	MIC D24	24	8.7	239.00	MIC E24	24	4.3	135.00
MIC A28*	28	2.6	129.00	MIC B28*	28	5.2	179.00	MIC D28*	28	7.8	239.00	MIC E28*	28	3.9	135.00
MIC A200	200	0.5	151.00	MIC B200	200	1.0	215.00	—	—	—	—	MIC E200	200	0.7	180.00
												MIC F5	5	50	445.00
												MIC F15-2	±15	12†	445.00

* Other standard models with outputs between 28 and 200 volts are available. Consult factory.
† 12 amps for each output voltage.

PR Constant Voltage / Current Silicon Power Supplies

Features

- High Power — Small Size
- Remotely Programmable
- All Silicon Semiconductors
- Mode Lites
- .01% Regulation
- Low Ripple
- Constant Voltage/Constant Current
- Parallel Operation



*

Model Number	Output Volts	Output Current Amps	Regulation Line CV	Regulation Line CC	Regulation Load CV	Regulation Load CC	Panel Height	Price
PR 20-15	0-20	0-15	0.01%	0.01%	0.01%	0.25%	3½"	$525.00
PR 40-10	0-40	0-10	0.01%	0.01%	0.01%	0.25%	3½"	515.00
PR 60-7	0-60	0-7	0.01%	0.01%	0.01%	0.25%	3½"	540.00
PR 125-3.2	0-125	0-3.2	0.01%	0.01%	0.01%	0.25%	3½"	625.00
PR 20-25	0-20	0-25	0.01%	0.01%	0.01%	0.25%	5¼"	715.00
PR 40-20	0-40	0-20	0.01%	0.01%	0.01%	0.25%	5¼"	730.00
PR 60-14	0-60	0-14	0.01%	0.01%	0.01%	0.25%	5¼"	715.00
PR 125-6.5	0-125	0-6.5	0.01%	0.01%	0.01%	0.25%	5¼"	920.00

HV Constant High Voltage Power Supplies

Features

- All Solid State
- Adjustable Current Limit
- 1 Millivolt Ripple
- 0.01% Regulation
- 10-Turn Voltage Adjustments
- Remote Programming
- Remote Sensing

Model Number	Output Volts	Output Amps	RMS Ripple	Regulation Line	Regulation Load	Size	Price
HV 350-1	0-350	1	< 1mv	0.005%	0.01%	3½ x 19 x 16½	$725.00
HV 350-2	0-350	2	< 1mv	0.005%	0.01%	5¼ x 19 x 16½	850.00
HV 350-3	0-350	3	< 1mv	0.005%	0.01%	7 x 19 x 16½	1025.00

* Photograph illustrates both **PR** and **HV** Series.

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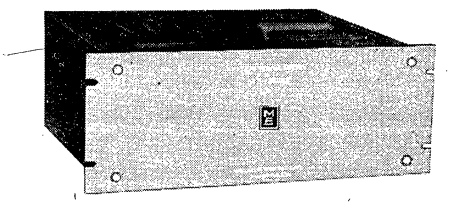
MS High Power System Component Power Supplies

■ Features

Most Complete Coverage
Up to 600 Volts
Up to 1200 Amperes
139 Standard Models

Low Cost
All Solid State
Extreme Reliability
10 Year Guarantee



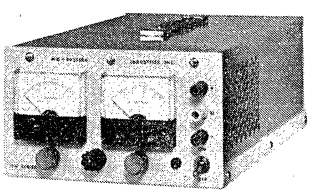
Model Number	Inches in Height	Model Number	Inches in Height	Model Number	Inches in Height	Model Number	Inches in Height	Model Number	Inches in Height	Model Number	Inches in Height
MS9-600	4⅝	MS20-10	3½	MS34-6	3½	MS65-3	3½	MS128-2	3½	MS350-1.5	5¼
MS9-1200	6⅞	MS20-30	5¼	MS34-20	5¼	MS65-10	5¼	MS128-6	5¼	MS350-3	8¾
MS12-12	3¼	MS20-45	8¾	MS34-30	8¾	MS65-15	8¾	MS128-10	8¾	MS350-5	12¼
MS12-40	5¼	MS20-80	12¼	MS34-50	12¼	MS65-25	12¼	MS128-15	12¼	MS350-7	17½
MS12-60	8¾	MS20-120	17½	MS34-75	17½	MS65-35	17½	MS128-24	17½	MS350-10	24
MS12-100	12¼	MS20-180	24	MS34-125	24	MS65-50	24	MS128-35	24	MS350-30	6⅞
MS12-150	17½	MS20-400	6⅞	MS34-300	6⅞	MS65-75	4⅝	MS128-45	4⅝	MS410-1.5	5¼
MS12-225	24					MS65-150	6⅞	MS128-90	6⅞	MS410-3	8¾
MS12-400	6⅞	MS25-8	3½	MS38-6	3½					MS410-5	12¼
		MS25-25	5¼	MS38-20	5¼	MS77-3	3½			MS410-7	17½
MS13.5-12	3½	MS25-37	8¾	MS38-30	8¾	MS77-10	5¼	MS240-.75	3½	MS410-10	24
MS13.5-40	5¼	MS25-60	12¼	MS38-50	12¼	MS77-15	8¾	MS240-3	5¼	MS410-30	6⅞
MS13.5-60	8¾	MS25-90	17½	MS38-75	17½	MS77-25	12¼	MS240-5	8¾		
MS13.5-100	12¼	MS25-140	24	MS38-125	24	MS77-35	17½	MS240-7	12¼	MS470-2	8¾
MS13.5-150	17½	MS25-200	4⅝	MS38-300	6⅞	MS77-50	24	MS240-10	17½	MS470-3	12¼
MS13.5-225	24	MS25-400	6⅞			MS77-75	4⅝	MS240-15	24	MS470-5	17½
MS13.5-400	6⅞					MS77-150	6⅞	MS240-40	6⅞	MS470-7	24
		MS29-8	3½	MS46-5	3½					MS470-10	4⅝
MS17-10	3½	MS29-25	5¼	MS46-15	5¼	MS109-2	3½	MS273-.75	3½	MS470-20	6⅞
MS17-30	5¼	MS29-37	8¾	MS46-22	8¾	MS109-6	5¼	MS273-3	5¼		
MS17-45	8¾	MS29-60	12¼	MS46-40	12¼	MS109-10	8¾	MS273-5	8¾	MS545-2	8¾
MS17-80	12¼	MS29-90	17½	MS46-60	17½	MS109-15	12¼	MS273-7	12¼	MS545-3	12¼
MS17-120	17½	MS29-140	24	MS46-90	24	MS109-24	17½	MS273-10	17½	MS545-5	17½
MS17-180	24	MS29-200	4⅝	MS46-120	4⅝	MS109-35	24	MS273-15	24	MS545-7	24
MS17-400	6⅞	MS29-400	6⅞	MS46-240	6⅞	MS109-45	4⅝	MS273-40	6⅞	MS545-10	4⅝
						MS109-90	6⅞			MS545-20	6⅞

NOTE: The digits of the Model Number indicate the output voltage and current in amps. Example: MS9-600 has an output of 9 volts, current of 600 amps. MS9-1200 has an output of 9 volts at 1200 amps. **Consult factory for prices.**

HW Constant Voltage/ Constant Current Power Supplies

■ Features

Models up to 100 Volts
Remotely Programmable
Remote Sensing
Series and Parallel Operation
500μ Volts Ripple
.01% Load Regulation
Half Rack Size
Separate Voltmeter and Ammeter
Rack or Bench mounted
.005% Line Regulation



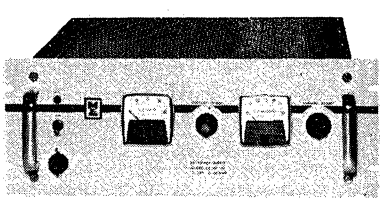
Model Number	Output Voltage	Output Amps	Regulation Line CV	Regulation Line CC	Regulation Load CV	Regulation Load CC	Price
HW 10-8	0-10	0-8	0.01%	0.1%	0.01% or 1 mv	0.5%	$240.
HW 10-15	0-10	0-15	0.01%	0.1%	0.01% or 1 mv	0.5%	345.
HW 20-4	0-20	0-4	0.01%	0.1%	0.01% or 1 mv	0.5%	250.
HW 20-10	0-20	0-10	0.01%	0.1%	0.01% or 1 mv	0.5%	345.
HW 40-2	0-40	0-2	0.01%	0.1%	0.01% or 1 mv	0.5%	250.
HW 40-5	0-40	0-5	0.01%	0.1%	0.01% or 1 mv	0.5%	325.
HW 60-1.5	0-60	0-1.5	0.01%	0.1%	0.01% or 1 mv	0.5%	250.
HW 60-3	0-60	0-3	0.01%	0.1%	0.01% or 1 mv	0.5%	345.
HW 100-2	0-100	0-2	0.01%	0.1%	0.01% or 1 mv	0.5%	395.
HW 200-1	0-200	0-1	0.01%	0.1%	0.01% or 1 mv	0.5%	445.

Prices include: meters, case, carry handle, and rubber feet.
Options: overvoltage, 10-turn potentiometers, and special input voltage.

RA Constant Voltage Silicon Supplies

■ Features

High Power — Small Size
Remotely Programmable
Low Ripple
Parallel Operation
.01% Regulation
All Silicon Semiconductors



Model Number	Output Voltage	Output Amps	Voltage Regulation Line	Voltage Regulation Load	Panel Height	Price
RA 20-15	0-20	0-15	0.01%	0.01%	3½"	$435.
RA 40-10	0-40	0-10	0.01%	0.01%	3½"	435.
RA 60-7	0-60	0-7	0.01%	0.01%	3½"	450.
RA 125-3.2	0-125	0-3.2	0.01%	0.01%	3½"	450.
RA 20-25	0-20	0-25	0.01%	0.01%	5½"	495.
RA 40-20	0-40	0-20	0.01%	0.01%	5½"	475.
RA 60-14	0-60	0-14	0.01%	0.01%	5½"	550.
RA 125-6.5	0-125	0-6.5	0.01%	0.01%	5½"	610.
RA 40-30	0-40	0-30	0.01%	0.01%	7"	695.
RA 60-20	0-60	0-20	0.01%	0.01%	7"	720.
RA 125-10	0-125	0-10	0.01%	0.01%	7"	805.

Options include: meters, overvoltage, 10-turn potentiometers, and special input voltages.

POWER SUPPLIES

LOW COST AC TO DC POWER SUPPLIES

SERIES F

FEATURING:

- HIGH QUALITY
- IC REGULATION
- U.S. MADE
- EXCELLENT REG. & RIPPLE
- LONG TERM RELIABILITY
- SHORT CIRCUIT PROTECTED
- CURRENT LIMITED
- LOW COST
- SMALL SIZE

MIL FOR PERFORMANCE

Mil has taken every step to insure that you will receive a quality product at the lowest possible price.
Only quality American components are used to insure safe and reliable operation. Specialized equipment such as the soldering line and custom transformer winding machinery have been installed to enable Mil's engineering department to optimize power supply design to your exact needs.

Each phase of Mil's operations are carefully checked by the quality control department. A thorough evaluation is also made of each completed supply before shipment to further insure complete customer satisfaction. The combination of exacting production techniques plus a desire to completely meet each customer's specific requirements make Mil the first choice in power supplies.

MODEL SPECIFICATIONS

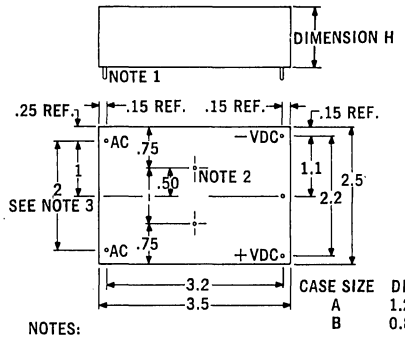
		SINGLE OUTPUT																														
	Line Ref.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
	Model Number	F5SA1A	F5SB60	F6SA90	F6SB45	F8SA70	F8SB35	F10SA50	F10SB25	F12SA50	F12SB25	F15SA50	F15SB25	F18SA20	F18SB10	F20SA20	F20SB10	F24SA20	F24SB10	F28SA20	F28SB10	F200SA05	F200SB03	F5DA40	F5DA25	F5DB15	F5DB05	F6DA40	F6DA25	F6DB15	F6DB05	F8DA30	F10DA25	F10DA20
DC OUTPUT VOLTAGE (VOLTS)	5	√	√																					±	±	±	±							
	6			√	√																							±	±	±	±			
	8					√	√																									±		
	10							√	√																								±	±
	12									√	√																							
	15											√	√																					
	18													√	√																			
	20															√	√																	
	22																																	
	24																	√	√															
	28																			√	√													
	200																					√	√											
OUTPUT CURRENT (EACH SIDE FOR DUALS) MILLIAMPS	25																						√											
	50																					√					√				√			
	75																																	
	100														√		√		√		√													
	150																									√				√				
	200													√		√		√		√														√
	250								√		√		√												√				√				√	
	300																															√		
	350						√																											
	400																							√				√						
	450				√																													
	500		√					√		√		√																						
	700					√																												
	900			√																														
	1000	√																																
Regulation %	0.1							√	√	√	√	√	√				√		√		√													
	0.2													√	√	√		√		√														√
	0.5	√	√	√	√	√	√																	√	√	√	√	√	√	√	√	√	√	
Dimensions — See Fig.		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Case Size		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	A	B	B	A	A	B	B	A	A	A
Price Per Unit $		48	38	50	40	50	40	50	40	50	40	50	40	50	40	50	40	50	44	50	44	29	27	68	58	42	24	68	58	37	22	68	68	50

ALSO SEE EEM Vol.1•766 FOR MIL's DC TO DC SUPPLIES

MIL ELECTRONICS 176 WALKER ST. LOWELL, MASS. 01854 (617) 453-4142 (617) 452-8981 . . . OR TELEX 94-7490

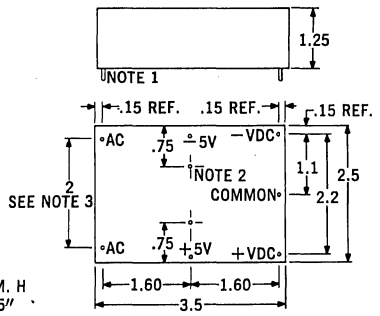
MECHANICAL SPECIFICATIONS

SINGLE AND DUAL OUTPUTS

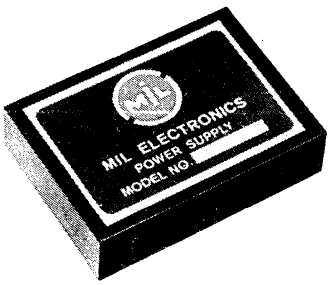


NOTES:
1. Seven Pins, .040 dia. x .2 lg. min.
2. Two Mounting Inserts, #4-40 x .10 dp min.
3. Optional 2.2″ Spacing Add — W to Part No.

TRIPLE OUTPUTS



NOTES:
1. Five Pins, .040 dia. x .2 lg. min.
2. Two Mounting Inserts, #4-40 x .10 dp min.
3. Optional 2.2″ Spacing Add — W to Part No.



GENERAL SPECIFICATIONS

Line Regulation: .05%
Input Voltage: 105-125 VAC
Input Frequency: 50-500 Hz

Output Ripple: Less than 1 mV_{RMS}
Operating Temp.: −25°C to +71°C
Storage Temp.: −55°C to +85°C

Temp. Coefficient: 0.02% per °C typical
Input Isolation: 50 Meg Ohms
Current Limit: Approx. 120% of max.

DUAL OUTPUT																								TRIPLE OUTPUT								
34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62		63		64		Line Ref.
F10DB10	F10DB05	F12DA25	F12DA20	F12DB10	F12DB05	F15DA25	F15DA20	F15DB10	F15DB05	F18DA20	F18DA20	F18DB10	F18DB05	F20DA20	F20DA15	F20DB08	F20DB05	F22DA20	F24DA15X	F24DA15	F24DB08	F24DB05	F28DA15X	F28DA15	F28DB08	F28DB05	F12TA10	F15TA10		F18TA08		F24TA05		Model Number
																											S	D	S	D	S	D	S	D	
																											+		+		+			5
																																		6
																																		8
±	±																																	10
		±	±	±	±																							±						12
						±	±	±	±																				±					15
										±	±	±	±																	±				18
														±	±	±	±																	20
																		±																22
																			±	±	±	±											±	24
																							±	±	±	±								28
																																		200
													√																					25
	√				√				√								√					√				√						√	50
																√					√				√					√				75
√				√				√				√																√		√				100
															√				√	√			√	√										150
			√				√			√	√			√				√																200
		√				√																												250
																																		300
																																		350
																																		400
																																		450
																											√	√		√		√		500
																																		700
																																		900
																																		1000
		√				√				√			√					√	√				√											0.1
√	√		√	√	√		√	√	√		√	√		√	√	√	√			√	√	√		√	√	√								0.2
																											√	√	√	√	√	√	√	√	0.5
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2		2		2		2	Dimensions — See Fig.
B	B	A	B	B	B	A	A	B	B	A	A	B	B	A	A	B	B	A	A	A	B	B	A	A	B	B	A		A		A		A	Case Size
42	24	66	54	38	20	66	54	38	20	68	56	40	22	68	56	40	22	68	68	56	40	22	68	56	40	22	78		78		82		82	Price Per Unit $

DC OUTPUT VOLTAGE (VOLTS)

OUTPUT CURRENT (EACH SIDE FOR DUALS) MILLIAMPS

Regulation %

ALSO SEE EEM Vol.1•766 FOR MIL's DC TO DC SUPPLIES

MIL ELECTRONICS 176 WALKER ST. LOWELL, MASS. 01854 (617) 453-4142 (617) 452-8981 . . . OR TELEX 94-7490

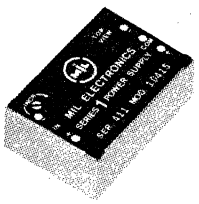
DC TO DC POWER SUPPLIES

FOR COMPLETE SPECIFICATIONS, SEND FOR FREE 32 PAGE CATALOGUE

MIL ELECTRONICS
176 WALKER ST.
LOWELL, MASS. 01854

. . . OR CALL COLLECT (617) 453-4142
(617) 452-8981
. . . OR TELEX 94-7490

SERIES I

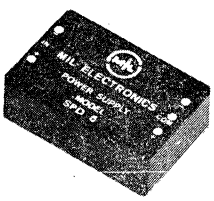


ONE WATT OF ISOLATED DUAL OR SINGLE REGULATED OUTPUT POWER FROM 4 TO 100 VOLTS

Adjustable Output — Printed Circuit Mounting
1 x 1.5 x .55 Aluminum Package
Choice of Input Voltages
5 ± .5 VDC
12 ± 2 VDC
24 ± 4 VDC
28 ± 4 VDC

$120.00 ea.

SERIES P

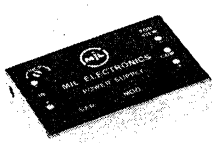


ONE WATT OF ISOLATED DUAL OR SINGLE REGULATED OUTPUT POWER FROM 4 TO 100 VOLTS DC

Fixed Output — Printed Circuit Mounting
1 x 1.5 x .5 Epoxy Package
Choice of Input Voltages
5 ± .5 VDC
12 ± 2 VDC
24 ± 4 VDC
28 ± 4 VDC

$49.00 ea.

SERIES M

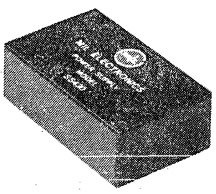


THREE WATTS OF ISOLATED DUAL OR SINGLE REGULATED OUTPUT POWER FROM 5 TO 250 VOLTS DC

Adjustable Output — Printed Circuit Mounting
1.5 x 2.43 x .60 Aluminum Package
Choice of Input Voltages
5 ± .5 VDC
12 ± 2 VDC
24 ± 4 VDC
28 ± 4 VDC

$135.00 ea.

SERIES S

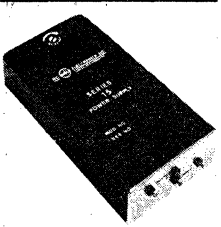


THREE WATTS OF ISOLATED TRIPLE, DUAL OR SINGLE REGULATED OUTPUT POWER FROM 5 TO 250 VOLTS DC

Fixed Output — Printed Circuit Mounting
2.4 x 1.5 x .82 Epoxy Package
Choice of Input Voltages
5 ± .5 VDC
12 ± 2 VDC
24 ± 4 VDC
28 ± 4 VDC

$79.00 ea.

SERIES 15

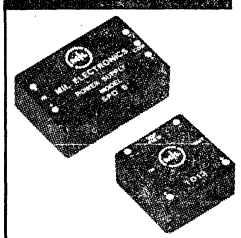


FIFTEEN WATTS OF ISOLATED POWER UP TO FOUR REGULATED OUTPUTS FROM 5 TO 2000 VOLTS DC

Adjustable Output — Solder Terminals — Threaded Inserts
5 x 2.58 x 1.16 Aluminum Package
High Efficiency Switching Regulator
Operates From 11 to 32 Volts DC Input

$479.00 ea.

SERIES N & T



NIXIE® TUBE POWER SUPPLY 200 VOLTS DC OUTPUT

DC Input	Model No. Output 3 ma	Model No. Current 13 ma
5V	T5	N5
6V	T6	N6
12V	T12	N12
24V	T24	N24
28V	T28	N28

Printed Circuit Mounting
Isolated Output
Epoxy Package

Series "T"	Series "N"
1x1.5x.5	1x1x.5
$15.95 ea.	$29.95 ea.

SERIES R

CRT POWER SUPPLY 2000 VOLTS DC @ 2 ma AND 6.3 VA @ 700 ma OUTPUT

Input VDC	Model No.
18	R1862
20	R2062
22	R2262
24	R2462
26	R2662
28	R2862
30	R3062

Metal Case
Threaded Inserts
Solder Terminals
Isolated Outputs
1.28 Dia. x 2.10 High

$89.00 ea.

SERIES V

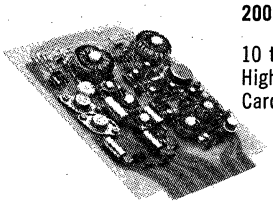
VARIABLE HIGH VOLTAGE POWER SUPPLY INPUT VOLTAGE 4 TO 12 VOLTS DC

Output VDC	Output Current ma	Model No.
300-1000	.1	VL10
300-1000	1.0	VH10
500-1500	.15	VL15
500-1500	1.5	VH15
700-2000	.2	VL20
700-2000	1.0	VH20

Printed Circuit Mounting
Isolated Output
2.4 x 1.5 x .82
Epoxy Package

$49.00 ea.

SERIES C

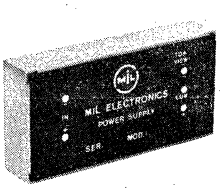


FIFTEEN WATTS OF ISOLATED POWER UP TO FOUR REGULATED OUTPUTS FROM 5 TO 2000 VOLTS DC

10 to 60 Volt Input
High Efficiency Switching Regulator
Card Mounted 5.3 x 6.5 x .75

$220.00 ea.

SERIES D



THREE WATTS OF ISOLATED DUAL OR SINGLE REGULATED OUTPUT POWER FROM 5 TO 46 VOLTS DC

Current Limiting — Printed Circuit Mounting
1.5 x 3.0 x .60 Aluminum Package
Choice of Input Voltages
5 ± .5 VDC
12 ± 2 VDC
24 ± 4 VDC
28 ± 4 VDC

$135.00 ea.

LOWEST PRICE YET

ONE YEAR WARRANTY — DELIVERY FROM STOCK
LP SERIES REGULATED D.C. POWER SUPPLIES

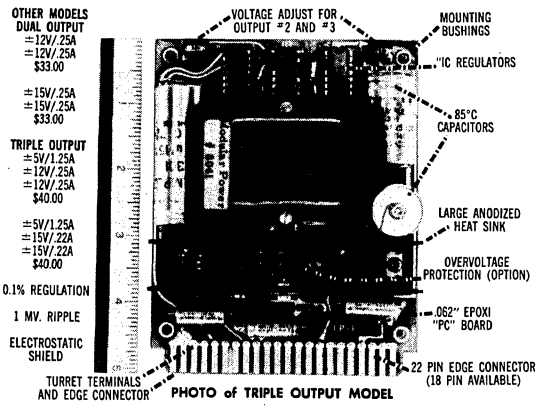


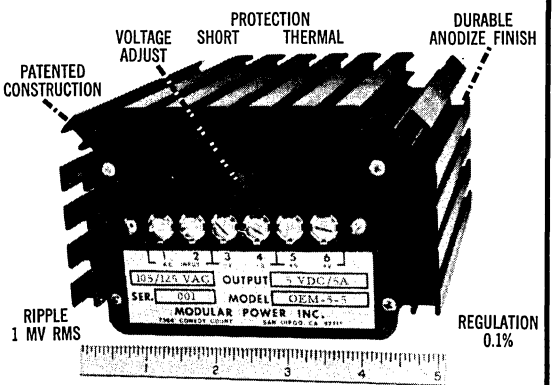
PHOTO of TRIPLE OUTPUT MODEL

ANY WIDTH 4.0" TO 5.0" — SMALL SIZE

5 Volt/1.5 Amp $26.00 (1to9)

LOWEST PRICE YET!

ONE YEAR WARRANTY — DELIVERY FROM STOCK
OEM SERIES REGULATED D.C. POWER SUPPLIES



SINGLE OUTPUT MODELS $40.00 (1/9)
.15 Volt/3 Amp. 24 Volt/2 Amp.
12 Volt/3 Amp. 28 Volt/1.7 Amp.

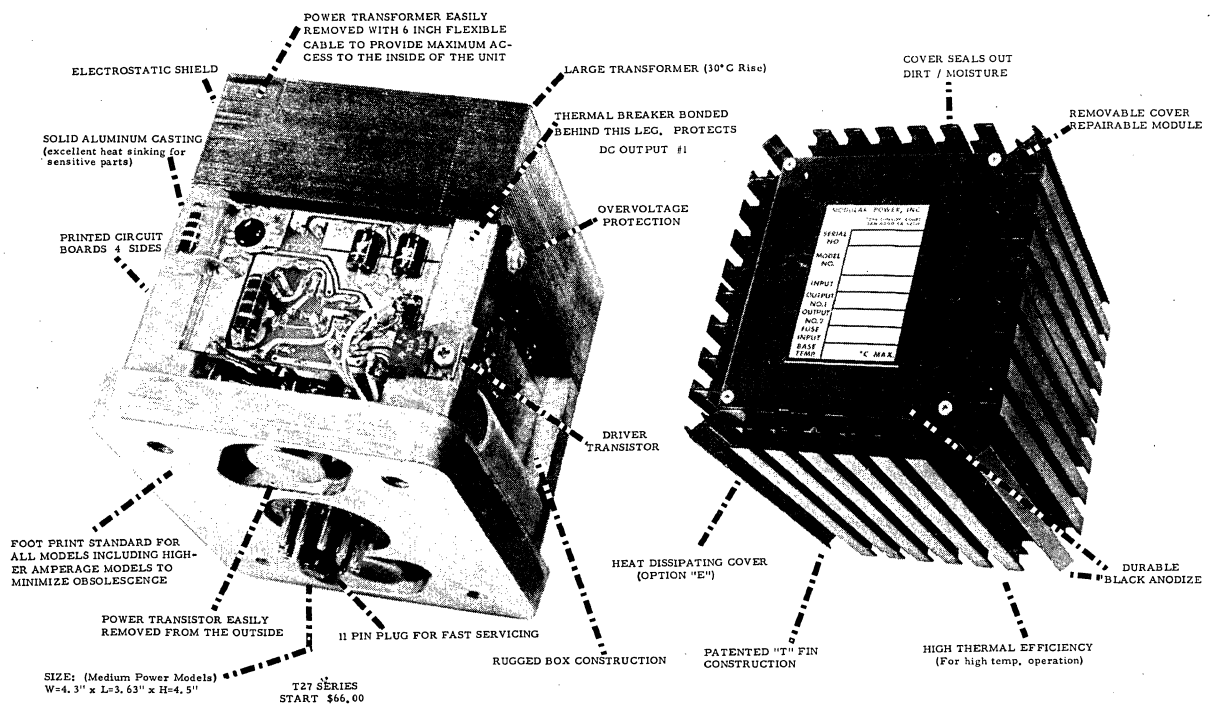
DUAL OUTPUT MODELS $60.00 (1/9)
±5 Volt/2.5 Amp. ±12 Volt/1.5 A
+5V/2.5A −9V/1.5A ±15 Volt/1.5 A

HIGH THERMAL EFFICIENCY — LOW PROFILE

5 Volt/5 Amp $40.00 (1to9)

PLUG-IN SUPPLY UP TO 4 OUTPUTS

2 VOLTS THRU 50 VOLTS — 1 AMP. THRU 10 AMPS.



T27 SERIES REGULATED POWER SUPPLIES

LOW COST LAB. & NIM-BIN POWER SUPPLIES **DIAL TOLL FREE (800) 645-9200 FOR MORE INFORMATION**

MODULAR POWER INC.

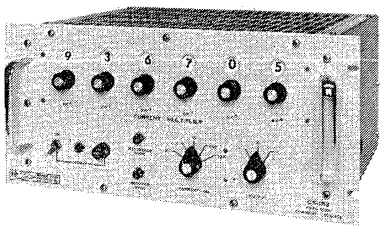
7364 CONVOY COURT (714)
SAN DIEGO CA. 92111 279 1641

PRECISION CURRENT & VOLTAGE SOURCES

Manual and Digital Control

PRECISION CURRENT SOURCES

ACCURACIES TO 0.01%



A line of high-performance constant sources for testing semiconductors, gyros, lamps, meters, et al. All have direct digital in-line readouts of current setting and feature current regulation with the line and load changes down to short circuit in low parts per million range.

Class I Sources: Current standard performance, bi-directional output, 0.01% accuracy, 2 ppm stability.

Class II Sources: 0.02% accuracy, 10 ppm stability.

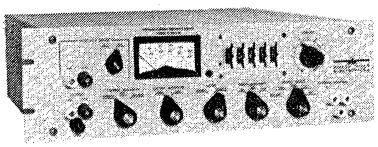
Class III Sources: 0.1% accuracy, 25 ppm stability.

Class IV Sources: 2% accuracy, .1% stability.

Class	Model No.	Current Range mA	Decades	Compliance V
I	CS-151	±0.1/1/10	6	± 10
	CS-152	±0.1/1/10/100/150	6	± 25
	CS-153	±0.1/1/10/100/150	6	±100
II	CS-11	0 to 100	5	100
	CS-12	0 to 1000	6	12
	CS-14	0 to 10,000	6	10
III	CS-110	0 to 1000	6	125
	CS-111	0 to 500	6	250
IV	CS-120	0 to 10	5	2000

PRECISION CURRENT/VOLTAGE SOURCES

0.01% ACCURACY



Combined constant voltage and constant current sources; operating mode selectable by front-panel switch; 2 ppm line and load regulation; automatic voltage and current limiting; meter monitor; 5.25″ panel height; warning indicator for out-of-range load conditions; local and remote voltage sensing.

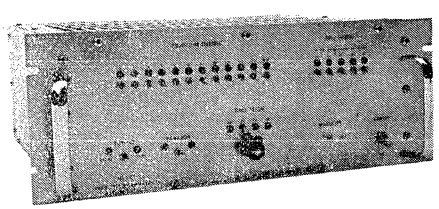
Accuracy: .01%. **Stability:** 5 ppm.

Model No.	Current Range mA	Voltage Range V	Decades
TC-100.2BR	1/10/100 @ 100 V max.	1/10/100 @ 200 mA max.	5 plus Vernier
TC-602CR	6/60/2000 @ 60 V max.	6/60 @ 2 A max.	5 plus Vernier

FOR OTHER NORTH HILLS PRODUCTS — SEE EEM SECTIONS 1800 ADJUSTABLE & FIXED COILS; 2000 REED SCANNERS & MATRICES; 2200 CONVERTERS, PROCESS CONTROL MODULES; 5600 WIDEBAND TRANSFORMERS & HYBRIDS.

DIGITAL PRECISION CURRENT AND VOLTAGE SOURCES

FOR COMPUTER-CONTROLLED AUTOMATIC TEST SYSTEMS



Wide range instruments: CS-210 — (Constant current)
VS-310 — (Constant voltage)

±100 mA, ±100 V; 5 full-scales, 12 bit binary multiplier; 0.05% accuracy, true bi-polar output circuits.

Programmable either manually or by digital logic inputs (levels or pulses). Built-in memory. May be interconnected with other instruments in common buss system and addressed by select line.

Discrete settings instruments: CS-212 — (Constant current)
VS-312 — (Constant voltage)

Up to five discrete preset levels in range ±100 mA, ±100 V; 0.01% accuracy; digital logic level inputs only.

FOR OTHER NORTH HILLS PRODUCTS — SEE EEM SECTIONS 2000 REED SCANNERS & MATRICES; 2200 CONVERTERS, PROCESS CONTROL MODULES; 4000 PRECISION CURRENT & VOLTAGE SOURCES; 5600 WIDEBAND TRANSFORMERS & HYBRIDS.

North Hills Electronics, INC. / *GLEN COVE, N.Y. 11542 • 516-671-5700*

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

National POWER PRODUCTS, INC.

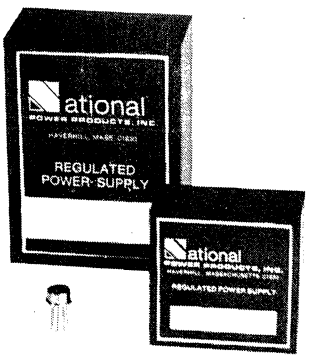
Formerly SERVOTRON CORPORATION

POWER SUPPLIES

- ECONOMY ENCAPSULATED SERIES
- INDUSTRIES STANDARD SERIES
- HIGH RELIABILITY SERIES

ECONOMY ENCAPSULATED LINE TO DC REGULATED SINGLE AND DUAL OUTPUT POWER SUPPLIES

EE SERIES



Model No.	Output Voltage Vdc	Output Current mA	Regulation Line %	Regulation Load %	Pard mVrms	Input Voltage 50-440 Hz	Package Outline No.	Price (1-9)
EE5S200	5	200					SC-3	16.95*
EE5S250	5	250					SC-3	19.00
EE5S500	5	500					SC-1	35.00
EE5S1000	5	1000					SC-2	48.00
EE10S100	10	100					SC-3	25.00
EE12S100	12	100					SC-3	25.00
EE15S100	15	100					SC-3	25.00
EE12D25	±12	25	.25	.25	2	105 to	SC-3	16.95*
EE12D50	±12	50				125 Vac	SC-3	28.95
EE12D100	±12	100					SC-1	35.00
EE12D200	±12	200					SC-2	54.00
EE15D25	±15	25					SC-3	16.95*
EE15D50	±15	50					SC-3	28.95
EE15D100	±15	100					SC-1	35.00
EE15D200	±15	200					SC-2	54.00

SC-3 Outline — Option G (suffix) Regulation: Line .01%, Load .05%, Pard 1.0 mVrms — Add $10.00.
*$12.00 in 1K quantities.

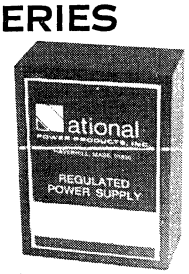
NATIONAL POWER PRODUCTS STANDARD LINE TO DC REGULATED SINGLE AND DUAL OUTPUT POWER SUPPLIES

SE SERIES

Model No.	Output Voltage Vdc	Output Current mA	Regulation Line %	Regulation Load %	Pard mVrms	Input Voltage 50-440 Hz	Package Outline No.	Price (1-9)
SE5S500	5	500	.05				SC-1	45.00
SE5S1000	5	1000	.05				SC-2	65.00
SE12S200	12	200					SC-1	39.00
SE15S200	15	200					SC-1	39.00
SE24S100	24	100					SC-1	39.00
SE5D250	± 5	250					SC-1	49.00
SE12D100	±12	100	.01	.05	1.0	105 to	SC-1	45.00
SE12D200	±12	200				125 Vac	SC-2	65.00
SE15D50	±15	50					SC-1	35.00
SE15D100	±15	100					SC-1	45.00
SE15D200	±15	200					SC-2	65.00
SE18D100	±18	100					SC-2	59.00
SE24D100	±24	100					SC-2	65.00

HIGH RELIABILITY VERSIONS OF INDUSTRIES STANDARD 900 SERIES POWER SUPPLIES

HRSE SERIES



Model No.	Output Voltage Vdc	Output Current mA	Regulation Line %	Regulation Load %	Pard mVrms	Input Voltage 50-440 Hz	Package Outline No.	Price (1-9)
HRSE915R	±15	25	.2	.2	1.0		SC-1-2	23.00
HRSE904R	±15	50			.5		SC-1-2	39.00
HRSE902R	±15	100			.5	105 to	SC-2-2	49.00
HRSE920	±15	200	.05	.1	.5	125 Vac	SC-2-2	69.00
HRSE903	5	500			1.0		SC-2-2	49.00
HRSE905	5	1000			1.0		SC-2-2	69.00

- R suffix designates the power supply models which are recognized under the Underwriters' Laboratory Components Recognition Program.
- All units of the HR Series are subjected to full load power burn-in for 100 hours min.
- Typical MTBF = 150,000 hours.
- All HR Series power supplies have National Power Products Inc. 5 year warranty.

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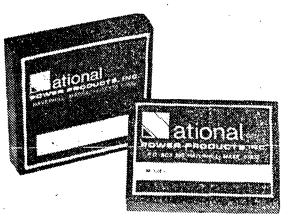
National Formerly SERVOTRON CORPORATION POWER PRODUCTS, INC.

POWER SUPPLIES

- DC-DC CONVERTERS
- REGULATORS
- UNREGULATED CARD AND ENCAPSULATED

ENCAPSULATED MINIATURE REGULATED DC TO DC CONVERTERS

CE SERIES



Model No.	Output Voltage Vdc	Output Current mA	Regulation Line %	Regulation Load %	Pard mVrms	Input Voltage Vdc	Package Outline No.	Price (1-9)
CE*-5S180	5	180					SC-5	45.00
CE*-5S600	5	600					SC-4	69.00
CE*-12S75	12	75					SC-5	39.00
CE*-12S250	12	250					SC-4	69.00
CE*-15S60	15	60					SC-5	39.00
CE*-15S200	15	200					SC-4	69.00
CE*-24S36	24	36					SC-5	39.00
CE*-24S125	24	125					SC-4	69.00
CE*-28S32	28	32	.02	.02	1.0	5, 6, 12	SC-5	39.00
CE*-28S110	28	110				or 28	SC-4	69.00
CE*-12D35	±12	35					SC-5	39.00
CE*-12D125	±12	125					SC-4	69.00
CE*-15D30	±15	30					SC-5	39.00
CE*-15D100	±15	100					SC-4	69.00
CE*-18D25	±18	25					SC-5	39.00
CE*-18D85	±18	85					SC-4	69.00
CE*-24D18	±24	18					SC-5	39.00
CE*-24D62	±24	62					SC-4	69.00

*Insert in place of asterisk any one of the specified input voltages to complete Model No. Example: CE5-15D25.

ENCAPSULATED PRECISION DC SERIES VOLTAGE REGULATORS

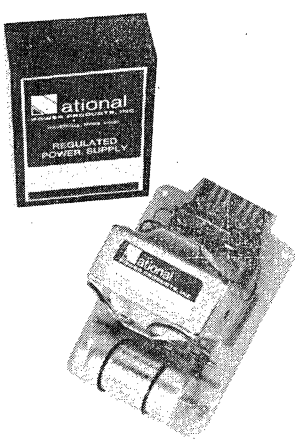
RE SERIES

Model No.	Output Voltage Vdc	Output Current mA	Regulation Line %	Regulation Load %	Pard mVrms	Input Voltage Vdc	Package Outline No.	Price (1-9)
RE5S500	5	500				6 to 11	SC-7	12.00
RE12D100	±12	100	0.005*	0.01	0.5	±13 to ±27	SC-6	12.00
RE15D100	±15	100				±16 to ±30	SC-6	12.00
RE24D100	±24	100				±25 to ±40	SC-6	12.00

*Per volt of raw supply change.

GENERAL PURPOSE CARD AND ENCAPSULATED LINE TO DC UNREGULATED SINGLE AND DUAL OUTPUT POWER SUPPLIES

U SERIES



Model No.	Output Voltage Vdc*	Output Current mA	Regulation	Pard Typ. Vrms	Input Voltage 50-440 Hz	Package Outline No.	Price (1-9)
UE24D200	±24	200	LINE	.75		SC-2	19.95
UE24S400	24	400	Proportional	.75		SC-2	19.95
UE200S25	200	25	to input Vac	15.0		SC-2	19.95
UC8S2000	8	2000	LOAD	.75	105 to	SC-10	19.95
UC24D500	±24	500	≈ +10%	.75	125 Vac	SC-10	19.95
UC24S600	24	600	½ to full	.75		SC-10	17.95
UC24S1000	24	1000	load	1.0		SC-10	19.95
UC48S500	48	500	−10% ½	.75		SC-10	19.95
UC200S25	200	25	to no load	15.0		SC-10	17.95

*HALF LOAD @ 115 Vac.

SPECIAL PURPOSE SUPPLIES FOR USE WITH (RE SERIES) VOLTAGE REGULATORS

			LINE				
UE6S1000	6	1000	Proportional			SC-2	19.95
UE16D250	±16	250	to input Vac			SC-2	19.95
UE25D150	±25	150	LOAD	.75	105 to	SC-2	19.95
UC6S2500	6	2500	≈ +10%		125 Vac	SC-10	19.95
UC16D500	±16	500	½ to full			SC-10	19.95
UC25D300	±25	300	load			SC-10	19.95
			−10% ½				
			to no load				

*FULL LOAD @ 105 Vac.

All U.C. Supplies have fused inputs.

Other Voltages and Currents are available and will be quoted upon request.
UE SERIES — approx. 6-9 watts 6-200 Vdc.
UC SERIES — approx. 16-24 watts 6-200 Vdc.

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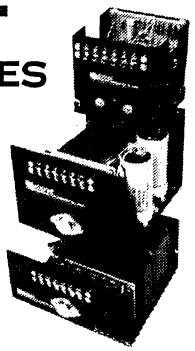
POWER SUPPLIES

- OPEN-FRAME — UP TO 60 WATTS
- OEM — ECONOMY — OPEN FRAME
- FIXED AND ADJUSTABLE LAB. SUPPLIES

OPEN FRAME 15, 35, 60 WATT OUTPUT LINE TO DC REGULATED POWER SUPPLIES

RF SERIES

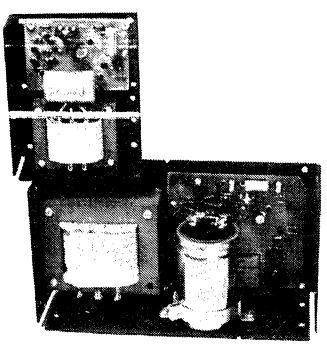


Model No.	Output Voltage Vdc	Output Current mA	Regulation Line %	Regulation Load %	Pard mVrms	Input Voltage 50-440 Hz	Package Outline No.	Price (1-9)
RF5S2000	5	2000					SC-12	39.95
RF5S3000	5	3000		.1			SC-12	48.95
RF5S5000	5	5000					SC-11	58.95
RF5S7000	5	7000					SC-11	68.95
RF5S12000	5	12000		10mV			SC-13	98.95
RF12D500	±12	500	.05		1.0	105 to	SC-12	65.00
RF12D1000	±12	1000				125 Vac	SC-11	88.95
RF12D2000	±12	2000					SC-13	119.95
RF15D500	±15	500		.1			SC-12	65.00
RF15D1000	±15	1000					SC-11	88.95
RF15D2000	±15	2000					SC-13	119.95

Option "CVR" (suffix) covers available for all units, see back of selection guide.

"LOW COST" OEM OPEN FRAME LINE TO DC REGULATED POWER SUPPLIES

OEM SERIES



Model No.	Output Voltage Vdc	Output Current mA	Regulation Line %	Regulation Load %	Pard mVrms	Input Voltage 50-440 Hz	Package Outline No.	Price (1-9)
OEM5S3000	5	3000					SC-14	29.00
OEM5S6000	5	6000					SC-15	44.00
OEM5S12000	5	12000					SC-16	75.00
OEM6S2500	6	2500					SC-14	29.00
OEM6S5000	6	5000					SC-15	44.00
OEM6S10000	6	10000					SC-16	75.00
OEM12S1500	12	1500					SC-14	29.00
OEM12S3000	12	3000	.25	.25	1.0	105 to	SC-15	44.00
OEM12S6500	12	6500				125 Vac	SC-16	75.00
OEM15S1300	15	1300					SC-14	29.00
OEM15S2800	15	2800					SC-15	44.00
OEM15S6000	15	6000					SC-16	75.00
OEM24S1000	24	1000					SC-14	29.00
OEM24S2300	24	2300					SC-15	44.00
OEM24S5000	24	5000					SC-16	75.00

ENCAPSULATED PRECISION FIXED VOLTAGE LABORATORY POWER SUPPLIES

L/AL SERIES

Model No.	Output Voltage Vdc	Output Current mA	Regulation Line %	Regulation Load %	Pard mVrms	Input Voltage 50-440 Hz	Package Outline No.	Price (1-9)
L5S500	5	500						49.00
L5S1000	5	1000						69.00
L12D100	±12	100	.05	.1	1.0	105 to	SC-17	49.00
L12D200	±12	200				125 Vac		69.00
L15D100	±15	100						49.00
L15D200	±15	200						69.00

GENERAL PURPOSE ADJUSTABLE VOLTAGE LABORATORY POWER SUPPLY

Model No.	Output Voltage Vdc	Output Current mA	Regulation Line mV	Regulation Load mV	Pard mVrms	Input Voltage 50-440 Hz	Package Outline No.	Price (1-9)
AL6S2200	0-6	2200	20	50	3.0	105 to 125 Vac	SC-18	59.50
AL22D400	±.5-±22	400	20	50	1.0		SC-18	79.50
AL25S1000	0-25	1000	20	50	1.0		SC-18	59.50

Option "RM" (suffix) see back page of selection guide.

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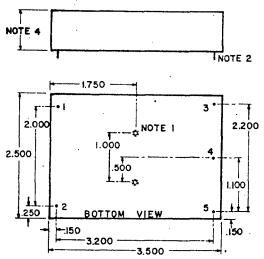
National POWER PRODUCTS, INC.

Formerly SERVOTRON CORPORATION

OUTLINE DRAWINGS CONNECTING INSTRUCTIONS

SC-1, SC-2



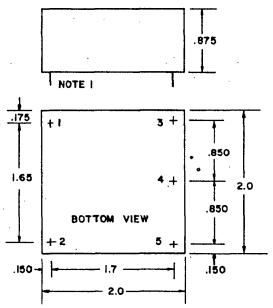
NOTES:
1. Two mounting inserts No. 4-40 x .10" Min.
2. Connection pins .04" Dia. x .20" Lg. Min.
3. High Isolation ground shield on I option only.
4. SC-1 OUTLINE = .875". SC-2 OUTLINE = 1.25".

SC-1-2 or SC-2-2 Outlines are as above except Pins 1 and 2 are 2.2" spacing.

SC-1 & SC-2 CONNECTING INSTRUCTIONS

SINGLE OUTPUT		DUAL OUTPUT
SC-1 or SC-2 Pins	SC-1-2 or SC-2-2 Pins	For all 4 outlines Pins
1 AC in	1 AC in	1 AC in
2 Ac in	2 Ac in	2 Ac in
3 −Vdc out	3 No Connection	3 −Vdc out
4 No Connection	4 Common	4 Common
5 +Vdc out	5 +Vdc out	5 +Vdc out

SC-3

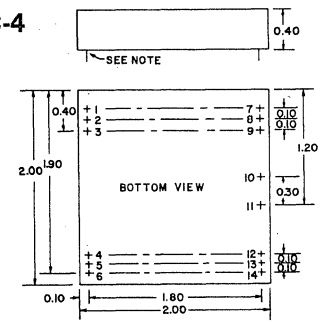


NOTE:
1. Five pins, .040" x .250" Lg. Min.

SC-3 CONNECTING INSTRUCTIONS

SINGLE OUTPUT	DUAL OUTPUT
Pins 1 AC in	Pins 1 AC in
2 AC in	2 AC in
3 −Vdc out	3 −Vdc out
4 No Connection	4 Common
5 +Vdc out	5 +Vdc out

SC-4

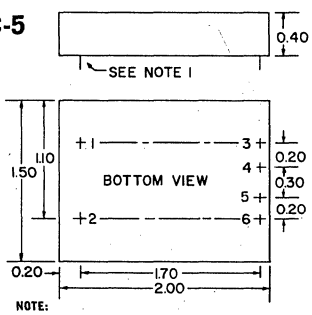


NOTES:
1. Fourteen pins .020" Dia. x .15" long.
2. Buss each individual pin group externally.

SC-4 CONNECTING INSTRUCTIONS

SINGLE OUTPUT		DUAL OUTPUT	
Pins 1-3	+Vdc in	Pins 1-3	+Vdc in
4-6	−Vdc in	4-6	−Vdc in
7-9	+Vdc out	7-9	+Vdc out
10+11	No Connection	10+11	Common
12-14	−Vdc out	12-14	−Vdc out

SC-5

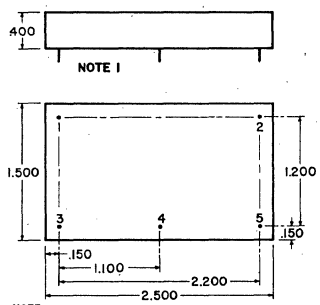


NOTE:
1. Six pins, .020" Dia. x 0.15" Lg. Min.

SC-5 CONNECTING INSTRUCTIONS

SINGLE OUTPUT		DUAL OUTPUT	
Pins 1	+Vdc in	Pins 1	+Vdc in
2	−Vdc in	2	−Vdc in
3+4	+Vdc out	3	+Vdc out
5+6	−Vdc out	4+5	Common
		6	−Vdc out

SC-6



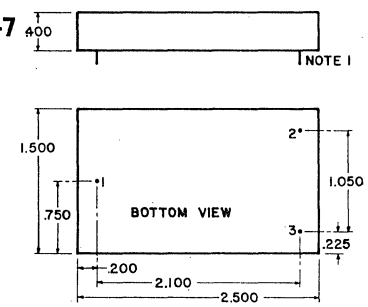
NOTE:
1. Five pins, .040" Dia. x .250" Lg. Min.

SC-6 CONNECTING INSTRUCTIONS

DUAL OUTPUT

Pins 1 +Vdc in (unregulated)
2 −Vdc in (unregulated)
3 +Vdc out (regulated)
4 Common
5 −Vdc out (regulated)

SC-7

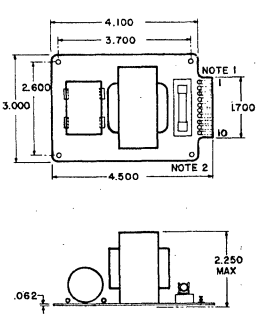


NOTE:
1. Three pins .040" Dia. x .250" Lg. Min.

SC-7 CONNECTING INSTRUCTIONS

Pins 1 Common
2 +Vdc in (unregulated)
3 +Vdc out (regulated)

SC-10

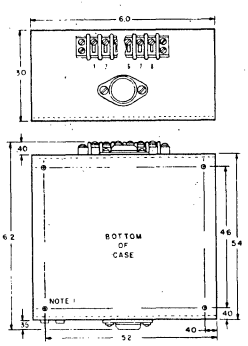


NOTES:
1. Fingers on .156" centers.
2. Four mounting holes .116" Dia.

SC-10 CONNECTING INSTRUCTIONS

Pins		Pins	
1+2	+Vdc out	5+6	Common (Dual)
3	AC in	7	No Connection
4	No Connection	8	AC in
5+6	No Connection (Single)	9+10	−Vdc out

SC-11

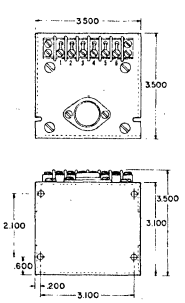


NOTES:
1. Four mounting holes .166" Dia.

SC-11 CONNECTING INSTRUCTIONS

SINGLE OUTPUT		DUAL OUTPUT			
Pins		Pins		Pins	
1	AC in	1	AC in	6	Sense
2	AC in	2	AC in		Common
3	+Vdc out	3	+Vdc out	7	−Sense
4	+Sense	4	+Sense	8	−Vdc out
5	−Sense	5	Common	—	Case Gnd
6	−Vdc out				
—	Case Gnd				

SC-12



NOTES:
1. Four mounting holes .166" Dia.

SC-12 CONNECTING INSTRUCTIONS

SINGLE OUTPUT		DUAL OUTPUT	
Pins		Pins	
1	AC in	1	AC in
2	AC in	2	AC in
3	+Vdc out	3	+Vdc out
4	+Sense	4	Common
5	−Sense	5	−Vdc out
6	−Vdc out	6	Ground
—	Case Gnd		

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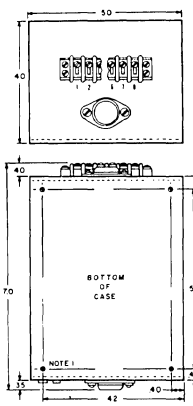
OUTLINE DRAWINGS
OPTIONS — SOCKETS

SC-13



SC-13 CONNECTING INSTRUCTIONS

SINGLE OUTPUT

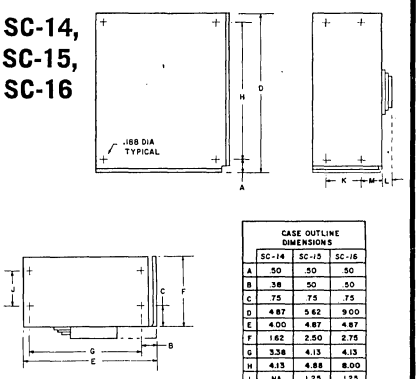
Pins	
1	AC in
2	AC in
3	+Vdc out
4	+Sense
5	−Sense
6	−Vdc out
—	Case Gnd

DUAL OUTPUT

Pins		Pins	
1	AC in	5	Common
2	AC in	6	Sense
3	+Vdc out		Common
4	+Sense	7	−Sense
		8	−Vdc out
		—	Case Gnd

NOTE:
1. Four mounting holes .166″ Dia.

SC-14, SC-15, SC-16

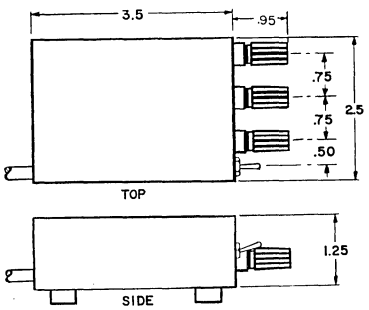


CONNECTING INSTRUCTIONS CONSULT FACTORY

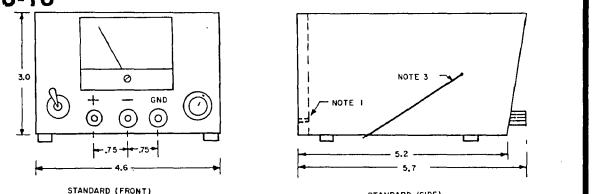
CASE OUTLINE DIMENSIONS

	SC-14	SC-15	SC-16
A	.50	.50	.50
B	.38	.50	.50
C	.75	.75	.75
D	4.87	5.62	9.00
E	4.00	4.87	4.87
F	1.62	2.50	2.75
G	3.38	4.13	4.13
H	4.13	4.88	8.00
J	NA	1.25	1.25
K	NA	1.25	1.25
L	.45	.45	.45
M	.75	.75	.75

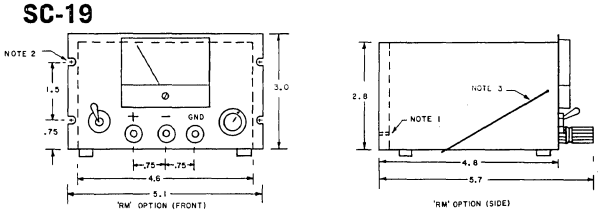
SC-17



SC-18



SC-19



NOTES:
1. PC-Board with 10 pin edge connector.
2. (4)-$\frac{3}{16}$″ dia. x $\frac{3}{8}$″ slots.
3. Fold-Away wire stand.

OPTIONS

Center Adjust	E	E2 †	D	I †	A	B
EESC-3	5.00	—	6.00	—	—	—
EESC-1 & 2	5.00	7.00	6.00	—	—	NC
SE	5.00	7.00	6.00	8.00	—	NC
HRSE	5.00	7.00	6.00	8.00	NC	—
CE	—	—	—	—	—	—
UE	5.00	7.00	—	8.00	—	NC
UC	5.00	7.00	—	10.00	—	—
RE	—	—	6.00	—	—	—
RF	5.00	7.00	8.00*	10.00	—	—
OEM	5.00	7.00	8.00*	10.00	—	—
L	5.00	—	6.00	8.00	—	—
AL	5.00	—	—	—	—	—

†Minimum order 10 pieces 10-24 Price Schedule

*Per Output 1-9 Price Schedule. Large discounts on large quantity orders. Add appropriate suffix to model number: e.g. HRSE 902 E2 D I

SUFFIX DESCRIPTION

E—Input 200-240 Vac

E2—Input 105-125/ 210-250 Vac

D—Over Voltage Protection

I—High Isolation electrostatic shielded input transformer

A—Silver plated pins with AC pins measuring 2.0″ center

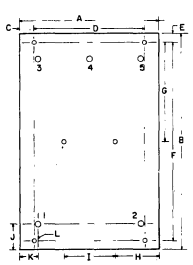
B—Gold plated pins with AC pins measuring 2.2″ on center.

RM—Rack Mountable SC-19 Outline—add $5.00.

CVR—Covers for RF Series units.
SC-11—$10.00
SC-12—$10.00
SC-13—$10.00

G—Tighter regulation for SC-3 Outline Models only—add $10.00.

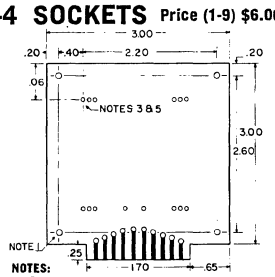
SC-1, SC-2, SC-3 SOCKETS
Price (1-9) $3.50



	DEM	SC-1 & SC-2	SC-1-2 & SC-2-2	SC-3
	A	2.70	2.70	2.10
	B	4.20	4.20	2.80
	C	0.28	0.28	0.20
	D	2.14	2.14	1.70
	E	0.17	0.17	0.20
	F	3.86	3.86	2.40
	G	1.93	1.93	NA
	H	.85	.85	NA
	I	1.00	1.00	NA
Ref.	J	0.50	0.50	0.525
Ref.	K	0.35	0.35	0.250
Mounting Holes	L	6-.11 Dia.	6-.11 Dia.	4-.14 Dia.
Board Thickness		0.10	0.10	0.06
Pin Location		SC-1 Outline	SC-1-2 Outline	SC-3 Outline

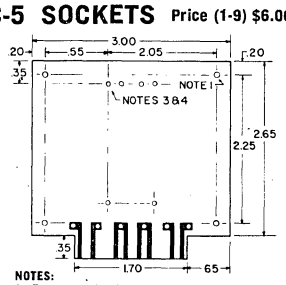
NOTE:
1. Five .020″ dia. Pin Connectors.

SC-4 SOCKETS **Price (1-9) $6.00**



NOTES:
1. Four mounting holes .11″ dia.
2. Board .06″ thick.
3. Fourteen .020″ dia. Pin Connectors.
4. Ten terminals .25″ ht. x .09″ dia.
5. See SC-4 outline for pin location.
6. Standard 10 finger edge termination .156″ centers.

SC-5 SOCKETS **Price (1-9) $6.00**



NOTES:
1. Four mounting holes .11″ Dia.
2. Board .06″ thick.
3. Six .020″ dia. Pin Connectors.
4. See SC-5 outline for pin location.
5. Standard 10 finger edge termination .156″ centers.

TIME FOR A CHANGE

In the past two years, Servotron Corporations' product line has undergone a change, from Servo-System Components to Power Supplies. To better identify with our new product line, it was felt a name change was necessary; this marked the beginning of National Products Inc.

A name change may denote many things; a new dimension in appearance and marketing philosophies, the creation of a new image, expansion of new and deletion of old products. Several of these things are taking place during our transition from old to new, but the basic concept upon which this company was originally established, (to deliver high performance power supplies which are lowest in cost and smallest in size), has been carried over. . . . Giving you the supply you need, when you need it, is your primary requirement and our most important consideration. . . .

NATIONAL POWER PRODUCTS INC.
"The company that brought you the $12.00 power supply."

NATIONAL POWER PRODUCTS, INC.
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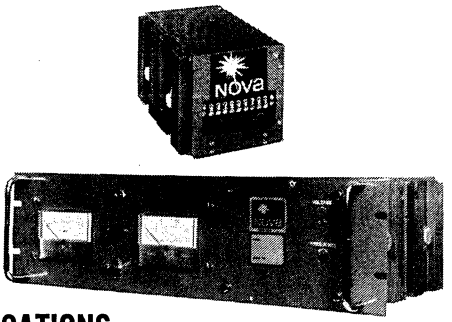
STATIC INVERTERS SINE WAVE 50 Hz, 60 Hz, 400 Hz



SPECIFICATIONS:

OUTPUT

Voltage: 117VAC, single phase (3ϕ units available).
Voltage Regulation: ±1% for line or load.
Voltage Adjustment Range: ±10% of nominal.
Frequency: 60 Hz (50 Hz and 400 Hz available with same spec's, see ordering information).
Frequency Regulation: ±0.15% for line and load.
Frequency/Temperature Coefficient: 0.01%/°C.
Frequency Adjustment Range: ±5% of nominal.
Transient Response: Less than 50 ms for 100% load change.
Maximum Distortion: Less than 6% worse case.
Inverter Efficiency (except 12 and 24V units): 75%.
Load Power Factor Range: 0.7 lagging to 0.7 leading.

CIRCUIT PROTECTION

Reverse input polarity protection.
Short circuit protection.
Output automatic current limited.
Thermal protected.

OTHER FEATURES

Operating Temperature: −20°C to ±50°C.
Two Mounting Surfaces: Front or bottom.
Adaptable for rack mounting, with addition of front panel.
All barrier strips are recessed to prevent accidental shorts.

OPTIONAL FEATURES AND ACCESSORIES

See page.

ORDERING INFORMATION

Model numbers for 50 Hz and 400 Hz output inverters are obtained in the following manner:

A. Units 125VA or larger — Take the equivalent 60 Hz model (25 60 -24) and insert the number 50 or 400 in the space where the 60 appears. Therefore a typical model designation for 50 Hz is 25 50 -24 and for 400 Hz is 25 400 -24.
B. Units 60VA and smaller — Take the equivalent 60 Hz model (60 6 -24) and insert the number 4 in the space where the 6 appears. Therefore a typical model designation for 400 Hz is 60 4 -24.

Weights on 50 Hz inverters are approximately the same as the 60 Hz units; the 400 Hz inverters weigh about 25% less. Dimensions essentially remain the same.
Pricing for 50 Hz and 400 Hz inverters — add 10% to the 60 Hz price.

* These units are available with 400 Hz output only, at prices indicated.

Output VA	Input DC Volts	Input DC Amps @ Nom. Volts	Wgt. Lbs.	SIZE H x W x D	60 Hz Model	Price
30	11-16	4.2	7	6x5x4	306-12	$195
30	22-32	1.9	7	6x5x4	306-24	195
30	42-54	0.9	7	6x5x4	306-48	205
30	105-150	0.3	7	6x5x4	306-150	215
60	11-16	8.3	9	6x5x5	606-12	235
60	22-32	3.9	9	6x5x5	606-24	235
60	42-54	1.8	9	6x5x5	606-48	245
60	105-150	0.6	9	6x5x5	606-150	265
90	11-16	12.5	7	6x5x5	904-12*	275
90	22-32	5.8	7	6x5x5	904-24*	275
90	42-54	2.7	7	6x5x5	904-48*	290
90	105-150	0.9	7	6x5x5	904-150*	310
120	11-16	16.7	7	6x5x5	1204-12*	330
120	22-32	7.7	7	6x5x5	1204-24*	330
120	42-54	3.6	7	6x5x5	1204-48*	345
120	105-150	1.0	7	6x5x5	1204-150*	360
125	11-16	17.4	19	5¼x6½x9¾	1260-12	315
125	22-32	8.0	19	5¼x6½x9¾	1260-24	315
125	42-54	3.7	19	5¼x6½x9¾	1260-48	335
125	105-150	1.1	19	5¼x6½x9¾	1260-150	375
125	150-250	0.7	19	5¼x6½x9¾	1260-250	450
125	250-350	0.5	19	5¼x6½x9¾	1260-350	525
250	11-16	35.0	37	6⅞x9x13¼	2560-12	475
250	22-32	16.0	37	6⅞x9x13¼	2560-24	445
250	42-54	7.5	37	6⅞x9x13¼	2560-48	480
250	105-150	2.2	37	6⅞x9x13¼	2560-150	545
250	150-250	1.3	37	6⅞x9x13¼	2560-250	605
250	250-350	1.0	37	6⅞x9x13¼	2560-350	635
500	11-16	70	60	6⅞x11¼x14¼	5060-12	690
500	22-32	32	60	6⅞x11¼x14¼	5060-24	635
500	42-54	15	60	6⅞x11¼x14¼	5060-48	685
500	105-150	4.4	60	6⅞x11¼x14¼	5060-150	785
500	150-250	2.7	60	6⅞x11¼x14¼	5060-250	875
500	250-350	1.9	60	6⅞x11¼x14¼	5060-350	925
1000	22-32	64	100	8¾x13¾x16	1K60-24	1070
1000	42-54	30	100	8¾x13¾x16	1K60-48	1150
1000	105-150	9	100	8¾x13¾x16	1K60-150	1290
1000	150-250	5.3	100	8¾x13¾x16	1K60-250	1380
1000	250-350	3.8	100	8¾x13¾x16	1K60-350	1470
1500	22-32	96	145	8¾x17⅛x17	1.5K60-24	1450
1500	42-54	45	145	8¾x17⅛x17	1.5K60-48	1500
1500	105-150	13.3	145	8¾x17⅛x17	1.5K60-150	1735
1500	150-250	8	145	10¼x17⅛x20¼	1.5K60-250	1835
1500	250-350	5.7	145	10¼x17⅛x20¼	1.5K60-350	1920
2000	22-32	128	200	10½x17⅛x20¼	2K60-24	1730
2000	42-54	60	200	10½x17⅛x20¼	2K60-48	1790
2000	105-150	17.8	200	10½x17⅛x20¼	2K60-150	2040
2000	150-250	10.7	200	10½x17⅛x20¼	2K60-250	2240
2000	250-350	7.6	200	10½x17⅛x20¼	2K60-350	2360
2500	22-32	160	250	14x17⅛x21	2.5K60-24	2195
2500	42-54	75	250	14x17⅛x21	2.5K60-48	2410
2500	105-150	22	250	14x17⅛x21	2.5K60-150	2750
2500	150-250	13.3	250	14x17⅛x21	2.5K60-250	2860
2500	250-350	9.5	250	14x17⅛x21	2.5K60-350	2970
3000	22-32	193	325	14x17⅛x23	3K60-24	3060
3000	42-54	90	325	14x17⅛x23	3K60-48	3375
3000	105-150	26.6	325	14x17⅛x23	3K60-150	3515
3000	150-250	16	325	14x17⅛x23	3K60-250	3720
3000	250-350	11.4	325	14x17⅛x23	3K60-350	3820

Terms Net 30 Days — F.O.B. Nutley, New Jersey

FOR SALES OR APPLICATION ENGINEERING
CALL: (201) 661-3434
WRITE: NOVA ELECTRIC MFG. CO., 263 Hillside Avenue, Nutley, New Jersey 07110

AC-AC FREQUENCY CONVERTERS 50 Hz, 60 Hz, 400 Hz

SPECIFICATIONS:

AC INPUT

Voltage: 105 to 125VAC, 1ϕ (other voltages and 3ϕ available).
Frequency: 48 to 440 Hz.

AC OUTPUT

Voltage: 117VAC, single phase (other voltages and phases available).
Voltage Regulation: $\pm$1% for line or load.
Voltage Adjustment Range: $\pm$10% of nominal.
Frequency: 60 Hz (50 Hz and 400 Hz available with same spec's, see ordering information).
Frequency Regulation: $\pm$0.15% for line and load.
Frequency/Temperature Coefficient: 0.01%/°C.
Frequency Adjustment Range: $\pm$5% of nominal.
Transient Response: Less than 50 ms for 100% load change.
Maximum Distortion: Less than 6% worse case.

CIRCUIT PROTECTION

Input circuit breaker.
Short circuit protection.
Output automatic current limited.
Thermal protected.

OTHER FEATURES

Load Power Factor Range: 0.7 lagging to 0.7 leading.
Operating Temperature: $-$20 to $+$50°C.
Two Mounting Surfaces: Front and bottom.
All units adaptable for rack mounting with addition of front panel.

OPTIONAL FEATURES AND ACCESSORIES

See page.

Output VA	SIZE H	W	D	Weight Lbs.	Model No.	Price
MINIATURE CONVERTERS						
30	5	5	6½	8	FC304*	$319
30	6	5	7½	10	FC306**	285
60	5	5	6½	8	FC604*	360
60	6	5	7½	10	FC606**	325
90	6	5	7½	12	FC904*	435
120	6	5	7½	12	FC1204*	510
STANDARD CONVERTERS						
125	5¼	11	9	30	FC1260U	480
250	6⅞	15¼	14¼	63	FC2560U	625
500	6⅞	15¼	14¼	80	FC5060U	950
1000	8 1/16	17	16⅞	140	FC1K600U	1390
1500	14	17¼	20⅞	160	FC1.5K60	2020
2000	14	17¼	20⅞	200	FC2K60	2490
3000	15¾	17¼	22	350	FC3K60	4235

Terms — Net 30 F.O.B. Nutley, New Jersey

ORDERING INFORMATION

Model numbers for 50 Hz and 400 Hz output converters 125VA and larger are obtained from the equivalent 60 Hz model (FC25 60 U) and insert the number 50 or 400 in the space where the 60 appears. Therefore the new model for 50 Hz is FC25 50 U and for 400 Hz is FC25 400 U. Units 120VA and smaller constitute Nova's Miniature line and are available only in the frequencies indicated by the asterisk.

Weights on 50 Hz converters are approximately the same as the 60 Hz units; the 400 Hz inverters weigh about 25% less. Dimensions essentially remain the same.

Pricing for 50 Hz and 400Hz convertes—add 10% to the 60 Hz price.

*These units are available with 400 Hz output only, at prices indicated.

**These units are available with 60 Hz output only.

DC-DC CONVERTERS

SPECIFICATIONS:

INPUT

ON/OFF switch.
Pilot light "ON."
Line transient protection.

OUTPUT

Voltage Regulation: 1% for line and load.
Maximum Ripple: 0.5% RMS.
Voltage Adjustable Range: 43 to 54VDC.

CIRCUIT PROTECTION

Reverse polarity protection.
Line transient protection.
Output current limited.
Thermal protected.
Output circuit breaker.

OTHER FEATURES

Voltage adjustment via panel.
Input/output isolated.
Rack mountable.

Input VDC	Output VDC	Output Curr.	SIZE H	W	D	Wgt. Lbs.	Model No.	Price
42-56	48	6A	6½	19	12	10	C48/48-6	$830
42-56	48	12A	6½	19	12	12	C48/48-12	1070
105-140	48	6A	6½	19	12	10	C125/48-6	830
105-140	48	12A	6½	19	12	12	C125/48-12	1070
105-140	48	24A	8¾	19	12	17	C125/48-24	1750
105-140	48	48A	10½	19	16	26	C125/48-48	2675

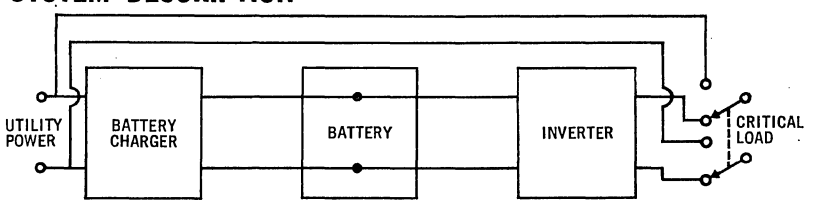
Terms — Net 30 F.O.B. Nutley, New Jersey

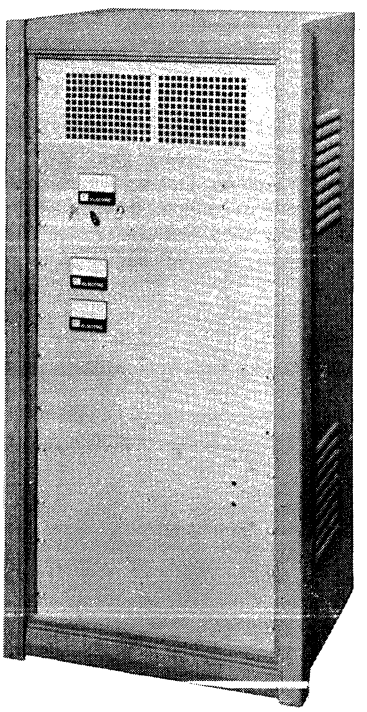
FOR SALES OR APPLICATION ENGINEERING
CALL: (201) 661-3434
WRITE: NOVA ELECTRIC MFG. CO., 263 Hillside Avenue, Nutley, New Jersey 07110

NOVA UNINTERRUPTIBLE POWER SYSTEMS

UPS NO BREAK EMERGENCY STAND BY TOTAL SYSTEM RESPONSIBILITY!!
COMPLETE SYSTEM INCLUDING BATTERY HOUSED IN ONE CABINET OR RACK
SHIPPED PREWIRED AND ASSEMBLED: READY FOR USE

SYSTEM DESCRIPTION





The system consists of four major components — battery charger, battery, inverter, and automatic transfer switch.

A. **Normal Mode** — The battery charger will float charge the battery and also supply the DC input to inverter. In this mode the load will continuously be fed quality power. The battery charger, battery and inverter filter act as buffers to absorb the voltage and frequency fluctuations on the incoming utility line.

B. **Emergency Mode** — In the event the incoming AC power line should fail, the battery charger ceases to operate and the battery instantly (without the use of switches) supplies the DC input to the inverter. During this time, the critical load continues to receive quality power from the battery through the inverter for a 15 minute period.

C. **Recovery Mode** — Upon the return of the utility AC power, the charger will automatically supply the DC input to the inverter and also recharge the battery in 8 hours.

D. **Inverter Failure Mode** — In the event the inverter output should fail, the transfer switch senses the voltage drop and transfers the critical load to the utility line.

SPECIFICATIONS:

INPUT
Voltage 117V ±15% (other voltages available).
Frequency 60 Hz ±5% (other single and three-phase frequencies available).

OUTPUT
117V, 60 Hz, 1ϕ (other voltages and phases available).
Adjustments: Voltage adjustable range ±10%.
Frequencies adjustable range ±5%.
Voltage Regulation: ±1% no load to full load.
Frequency Regulation: ±0.15% no load to full load.
Recovery Time: Less than 50 ms for 100% load change.
Distortion: Less than 6%.
Power Factor Range: 0.7 lead to 0.7 lag.
Frequency Temperature Coefficient: 0.01% per °C.
Overload Capability: 130% of rating for 5 min. (at reduced tolerances).

CIRCUIT PROTECTION
Input circuit breaker.
Short circuit protection.
Output automatic current limited.
Internal over temperature protection.
Input, Battery, and Output: Electrically isolated.
Contacts for remote power switching, when requested.
Cooling: Natural convection, no fans or external heat sinks.
Temperature: −20°C to 50°C, except battery rated at 25°C.
Battery: Easy access from top of cabinet.
Meters: Output AC voltage and current.
Recharge Time: 8 hours.

TOTAL SYSTEM WITH 15 MINUTE PROTECTION

Power	Model	CABINET SIZE H	W	D	Approx. Weight	Cost, Including Battery
125VA	NB-1260-1Q	16″	22″	18″	90	$ 880
250VA	NB-2560-1Q	16″	22″	18″	120	1,165
500VA	NB-5060-1Q	20″	22″	18″	200	1,615
1000VA	NB-1K60-1Q	34″	22″	18″	370	2,400
2000VA	NB-2K60-1Q	51″	22″	22″	560	3,500
3000VA	NB-3K60-1Q	60″	22″	22″	915	5,625

OPTIONAL FEATURES AND ACCESSORIES:

Frequency Meter	$100.00
Emergency Mode indicator and alarm contacts — to advise emergency battery is in use	50.00
System Monitor, indicator and alarm contacts — continually monitors AC output of the system	50.00
High Precision Frequency — ±0.0001%	300.00
Synchronizing Circuit — syncs inverter output to that of an external signal	75.00
Manual By-Pass (break-before-make) — to remove system from service	30.00
Additional Meters AC or DC volt or ammeters, each meter	40.00
Additional back-up protection time	Consult Factory
Special requirements or options not listed	Consult Factory

Terms Net 30 Days — F.O.B. Nutley, New Jersey
Pricing for 50 Hz and 400 Hz output — add 10%.

NOVA

FOR SALES OR APPLICATION ENGINEERING
CALL: (201) 661-3434
WRITE: NOVA ELECTRIC MFG. CO., 263 Hillside Avenue, Nutley, New Jersey 07110

NUCOR

POWER SUPPLIES

VWS95 BASE TEMP. RATING 95° QUALIFIED FOR EXTREME MIL ENVIRONMENTS

SPECIFICATIONS — VWS 95 Series

Input Voltage Range: 115VAC ±10%.
Line Swing: 103.5VAC to 126.5VAC.
Input Frequency Range: 47 Hz to 440 Hz.
Regulation Accuracy: 0.01% +1MV for full input range.
Ripple: 0.02% +2MV for 0 to 100% load change.
Temperature Coef.: 0.01%/°C of nominal output voltage.
Temperature, Storage: −55°C to +105°C.
Temperature, Operating: −20°C to +95°C mounting base, refer to specific model for maximum ambient.
Polarity: VWS95 Series Power Supplies may be used with positive or negative ground or output may be floated to 250VDC on lowest voltage terminal. Consult factory for higher ratings.
Output Voltage Adjustment Range: ±10% of nominal.
Series Operation: May be provided at no additional cost.
Short Circuit Protection: Fold back current limiting.
Over-Temperature Protection: Standard on NA case size and larger.
Over-Voltage Protection: (Optional) will be installed internally when ordered with power supply.
Recovery Time: Less than 50 micro seconds for ½ load to full load step change.
Operation with Lamp Loads: Available upon request.
400 Hz Operation Only: Power Supplies can be packaged in smaller can sizes (approx. 1 size smaller).
Stability: Less than .5% (for 8 hours continuous operation).
NOTE: 100% MIL components.

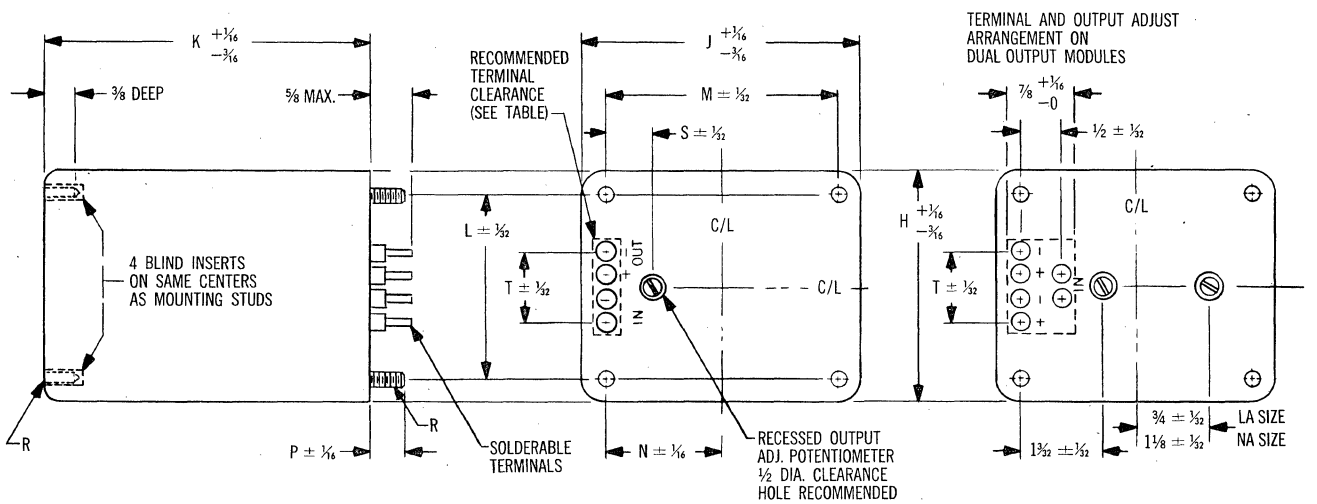
95° FEATURES

- −20°C to +95°C operation.
- −55°C to +125°C storage.
- Qualified for extreme MIL environments.
- Temperature coefficient — 0.01%/°C or 1MV/°C.
- Overload protection.
- Short circuit protection.
- Reverse voltage protection.
- Over-temperature protection.*
- Over-voltage protection (optional).
- MTBF 40,000 hours.
- Recovery time — less than 50 Micro sec half load to full load.
- Off ground operation.
- Transformer design per MIL-T-27A.

*Standard in all units in Case Sizes NA and larger.

OPTIONS

• Over-voltage protection	Suffix O.V.
• 400 Hz input only — (Reduced Size and Wgt.)	-A.
• Operation with lamp loads	-L.
• Fixed output voltage	-F.
• Remote sensing	-R.
• External output adjustment	-X.
• Over-temperature protection (see note)	-O.T.

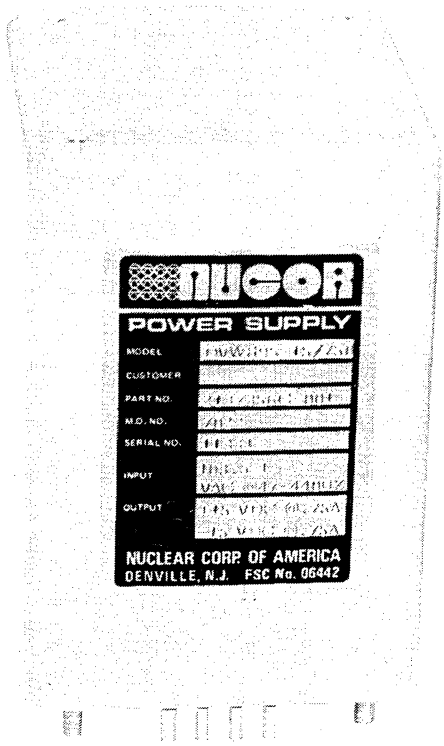


DIMENSIONS

Case Size	H	J	K	L	M	N	P	R	S	T	Recommended Terminal Clearance
HA	2 5/8	3 1/16	4 1/4	1 55/64	2 19/64	1 5/32	11/32	8-32	19/32	15/16	3/8 x 1 5/16
JA	3 1/16	3 9/16	4 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	19/32	15/16	3/8 x 1 5/16
KA	3 3/8	3 15/16	5 1/4	2 7/16	3	1 1/2	15/32	10-32	19/32	15/16	3/8 x 1 5/16
LA	3 11/16	4 5/16	5 9/16	2 11/16	3 5/16	1 21/32	7/16	10-32	19/32	15/16	3/8 x 1 5/16
MA	4	4 11/16	6	3	3 11/16	1 27/32	9/16	1/4-20	19/32	15/16	3/8 x 1 5/16
NA	4 5/16	5 1/16	6 13/16	3 5/16	4 1/16	2 1/32	9/16	1/4-20	19/32	15/16	3/8 x 1 5/16
PA	4 15/16	6 9/16	7	3 5/8	5 1/4	2 5/8	11/16	5/16-18	3/4	15/16	3/8 x 1 5/16
QA	6 9/16	6 3/4	7	5 1/4	5 7/16	2 23/32	11/16	5/16-18	3/4	1 7/8	1/2 x 2 3/8

VWS95 (cont'd)

Output Voltage	Output Current	Case Size	Model Number
4.7-5.3	.750	JA	VWS95-5/P750
	1.5	LA	VWS95-5/1.5
	3.0	MA	VWS95-5/3
	6.0	NA	VWS95-5/6
	12.0	QA	VWS95-5/12
11.4-12.5	.200	HA	VWS95-12/P200
	.375	JA	VWS95-12/P375
	.750	KA	VWS95-12/P750
	1.5	MA	VWS95-12/1.5
	3.0	PA	VWS95-12/3
13.7-15.2	.200	HA	VWS95-14/P200
	.375	JA	VWS95-14/P375
	.750	KA	VWS95-14/P750
	1.5	MA	VWS95-14/1.5
	3.0	PA	VWS95-14/3
16.5-18.5	.200	HA	VWS95-17/P200
	.375	JA	VWS95-17/P375
	.750	KA	VWS95-17/P750
	1.5	NA	VWS95-17/1.5
	3.0	PA	VWS95-17/3
22.3-24.4	.200	HA	VWS95-23/P200
	.375	JA	VWS95-23/P375
	.750	LA	VWS95-23/P750
	1.5	NA	VWS95-23/1.5
	3.0	PA	VWS95-23/3
26.8-29.2	.200	JA	VWS95-28/P200
	.375	KA	VWS95-28/P375
	.750	LA	VWS95-28/P750
	1.5	NA	VWS95-28/1.5
	3.0	PA	VWS95-28/3



DUAL OUTPUT UNITS

Output Voltage	Output Current	Case Size	Model Number
±11.4-12.6	.750	LA	DVWS95-12/P750
	1.500	NA	DVWS95-12/1.5
±14.2-15.8	.750	LA	DVWS95-15/P750
	1.500	NA	DVWS95-15/1.5

OTHER SPECIAL OPTIONS

For simplicity we have omitted the listing of vast numbers of options. However, many other special options are available upon request, such as special configurations, special painting, closer regulation, 230 volt input, multiple outputs, etc. If your needs cannot be filled from our catalog try our factory. You may be surprised at our capabilities.

Other units with output voltages to 155 volts at 4 amperes available. Consult factory.

ORDER BY MODEL NUMBER

When ordering please specify the catalog model number and name of instrument desired. For example "VWS5/6-OV." To prevent misunderstanding, include option numbers and specific instructions in your order whenever you desire special options or special features such as a special color, non-standard input AC power connector, etc.

WARRANTY

The Nucor Warranty not only guarantees you an instrument which will perform to published specification, but also expresses our pride and confidence in the materials and workmanship which have gone into that instrument. It is a warranty backed by over 12 years experience in the Electronics industry.

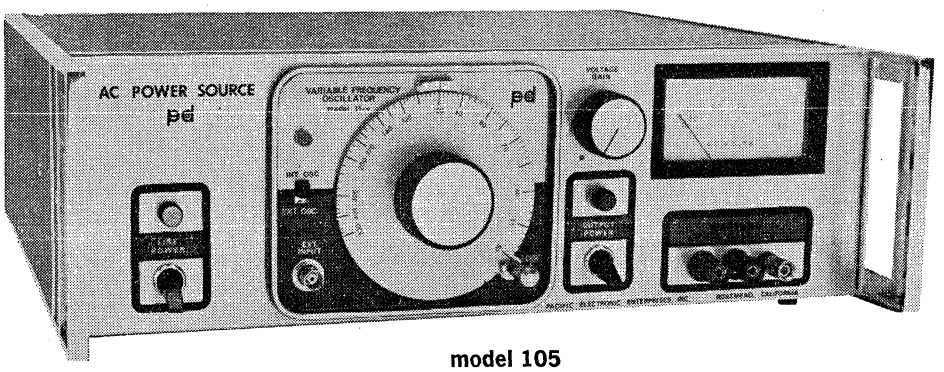
All Nucor products are warranted against defects in materials and workmanship. This warranty applies for One Year from date of delivery. We will repair or replace products which prove to be defective during the warranty period. No other warranty is expressed or implied. We are not liable for consequential damages.

If our VW Series doesn't satisfy your needs, look into our specialty, CUSTOM SUPPLIES.

NUCOR

NUCOR CORPORATION
POWER SUPPLY DIVISION
4 RICHWOOD PLACE • DENVILLE, NEW JERSEY 07834
TELEPHONE (201) 627-4200 TWX 710-9878487

ac POWER SOURCES



model 105

STANDARD FEATURES

- OVERLOAD PROTECTION
- FULLY METERED
- VARIABLE OUTPUT 0 to 125VAC
- 110/220V — 47/63Hz INPUT POWER REQUIREMENTS (400Hz available)
- EXTERNAL INPUT FOR EXPANDED FREQUENCY OPERATION
- INTERNAL VARIABLE OSCILLATOR (47 to 500Hz)
- LIGHTWEIGHT
- ATTRACTIVE STYLING

MODEL	VA	PHASE	REGULATION		DISTORTION	SIZE (H-W-D)	WEIGHT	PRICE
			LINE	LOAD				
250-A	250	1	.5%	.9%	.5%	5½ x 12 x 13	30	695.00
303-A	300	3	.5%	.9%	1%	5½ x 19 x 13	30	1,495.00
105	500	1	.25%	.9%	.75%	5½ x 19 x 13	25	1,395.00
110	1000	1	.25%	.9%	.75%	10 x 19 x 15	40	2,195.00
315	1500	3	.25%	.9%	.75%	10 x 19 x 17	CONSULT FACTORY	
120	2000	1	.25%	.9%	1%	29 x 19 x 24		
130	3000	1	.25%	.9%	1%	29 x 19 x 24		
160	6000	1	.25%	.9%	1%	42 x 19 x 24		
330	3000	3	.25%	.9%	1%	29 x 19 x 24		
360	6000	3	.25%	.9%	1%	42 x 19 x 24		

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Pacific Electronic AC Power Sources are designed for portable continuous duty production of AC power. These lightweight solid-state units provide reliable distortion free power at any of the popular power frequencies, and at other frequencies with external excitation. Bandwith is sufficient to maintain a high purity sinewave of voltage, even when load current is non-linear.

pd

PACIFIC ELECTRONIC ENTERPRISES, INC.

2643 North San Gabriel Boulevard
Rosemead, California 91770
(213) 573-1686

Nickel - Cadmium

R E C H A R G E A B L E

Sealed Cells and Batteries

by POWER INCORPORATED

CAPACITIES UP TO 2000 AMPERE HOURS ON REQUEST

TYPICAL CYLINDRICAL CELLS (FIG. A) 1.2 VOLTS PER CELL

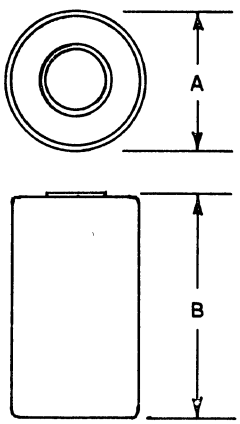


FIG. A

Type	Capacity mAH	Dimensions (in) A	Dimensions (in) B	Wt. oz.
170SC	170	0.625	0.600	0.4
250SC	250	0.542	1.209	0.6
500SC	500	0.554	1.920	1.0
600SC	600	0.625	1.920	1.0
750SC	750	1.020	0.910	1.1
1000SC	1000	1.000	1.280	1.1
1200SC	1200	.875	1.600	1.5
1800SC	1800	1.000	1.840	2.5
2000SC	2000	1.272	1.400	2.8
4000SC	4000	1.289	2.300	4.6
7000SC	7000	1.290	3.490	7.6
8000SC	8000	1.344	4.218	9.8

Oval cell also available (Fig. C) in 4000mAH, W-2.080 T-1.260 and H-1.656 Wt. .37 lbs.
All battery configurations available with pressure contact buttons or solder lug terminals.

TYPICAL BUTTON CELLS (FIG. B) 1.2 VOLTS PER CELL

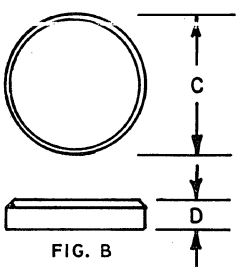


FIG. B

Type	Capacity mAH	Dimensions (in) C	Dimensions (in) D	Wt. oz.
20B	20	0.449	0.201	0.04
50B	50	0.606	0.230	0.09
100B	100	0.984	0.240	0.28
150B	150	0.984	0.260	0.30
180VBH*	180	0.984	0.290	0.39
225B	225	0.984	0.339	0.41
225BH*	225	0.984	0.347	0.44
250VBH*	250	1.340	0.210	0.58
400B	400	0.992	0.571	0.66
450B	450	1.689	0.299	1.10
500BH*	500	1.340	0.374	0.90
1000VBH*	1000	2.000	0.330	2.24
2000VBH*	2000	2.000	0.590	3.50
3000BH	3000	2.000	.976	5.00

*H denotes high rate discharge capability.

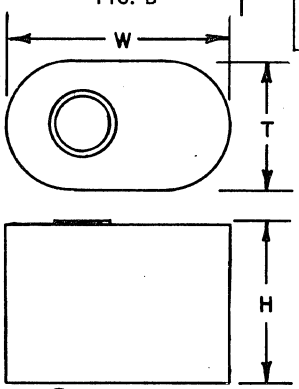
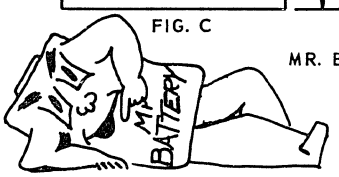


FIG. C

POWER INCORPORATED ALSO MARKETS:

Emergency lighting units.
Flashlight and lantern rechargeable batteries.
Custom and prototype design battery packs built to your specifications.
Battery chargers for all types of batteries.
Batteries - **NICKLE CADMIUM - SILVER CADMIUM - SILVER ZINC - MERCURY - SEALED LEAD-ACID.**



MR. BATTERY SAYS: ®

"We have over 10,000 cell and battery sizes in stock. If you don't see exactly what you are looking for here, let us know, chances are we'll be able to take care of your application immediately. We'd be happy to answer any questions. If we can't help you, no one can."

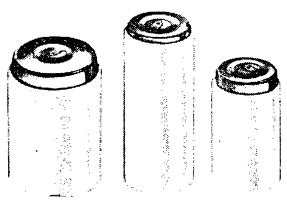
All cylindrical and oval battery types feature a pressure safety device for security and reliability making them especially suited for cordless consumer and electronic products.

CUSTOM BATTERY PACKS

Cylindrical cells are incased in a rigid, high impact case. Case materials are highly dielectric to provide maximum cell insulation at minimum cost. The case is vented to each cell to provide cooling and long life. Packs are available to your specifications in any voltage.

Button cell batteries are constructed of sealed nickle cadmium button cells (see fig. B) to meet almost any application requirement. The compact size of button cells permits easy stacking to form multiple cell batteries of optimum power/volume ratio and space utilization. Completely sealed button cells are ideally suited for portable radios, flashlights, photoflash, alarms, and any low-drain, high capacity application.

TYPICAL BUTTON CELL BATTERIES



"Solar cell weatherproof panels are available to provide power and battery charging in remote areas. These "sun power panels" are available separately or with our custom battery packs."

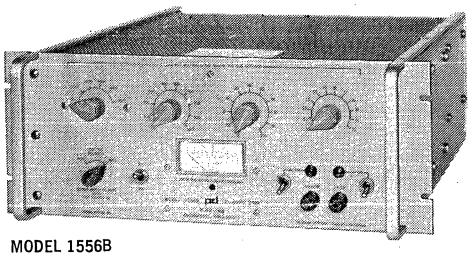
INVESTIGATE direct current emergency power sources available in any regulated voltage or current, featuring automatic SCR solid state switchover to a self-contained battery. We have the answer to reliable economical D.C. power with automatic emergency back-up.

POWER INCORPORATED

FOR COMPLETE SPECIFICATIONS, PRICE, AND DELIVERY, WRITE OR PHONE
POWER INC. • MARKETING DIVISION • 12809 Eagle Ridge Drive • Burnsville, Minnesota 55378 • (612) 890-1360 •

HIGH VOLTAGE

POWER DESIGNS INC.



MODEL 1556B

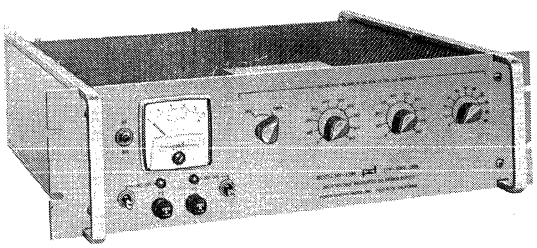
CALIBRATED POWER SOURCES FOR PHOTOMULTIPLIER PROPORTIONAL AND SOLID STATE DETECTORS, ELECTRON OPTICS, LASERS, CRT DISPLAYS

Calibrated high voltage power sources supplying tightly regulated DC for critical applications where stability, low noise and reliability are of prime consideration.
• .25% calibration accuracy • 10 MV resolution • Sealed transformers and rectifiers • Self-restoring overload and short circuit protection • All solid state except for "Series" Pass Tube • Voltage and current metering.

PARTIAL LIST OF AVAILABLE UNITS

Model	Voltage	Current mA	Regulation Line or Load	Ripple Pk to Pk mV	Size Panel Ht.	*PRICE
2K20	1-2012	0-20	0.001% +2 mV	1.0	3½	$325.00
1570	1-3012	0-40	0.001% +2 mV	1.0	5¼	$550.00
1556B	10-6021	0-20	0.001% +2 mV	1.0	7	$625.00
1543A	10-10021	0-10	0.001% +2 mV	5.0	10½	$950.00
**3K10B	10-3000	0-10	.001% +3 mV	3.0	3.0	$390.00

**All Solid State. Write for specification sheets.



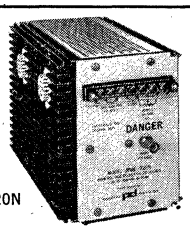
MODEL 1584

CALIBRATED POWER SOURCES FOR ELECTRON GUN, ION PROBE, SCANNING ELECTRON MICROSCOPE, MASS SPECTROMETER APPLICATIONS

• High Stability: 25 PPM/hour, 100 PPM/day • Regulation: .0025% • Calibration Accuracy: 0.25% • Temperature Coefficient better than 50 PPM/°C • All high voltage circuits vacuum encapsulated in specially formulated epoxy to provide corona-free operation under adverse environmental conditions • Arc, overload and short circuit protection • Optional overvoltage protection • 50 KV mating connector supplied.

PARTIAL LIST OF AVAILABLE UNITS

Model	Output Voltage	Output Current	Ripple Pk to Pk	Polarity	*PRICE
1584	1 kV to 20 kV	0-3 mA	250 mV	Positive	$1875.00
1584R	1 kV to 20 kV	0-3 mA	250 mV	Reversible	$2200.00
1584M-8	1 kV to 20 kV	0-5 mA	250 mV	Positive	$2050.00
1584M-10	1 kV to 20 kV	0-5 mA	250 mV	Negative	$2050.00
1579	10 kV to 30 kV	0-1 mA	250 mV	Positive	$2250.00
1579R	10 kV to 30 kV	0-1 mA	250 mV	Reversible	$2575.00



MODEL UPMD-220N

MODULAR REMOTE CONTROL HV SOURCES FOR PHOTOMULTIPLIER, PARTICLE DETECTOR, AND TV CAMERA APPLICATIONS

• Remote resistance programming of output voltage at low potentials (15 V) • Voltage or digital programming optional • Regulation better than 25 PPM • Stability better than 100 PPM/day • Temperature Coefficient better than 50 PPM/day • Arc, overload and short circuit protection • Built-in tracking overvoltage crowbar which trips at 500 volts approx. over any preset output voltage • Internal precision multiplier permits remote monitoring of output voltage.

PARTIAL LIST OF AVAILABLE UNITS

Model	Output Voltage	Output Current	Ripple & Noise Pk to Pk	Polarity	*PRICE
UPMD-220N	10 V - 2000 V	0-20 mA	10 mV	Negative	$385.00
UPMD-220P	10 V - 2000 V	0-20 mA	10 mV	Positive	$395.00
UPMD-310N	10 V - 3000 V	0-10 mA	5 mV	Negative	$385.00
UPMD-310P	10 V - 3000 V	0-10 mA	5 mV	Positive	$395.00
UPMD-550N	10 V - 5000 V	0-5 mA	5 mV	Negative	$440.00
UPMD-550P	10 V - 5000 V	0-5 mA	5 mV	Positive	$450.00

Power Designs Inc.

Westbury, N. Y.: 1700 Shames Drive, Zip: 11590/Tel: (516) 333-6200/TWX: 510-222-6561
Palo Alto, Calif.: 3381 Miranda Ave., Zip: 94304/Tel: (415) 493-6111/TWX: 910-373-1251

*Prices are FOB Westbury, New York. Subject to change without notice.

POWER DESIGNS INC. UNIPLY®

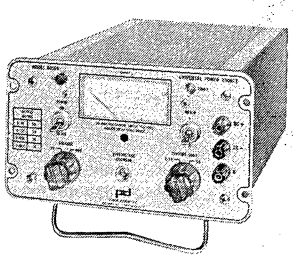
A LABORATORY OF POWER SUPPLIES IN A SINGLE PACKAGE

The *UNIPLY® principle involves a regulator technique that provides a general purpose power source functionally replacing four conventional power supplies.
The regulator system comprises a number of unregulated DC sources, a number of power semiconductors selected for optimum voltage and current characteristics and a single control amplifier which selects through "OR" gates that combination of unregulated source and power semiconductors that satisfy the demands of the load and the panel control settings with minimum power supply losses.
Ranging is automatic and transient-free. Operation is electronic, without relays or manual switching and utilizes linear circuits only. No triacs, SCR's or switching circuits are employed.
*Patents applied for

A built-in front panel continuously adjustable overvoltage "crowbar" in conjunction with an inhibit switch limiting the automatic ranging to 6 volts provides completely safe operation with digital circuit loads. The UNIPLY® technique permits increased power supply capability with increasing AC line voltages. Up to 150% of panel ratings is available at line voltages over 105 volts. Useful output at reduced levels is available at line voltages as low as 85 volts. A flashing panel indicator signals loss of regulation if load demands exceed the regulator capability or AC input voltages are inadequate.
Two voltage and current ranges are provided on the taut-band suspension panel meter to increase resolution. Ranges switch automatically with range switch setting.

MODEL 6050A

0-7V at 5A / 0-15V at 3A / 0-25V at 2A / 0-60V at 1A



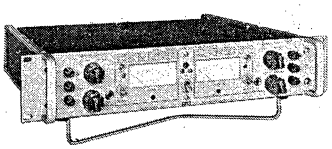
***$229.00**

SPECIFICATIONS

Input: 105-125 volts, 57-440 Hz, 100 watts nominal.
Line Regulation: 0.01% +1 millivolt.
Load Regulation: 0.01% +1 millivolt for load variation from 0-100% of rated output current.
Polarity: Either positive or negative output terminal may be operated at ground potential.
Ripple and Noise: Less than 1 millivolt peak-to-peak.
Source Impedance: $< 0.005\,\Omega$ at DC, $0.1\,\Omega$ to 20 KHz, $1.0\,\Omega$ to 1 MHz.
Recovery Time: Less than 50 microseconds to return to within a 15 millivolt band of the original voltage for a step change in rated load of 10% to 100% (1 microsecond rise time).
Stability: 0.02% +3 millivolts per 24 hours.
Operating Temperature: 0-50°C at full load. Storage: −20°C to +85°C.
Temperature Coefficient: 0.02% per degree C.
Current Limiting: Concentric switch/potentiometer provides continuous adjustment in two ranges: 0-500 milliamperes, 0-5 amperes.
Metering: Front panel taut-band meter and a selector switch permit monitoring voltage or current with an accuracy of ±3% of full scale. Voltage ranges 0-6V/0-60V change automatically with voltage range control. Current ranges 0-500 mA/0-5A change automatically with current range control.
Output Terminals: Front Panel: Three binding posts for positive, negative and ground.
Rear Panel: Seven terminal barrier strip for output voltage, sensing, voltage programming and parallel operation.
Dimensions: 8⅜" wide x 4¾" high x 11⁹⁄₁₆" deep.
Weight: 15½ lbs.
Overvoltage Crowbar: Built-in overvoltage crowbar adjustable from 2.0 V to 70 V from the front panel.

MODEL TW6050A

TWO INDEPENDENT MODEL 6050A SOURCES IN A 3½" x 19" RACK MOUNTING PACKAGE

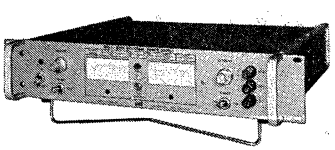


More compact than two Model 6050A units, the Model TW6050A offers two independent sources which are electrically identical to the Model 6050A, but permit series operation to 120 V at 1 ampere or parallel operation to 7V at 10 amperes, in addition.

***$449.00**

MODEL 6150

0-7V at 15A / 0-15V at 7.5A / 0-25V at 5A / 0-60V at 2A



The Model 6150 offers more than twice the output power of the Model 6050A, with essentially the same electrical characteristics. Two taut-band meters are provided. Each instrument has two voltage and current ranges 0-6V/0-60V, 0-1.5A/0-15A. Ranges switch automatically with range switches. The Model 6150 mounts in a 19" rack, measures 3½" H x 16" D and is suitable for laboratory bench operation as well.

***$350.00**

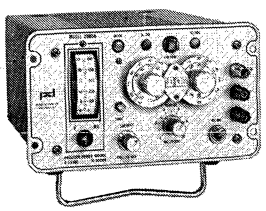
Power Designs Inc.
Westbury, N. Y.: 1700 Shames Drive, Zip: 11590/Tel: (516) 333-6200/TWX: 510-222-6561
Palo Alto, Calif.: 3381 Miranda Ave., Zip: 94304/Tel: (415) 493-6111/TWX: 910-373-1251
*Prices are FOB Westbury, New York. Subject to change without notice.

POWER DESIGNS INC. CALIBRATED POWER SOURCES

CALIBRATED, STABLE, LOW NOISE HIGH RESOLUTION POWER SOURCES FOR PRECISION LABORATORY APPLICATIONS

0-20 VDC/0-500 mA

MODEL 2005A

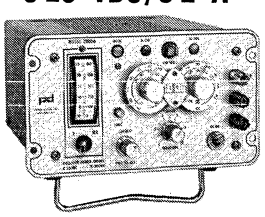


***$325.00**

• Two dual concentric switches (four decades) and a calibrated potentiometer provide digital readout to five significant figures • A toggle switch provides readout to six figures above 10 volts • Last-place potentiometer has 10 μV resolution • Source impedance is less than two milliohms at DC, less than 0.5 ohms at 1 MHz • Recovery time is less than 25 microseconds to return within a 100 μV band of the programmed voltage for an 80% load change • Front and rear access terminals.

• Better than 0.1% calibration accuracy • Critical components in temperature stabilized oven • 10 PPM plus 100 μV stability for 8 hours • Temperature coefficient better than 10 PPM or 50 μV per °C • Self-restoring overload and short circuit protection with adjustable current limit control and flashing limit indicator • 100 μV maximum peak-to-peak ripple (250 μV on Model C400) • Solid silver decade switch contacts • 100 hour minimum burn-in prior to calibration • Individual calibration data furnishd with each unit • Provisions for remote sensing and remote resistance programming at 1000 Ω/volt • Voltage or current metering.

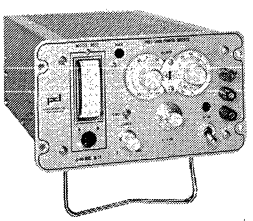
0-20 VDC/0-2 A



• Two dual concentric switches (four decades) and a calibrated potentiometer provide digital readout to five significant figures • A toggle switch provides readout to six figures above 10 volts • Last-place potentiometer has 10 μV resolution • Source impedance is less than two milliohms at DC, less than 0.5 ohms at 1 MHz • Recovery time is less than 25 microseconds to return within a 100 μV band of the programmed voltage for an 80% load change • Front and rear access terminals.

MODEL 2020A ***$375.00**

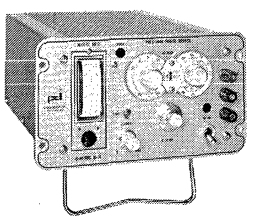
0-40 VDC/0-1 A



• Two dual concentric switches (4 decades) and a calibrated 10-turn potentiometer provide calibrated readout to six significant figures • Sixth place interpolation with 10 microvolt resolution • Dial accuracy is 0.1% plus one millivolt below one volt, 0.1% from one to forty volts • Front and rear access terminals • Bail/carrying handle tilts front panel for viewing ease • Electrical characteristics similar to Model 2005A.

MODEL 4010 ***$395.00**

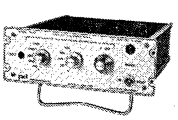
0-100 VDC/0-400 mA



• Two dual concentric switches (4 decades) and a calibrated 10-turn potentiometer provide calibrated readout to six significant figures • Sixth place interpolation with 10 microvolt resolution • Dial accuracy is 0.1% plus one millivolt below one volt, 0.1% from one to 100 volts • Front and rear access terminals • Bail/carrying handle tilts front panel for viewing ease • Electrical characteristics similar to Model 2005A.

MODEL C400 ***$395.00**

10-3000 VDC/0-10 mA HV PHOTOMULTIPLIER SOURCE



• Two switches and a 10-turn potentiometer provide calibrated readout with 0.25% accuracy • 3 millivolts peak-to-peak noise and ripple • Stability better than 30 millivolts/24 hrs. • Regulation better than 10 ppm or 3 millivolts for line and load variations • Fully protected against overload, short circuit or arcing • Proprietary overvoltage protection • Safety (SHV) output connectors.

MODEL 3K10B ***$390.00**

PARTIAL LIST OF AVAILABLE PRECISION POWER SOURCES

Model	Range Volts	Current Amps	Regulation Line/Load	Max. Ripple Pk to Pk	Stability	TC Per °C	Size	Special Features	*PRICE
2005A	0-20	0-0.01	.0005% +100 μV	100 μV	.001% +100 μV/8 hrs.	.001% or 50 μV	8⅜x4¾ x8 7/32	4 decade readout with .1% accuracy. Continuous current limiting with panel pushbutton setting. Remote programmable 1000Ω/V.	$325.00
2020A	0-20	0-2.0	.0005% +100 μV	100 μV	.001% +100 μV/8 hrs.	.001% or 50 μV	8⅜x4¾ x11 7/16	4 decade readout with .1% accuracy. Remote programmable 1000Ω/V.	$375.00
4010	0-40	0-1.0	.0005%	100 μV	.001% +100 μV/8 hrs.	.001% or 50 μV	8⅜x4¾ x11 7/16	Same as 2020A.	$395.00
C400	0-100	0-0.4	.001% +100 μV	250 μV	.001%	.001% or 50 μV	8⅜x4¾ x11 7/16	4 decade readout with .1% accuracy. Continuous current limiting. Remote programmable 1000Ω/V.	$395.00
3K10B	10-3000	0-0.01	.001% or 3 mV	3 mV		.005%	3x8½ x11½	Calibrated readout to ¼%. Arc and short circuit proof.	$390.00

Power Designs Inc.

Westbury, N. Y.: 1700 Shames Drive, Zip: 11590/Tel: (516) 333-6200/TWX: 510-222-6561
Palo Alto, Calif.: 3381 Miranda Ave., Zip: 94304/Tel: (415) 493-6111/TWX: 910-373-1251

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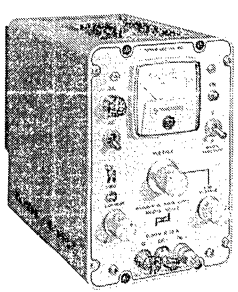
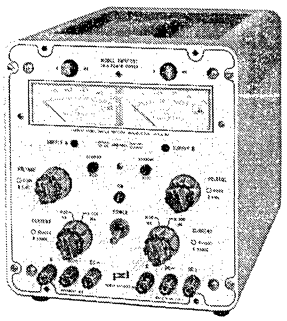
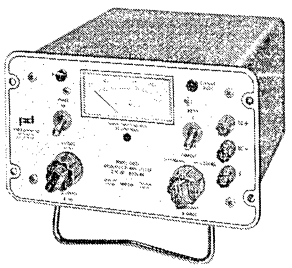
LABORATORY/MODULAR POWER DESIGNS INC.



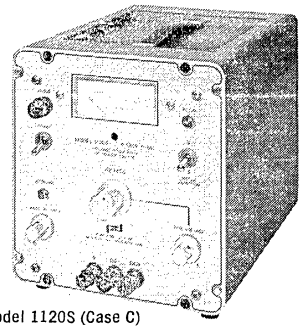
Model 5015T (Case B)
5¾″ w x 8⅝″ h x 10⅞″ d



Model TW5005T (Case C)
7¾″ w x 8⅝″ h x 13½″ d



Model 5005T (Case A)
8⅜″ w x 4¾″ h x 9″ d



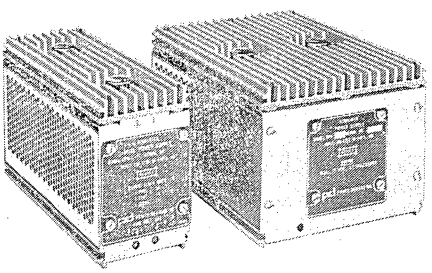
Model 1120S (Case C)
7¾″ w x 8⅝″ h x 13½″ d

• Laboratory workhorse power supplies with over 12 years of field history • Continuously adjustable voltage, current or current limiting controls with limiter or current mode indicating lamps • No RFI generating SCR or switching circuits • Modular package construction suitable for bench or rack mounting • Processed under a "Predictable Reliability" Program for 5-year minimum operation to published specifications. This program features: Avalanche-controlled rectifiers, 100% stress testing of transistors, pre-aged zener references with maximum I/F noise specifications, computer grade capacitors, low T.C. 1% tin oxide film resistors in critical circuits, etc. • Supplies are burned in under full load for a minimum of 50 hours prior to test.

PARTIAL LIST OF AVAILABLE UNITS

Model	Voltage	Current Amps.	Voltage Regulation	Current Regulation	Ripple Pk to Pk mV	Case	*PRICE
5005T	0-50	0-0.5	0.005% +1 mV	better than 500 μA	1.0	A	$149.50
2015R	0-20	0-1.5	+0.03% or 5 mV†	0.02% or 200 μA	1.0	A	$175.00
5015T	0-50	0-1.5	+0.01% or 3 mV†	current limit only	1.0	B	$234.50
1210S	0-12	0-10	0.01% +2 mV	current limit only	1.0	C	$299.00
TW5005T (dual)	0-50, 0-.5 A each output 0-100 at 0.5 A series 0-50 at 1.0 A parallel		each output same as 5005T	each output same as 5005T	1.0	C	$297.50
3650S	0-36	0-5.0	0.01% +3 mV	current limit only	1.5	C	$324.50
1120S	0-120	0-1.0	0.01% +3 mV	current limit only	1.0	C	$324.50

† Whichever is greater



REDULE® UNIVERSAL MODULAR POWER SUPPLIES

• Single or dual outputs with choice of several output voltage levels in one package • Multi-turn incremental voltage adjustment potentiometer • Parallel or series operation with any terminal at ground potential • Remote sensing • Remote programming • Self-restoring fold-back overload and short protection • Thermal overload cutout • 100% inspected "reliability controlled" silicon semiconductors • 50 hours power supply pre-aging prior to test • 50 μs recovery time • 105-125 V, 57-440 Hz input • Mounts in any plane, to any surface • No external heat sink required • Connector keying system prevents mating errors • Complete maintainability, reliability and workmanship to most military standards • 0-60°C operating range.

PARTIAL LIST OF AVAILABLE UNITS

MODEL	OUTPUT RATING	NUMBER OUTPUTS	REGULATION LINE/LOAD	MAX. RIPPLE PK TO PK	INPUT POWER @ NOM. LINE	†PRICE
UPM-6	24V @ 1½A, 27V @ 1¼A, 30V @ 1A	1	.01% + 2mv	1mv	90w	$157.50
UPM-11	0-16V @ 1A	2	.01% + 1mv	1mv	80w	199.00
UPM-16*	5, 6V @ 5A	1	.01% + 2mv	1mv	85w	169.00
UPM-22	16-30V @ ½A, 30-60V @ ¼A	2	.01% + 1mv	1mv	70w	199.00
UPM-33	0-16V @ 2A	1	.01% + 1mv	1mv	80w	147.50
UPM-44	16-30V @ 1A, 30-60V @ ½A	1	.01% + 1mv	1mv	70w	147.50
UPMD-10	24V @ 3A	1	.04% + 2mv	2mv	180w	180.00
UPMD-11B	±15V @ 1A (precision tracking)	2	100 μv	150 μv	85w	275.00
UPMD-15	15V DC @ 2A	2	.01% + 2mv	1mv	125w	265.00
UPMD-15V	Same as UPMD-15 with overvoltage crowbar protection					290.00
UPMD-X9	100V DC @ ¼A	2	.03% + 1mv	1mv	90w	260.00
UPMD-56A*	5, 6V @ 10A	1	.01% + 2mv	1mv	170w	225.00
FPM-101	±15V @ 1A (precision tracking)	2	.01%	1mv	65w	164.00

*Includes built-in overvoltage crowbar protection.

Power Designs Inc.

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Product Section	Volumes 1, 2, 3 Page	1973 Volume 4 Page	Products
1100	Vol.2•308	Vol.4•309	Amplifiers, Audio, Operational, etc.
1200			Antennas & Accessories
1300	Vol.1•308	Vol.4•310	Audio Equipment & Accessories
1400	Vol.3•308	Vol.4•311	Cabinets, Chassis, Containers, Racks, Boxes, etc.
1500	Vol.3•342	Vol.4•314	Capacitors (All Types)
1600	Vol.3•516	Vol.4•324	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
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1800	Vol.3•519		Coils (Inductors, Chokes), Assemblies, Forms
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UNI Series Wide Multiple Range Systems Power Supplies	Modular . . . Wide Multiple Ranges . . . High Power Density . . . Remotely Programmable . . . Same-Day-Shipment . . . 9 Case Sizes . . . UL Approved	0-34 VDC	0-34 Amps	1•791-1•793
EM Series Economical Modular Power Supplies	New ECONO/MATE Series features High Reliability at Modest Cost . . . 3 Case Sizes . . . Solid State Regulators . . . OVP Optional . . . Same-Day-Shipment . . . 15 Models	0-24 VDC	0-15 Amps	1•794, 1•795
ET Dual Output Series Economical Dual Output Modular Power Supplies	New Dual Output ECONO/TWIN Series features High Reliability at Modest Cost . . . Dual Outputs . . . 2 Case Sizes . . . Solid State Regulators . . . OVP Optional . . . Same-Day-Shipment . . . 10 Models	±5 VDC ±18 VDC	Up to 6 Amps Dual Output	1•796, 1•797
OEM Series Modular Systems Power Supplies	Modular . . . Standard Voltage Ranges for OEM Applications . . . Built-in Protection Remote Programmable . . . Large OEM Discounts . . . 128 Standard Models . . . UL Approved	3-48 VDC	0-34 Amps	1•799-1•802
SUPER/UNI Series New Higher Current Multiple Range Systems Power Supplies	New . . . Modular . . . Wide Multiple Ranges . . . Very High Power Density . . . Remotely Programmable . . . Built-in OVP . . . Same-Day-Shipment . . . 9 Case Sizes . . . UL Approved	0-34 VDC	0-36 Amps	1•803-1•806
PM Series Systems Modular Single Range Power Supplies	Modular . . . Singular Range, Utilizing State-of-the-Art Integrated Circuits . . . 6 Case Sizes, 90 Models . . . All with Built-in OVP . . . UL Approved . . . OEM Discounts	0-150 VDC	0-34 Amps	1•807-1•809
PM Full Rack Series High Power Systems Power Supplies	Full Rack . . . Voltage up to 60 VDC with Currents to 150 Amps . . . Metered or Non-Metered . . . Remotely Programmable . . . Also Wide Range Models Available	3-60 VDC	0-150 Amps	1•810-1•812

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SERIES	DESCRIPTION	VOLTAGE RANGE	CURRENT OUTPUT	EEM PAGES VOL. 1
PX Series High Current Compact Modular Power Supplies	Over 90 Compact High Current Power Supplies Ideally Suited for IC Logic and Systems Applications . . . All Units Have Built-in OVP and "Fail-Safe" Thermal Protection Compact Size	0-150 VDC	0-40 Amps	1•813-1•815
PX Full Rack Series Rack Mounted System Power Supplies	Full Rack Mountable . . . from 3 VDC to 60 VDC . . . Up to 180 Amps . . . Metered or Non-Metered . . . Built-in OVP . . . High Power Density	3-60 VDC	0-180 Amps	1•816-1•818
PC Series Mil Spec Performance Modular Power Supplies	Designed to Meet Mil/Specs . . . Full Temperature Range for Critical Applications . . . Excellent Regulations for Both Line and Load . . . Low Lov Ripple . . . Built-in OVP	0-150 VDC	0-30 Amps	1•819-1•822
WR Wide Range Series Modular Systems Power Supplies	Full Wide Range Systems Supplies . . . No Internal Changes Required . . . Optional Built-in OVP . . . Same-Day-Shipment . . . Continuously Adjustable . . . 104 Off-the-Shelf Models	0-30 VDC	0-25 Amps	1•823-1•825
PT Dual Output Series Modular Power Supplies	2 Separate DC Outputs . . . Use with OP Amps, IC's, etc. . . . May be Tracking or Non-Tracking . . . 5 Year Warranty . . . 8 Case Sizes . . . Fully Adjustable Outputs . . . 32 Standard Models	±5 VDC to ±18 VDC	UP to 18 Amps Each Output	1•826, 1•827
Racks & Accessories For Custom Requirements	Racks, Panels, Metered Panels, Terminal Strips, Overvoltage Protection, Adapters, etc. . . . For Use with All PMC Power Supplies . . . Same-Day-Shipment	Use with All PMC Models	—	1•828-1•831
HV/HW Series High Efficiency Power Supplies	Modular or Full Rack . . . Efficiencies to 80% . . . Uses Patented "Simag" Circuitry . . . Built-in OVP . . . Self Restoring Current Limiting . . . Use with All Logic and IC's . . . 5 Year Warranty	3-150 VDC	Up to 200 Amps	1•832-1•836

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SERIES	DESCRIPTION	VOLTAGE RANGE	CURRENT OUTPUT	EEM PAGES VOL. 1
BP BENCH/PAC Series Laboratory Power Supplies	Laboratory Bench Supplies with Built-in Meters, Voltage and Current Controls . . . Rack Mountable . . . 6 Case Sizes . . . All Models Series Regulated . . . Built-in Short Circuit Protection	0-60 VDC	0-15 Amps	1•837-1•839
PR High Current Series Rack Power Supplies	Rack Lab Supplies . . . High Current Pre-Regulated, High Efficiency . . . Metered or Non-Metered . . . Low Ripple . . . 15 Separate Models . . . Many Options	0-60 VDC	0-100 Amps	1•840-1•842
FPS Series Ferroresonant Power Supplies	Magnetically Regulated . . . Fixed Voltage DC Supplies . . . Good Load Regulation . . . Built-in Current and Overvoltage Protection . . . Over 100 Standard Models	3-60 VDC	0-125 Amps	1•843-1•845
MM/DD MINI/MATE Series Miniature Encapsulated Power Supplies	Miniature Encapsulated Power Supplies for OP Amp, Logic and Display Circuitry . . . Single or Dual Outputs . . . Same-Day-Shipment . . . AC to DC . . . DC to DC . . . Over 165 Models . . . Multiple Outputs	3-200 VDC	0-2.0 Amps	1•846-1•851
CP CARD/PAC Series PC Board Power Supplies	"Plug-in" PC Board Power Supplies for OP Amp and Logic . . . Dual and Single Outputs . . . Off-the-Shelf	3, 6-50 VDC	0-2.0 Amps	1•852-1•853
RA, RB, RC, RD Series Plug-in Modular Supplies	Complete Series of Plug-in Modular DC Power Supplies . . . High Power Density . . . Designed to Meet Mil/Specs . . . 10 Case Sizes . . . Over 500 Models . . . Full Temp. Range for Critical Applications	0-500 VDC	0-25 Amps	1•854-1•858
DRA and DRB Series Dual Plug-in Modular Supplies	A Series of Dual Plug-in Modular DC Power Supplies . . . Any Dual Output Combination Available	3-76 VDC	0-1.5 Amps Each Output	1•859

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UNI UNIVERSAL POWER SUPPLIES

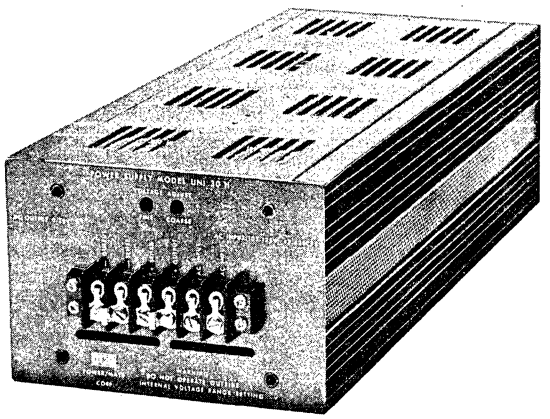
PRODUCT DIGEST

The UNI Series VARI-rated power supply modules may be operated at any range of DC output voltages and currents, so the nine units replace literally thousands of more expensive, narrow-range power supplies. Collectively, the outputs of the UNI Series cover currents from 0 to 34 amperes and voltages from 0 to 34 volts. All units are UL approved.

These power supplies are compact, rugged, mount on any of three sides, and meet Mil Spec environment requirements. They are short-circuit proof, designed for efficient operation up to 71°C without external cooling, carry a 5-year Warranty, and are significantly less expensive than narrow-range units.

THE UNIQUE UNI CONCEPT

The key to the versatility of PMC's UNI Series is an exceptional design concept pioneered by POWER/MATE CORP. It allows any UNI power supply to be set for a range of DC outputs. This adjustable feature simplifies the customer's inventory situation, and it makes possible POWER/MATE's Same-Day-Shipment policy for UNI power supplies.



SPECIFICATIONS

INPUT: 105-125V, 47-420 CPS.

OUTPUT VOLTAGE: 0-30 volts for all units except Uni-76 (0-34V); Uni-88 (0-34V); and UniTwin 164 (0-25V dual output).

OUTPUT VOLTAGE RANGE: Set in overlapping ranges by means of internal quick disconnect taps.

OUTPUT CURRENT: See chart on following page.

REGULATION: Uni-76 and Uni-88 better than ±0.005% +1MV for line and load. All other units better than ±0.01% +1MV for line and load.

RIPPLE: Less than 250 microvolts.

RESPONSE TIME: Less than 20 microseconds.

TEMPERATURE COEFFICIENT: Better than 0.01%/°C.

LONG TERM STABILITY: Better than 0.025% for 8 hours.

OVERLOAD & SHORT CIRCUIT PROTECTION: Solid state short circuit and overload protected. Instantaneous recovery, and automatic reset. Unit cannot be damaged by prolonged short circuits or overloads.

POLARITY: May be either positive, negative or floating up to 300 volts.

AMBIENT OPERATING TEMPERATURE: Continuous duty from −20°C to +71°C ambient.

STORAGE TEMPERATURE: −55°C to +85°C.

OUTPUT CURRENT vs. TEMPERATURE: Unit is rated for full current output at temperatures between −20°C and +45°C and is linearly derated from +45°C to 70% of the full output at +71°C.

REMOTE-LOCAL SENSING: Provision is included to permit remote sensing of the output voltage directly at the load for improved over-all regulation. Unit may be connected for local sensing if desired.

REMOTE-LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted, or internally adjusted with coarse and fine controls. Both are accessible through holes in the terminal end of the supply.

MECHANICAL DATA

UNI power supplies may be mounted on any of three surfaces. They will function when mounted in any position.
10-32 screws and studs are supplied for mounting each power supply.
3½-inch and 5¼-inch rack mounting assemblies are available, along with other accessories.

SAME-DAY-SHIPMENT

You can be sure that POWER/MATE CORP. will ship any of its UNI series power supplies to you the same day that your order arrives in our offices.

UL APPROVED

POWER/MATE's power supplies are listed as a recognized component in Underwriter Laboratory's recognized component index. (UL 478-1967).

5-YEAR WARRANTY

5 Year Warranty

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

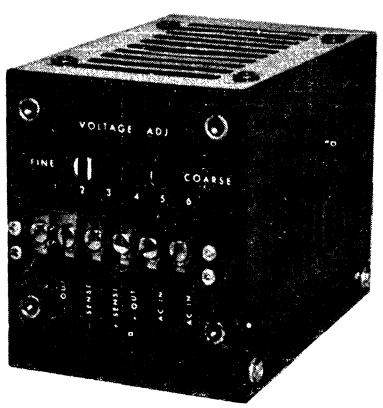
PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

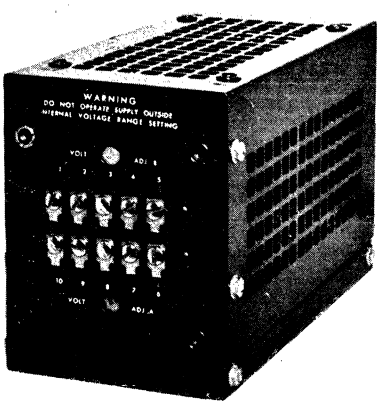
UNI UNIVERSAL POWER SUPPLIES

OUTPUT VOLTAGE vs. OUTPUT CURRENT FOR VARI-RATED UNI SERIES

Model	VOLTAGE 3	5	6	8	10	12	14	15	16	18	20	22	24	26	28	30	
UNI-76	0.5 amps throughout range																
UNI-88	1.5 amps throughout range																AMPERES
UNI-30C	4	4	4	4	4	3.75	3.6	3.5	3.4	3.25	3.0	2.9	2.75	2.5	2.5	2.1	
UNI-30D	6	6	6	5.6	5.2	5.0	4.7	4.5	4.3	4.2	4.1	3.7	3.5	3.4	3.3	3.1	
UNI-30E	12	12	11	10.5	9.5	9.3	8.5	8.0	7.7	7.5	7.0	6.5	6.0	5.7	5.5	5.2	
UNI-30F	15	15	15	14.2	12.8	12.0	11.5	10.0	10.0	9.9	9.4	8.9	8.7	8.5	8.0	7.6	
UNI-30G	24	22	21	20	18	17	16.5	16.0	15.5	15	14	13.5	13	12.5	12	11.5	
UNI-30H	34	32	31	29	25	23	22	21	20	19	17	16.5	16	15.5	15	14.3	

SAME DAY SHIPMENT





CASE A

UNI-76 0-34 volts, 0.5 amp over entire voltage range. Regulation: Better than ±0.005% +1 Mv for line and load.

3¾₆"W x 3⅞"H x 5⅛"D
Weight: Net 3¾ lbs.,
Shipping 4¾ lbs.

$79.00

CASE B

UNI-88 0-34 volts, 1.5 amps over entire range. Regulation: Better than ±0.005% +1 Mv for line and load.

3¾₆"W x 3⅞"H x 6⅞"D
WEIGHT: Net 5¼ lbs.,
Shipping 6¾ lbs.

$99.00

CASE BB

UniTwin-164 DUAL OUTPUT 0-25 volts, 0.75 amps over entire voltage range. Regulation: Better than ±0.005% +1 Mv for line and load.

3¾₆"W x 4¾₆"H x 6⅞"D
WEIGHT: Net 5¾ lbs.,
Shipping 7½ lbs.

$169.00

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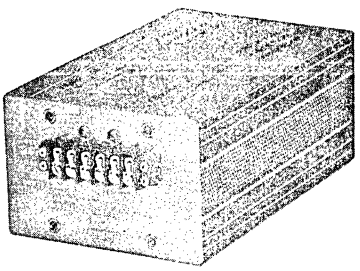
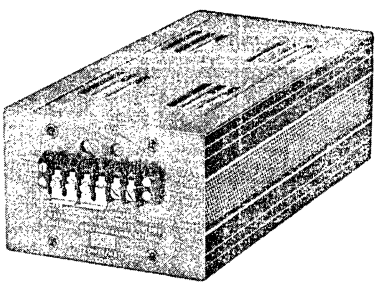
UNI UNIVERSAL POWER SUPPLIES

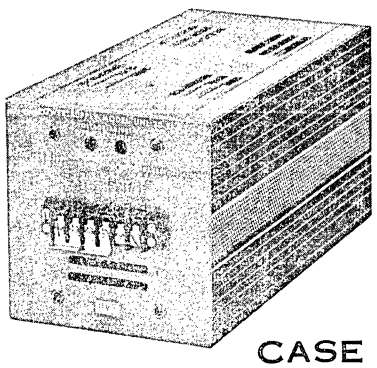
SAME DAY SHIPMENT



CASE C



CASE D



CASE E

UNI-30C 0-30 volts, up to 4 amps. Regulation: Better than ±0.01% +1 Mv for line and load.

5⅜"W x 3¼"H x 7⅝"D
WEIGHT: Net 9¼ lbs.,
Shipping 10¼ lbs.

$134.00

UNI-30D 0-30 volts, up to 6 amps (see chart). Regulation: ±0.01% +1 Mv for line and load.

5⅜"W x 3¼"H x 9⅜"D
WEIGHT: Net 11½ lbs.,
Shipping 14 lbs.

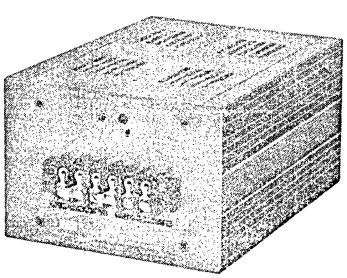
$151.00

UNI-30E 0-30 volts, up to 12 amps (see chart). Regulation: ±0.01% +1 Mv for line and load.

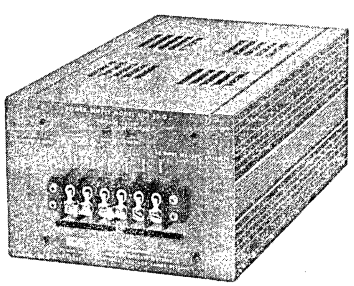
5⅜"W x 5⅜"H x 9⅜"D
WEIGHT: Net 15½ lbs.,
Shipping 19 lbs.

$174.00

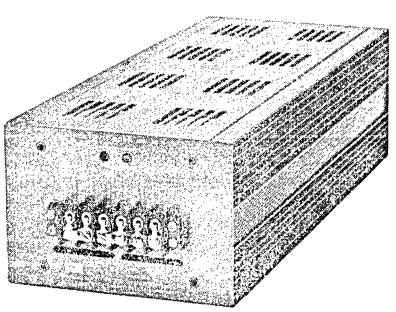
SAME DAY SHIPMENT



CASE F



CASE G



CASE H

UNI-30F 0-30 volts, up to 15 amps (see chart). Regulation: ±0.01% +1 Mv for line and load.

7½"W x 5⅜"H x 9⅜"D
WEIGHT: Net 20¼ lbs.,
Shipping 24¼ lbs.

$205.00

UNI-30G 0-30 volts, up to 24 amps (see chart). Regulation: ±0.01% +1 Mv for line and load.

7½"W x 5⅜"H x 11⅞"D
WEIGHT: Net 25¾ lbs.,
Shipping 30¼ lbs.

$265.00

UNI-30H 0-30 volts, up to 34 amps (see chart). Regulation: ±0.01% +1 Mv for line and load.

7½"W x 5⅜"H x 16½"D
WEIGHT: Net 34½ lbs.,
Shipping 39½ lbs.

$315.00

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

EM ECONOMATE POWER SUPPLIES

PRODUCT DIGEST

Power/Mate's Econo/Mate "EM Series" power supplies are low cost modular units which are superior to any comparable power supplies available today.

The Econo/Mate power supply modules were painstakingly designed through the use of Power/Mate's computer aided "PWR-CHK" design program to insure not only 100,000 hr MTBF but also continuous full life performance to rated specifications under worst case conditions.

The Econo/Mate modules are offered at surprisingly modest prices. Their extremely low cost is attainable only through the use of Power/Mates' modern computer automated production facilities which utilize the latest numercial controlled equipment. These savings are passed along to you without sacrificing Power/Mates' high quality and reliability.

Each power supply contains self-restoring current limiting and built-in short circuit protection to limit the maximum output current available on external loads. In addition overvoltage protection is available for even further protection for each Econo/Mate unit.

Every "EM Series" power supply is thoroughly tested and backed by Power/Mates' enviable record of technical excellence.

LINE REGULATION: ±0.25%.
LOAD REGULATION: ±0.25%.
TEMPERATURE COEFFICIENT: 0.02%/°C.
RIPPLE: 1Mv RMS Max (24V models, 3Mv RMS max).

SPECIFICATIONS

INPUT VOLTAGE: 105-125 VAC, 47-634z.

OUTPUT VOLTAGE: See respective charts.

OUTPUT CURRENT: See respective charts.

LINE REGULATION: ±0.25%.

LOAD REGULATION: ±0.25%.

TEMPERATURE COEFFICIENT: 0.02%/°C.

RIPPLE: 1Mv RMS Max (24V models, 3Mv RMS max).

STABILITY: ±0.1% for 8 hours after warmup.

RESPONSE TIME: Less than 50 microseconds.

OVERLOAD & SHORT CIRCUIT PROTECTION: Solid State short circuit and overload protection. Instantaneous recovery and automatic reset.

AMBIENT OPERATING TEMPERATURE: Continuous duty from 0°C to +71°C ambient.

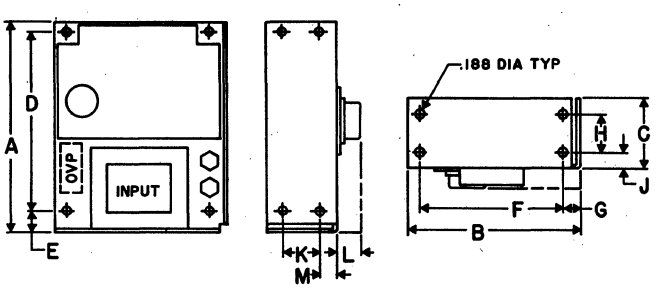
OUTPUT CURRENT vs. TEMPEROTURE: Unit is rated for full current output at temperature between 0°C and +40°C and is linearly derated from +40°C to 65% of the full output at +71°C.

COOLING: Convection cooled, no fans or external heat sinks required.

MOUNTING: Easily mounted on either of 3 surfaces.

MECHANICAL DATA

	Series B	Series C	Series D
A	4.87	5.62	9.00
B	4.00	4.87	4.87
C	1.62	2.50	2.75
D	4.13	4.88	8.00
E	.50	.50	.50
F	3.38	4.13	4.13
G	.38	.50	.50
H	NA	1.25	1.25
J	.75	.75	.75
K	NA	1.25	1.25
L	.45 MAX.	.45 MAX.	.45 MAX.
M	.75	.75	.75



Each EM unit is warranteed for 1 full year.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

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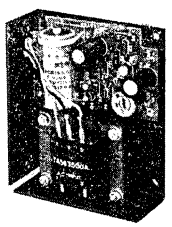
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

EM ECONOMATE POWER SUPPLIES

EM SERIES B

only

$39.95

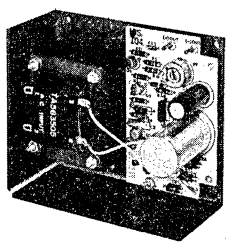


Model	DC Output	
	Voltage	Amperes
EM-5B	5	3.0
EM-6B	6	2.5
EM-12B	12	1.5
EM-15B	15	1.3
EM-24B	24	1.0

EM SERIES C

only

$59.95

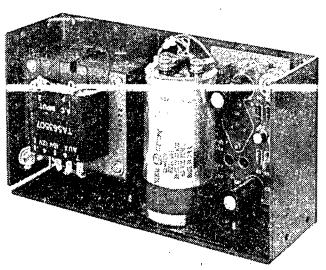


Model	DC Output	
	Voltage	Amperes
EM-5C	5	5.0
EM-6C	6	5.0
EM-12C	12	3.0
EM-15C	15	2.8
EM-24C	24	2.3

EM SERIES D

only

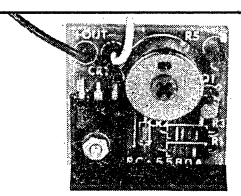
$99.95



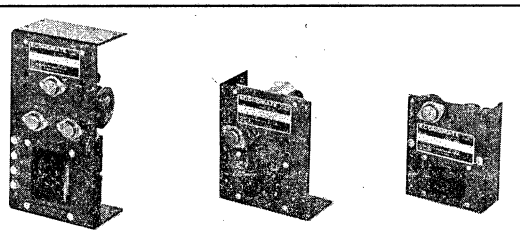
Model	DC Output	
	Voltage	Amperes
EM-5D	5	12.0
EM-6D	6	10.0
EM-12D	12	6.6
EM-15D	15	6.0
EM-24D	24	5.0

only

$12.95



An optional adjustable overvoltage protection module is available for use with any Econo/Mate model.
Order Model OVP-4.



SAME DAY SHIPMENT

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

ET DUAL OUTPUT POWER SUPPLIES

PRODUCT DIGEST

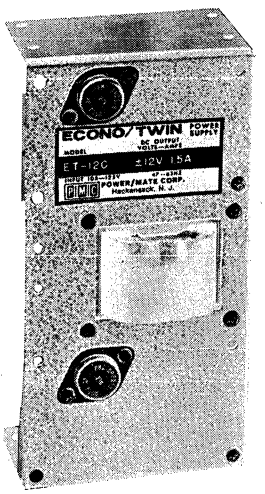
Power/Mate's New Dual Econo/Twin "ET Series" power supplies are low cost modular units which are superior to any comparable power supplies available today and are an extension of Power/Mate's field proven EM Series.

The Econo/Twin "ET Series" were painstakingly designed through the use of Power/Mate's computer aided "PWR-CHK" design program to insure not only 100,000 hr MTBF but also continuous full life performance to rated specifications under worst case conditions.

The Econo/Twin Dual Output power supplies are offered at surprisingly modest prices. Their extremely low cost is attainable through the use of Power/Mate's modern computer automated production facilities which utilize the latest numerical controlled equipment. These savings are passed along to you without sacrificing Power/Mate's high quality and reliability.

Each Econo/Twin "ET Series" Power Supply contains both self-restoring current limiting and built-in short circuit protection for each output to limit the maximum output current available on external loads. Also, overvoltage protection is available for even further protection for each Econo/Twin Power Supply.

In addition, each "ET Series" power supply is thoroughly tested and backed by Power/Mate's enviable record of technical excellence.



SPECIFICATIONS

INPUT VOLTAGE: 105-125 VAC, 47-634z.

OUTPUT VOLTAGE: See respective charts.

OUTPUT CURRENT: See respective charts.

LINE REGULATION: ±0.25%.

LOAD REGULATION: ±0.25%.

TEMPERATURE COEFFICIENT: 0.02%/°C.

RIPPLE: 1Mv RMS Max (24V models, 3Mv RMS max).

STABILITY: ±0.1% for 8 hours after warmup.

RESPONSE TIME: Less than 50 microseconds.

OVERLOAD & SHORT CIRCUIT PROTECTION: Solid State short circuit and overload protection. Instantaneous recovery and automatic reset.

AMBIENT OPERATING TEMPERATURE: Continuous duty from 0°C to +71°C ambient.

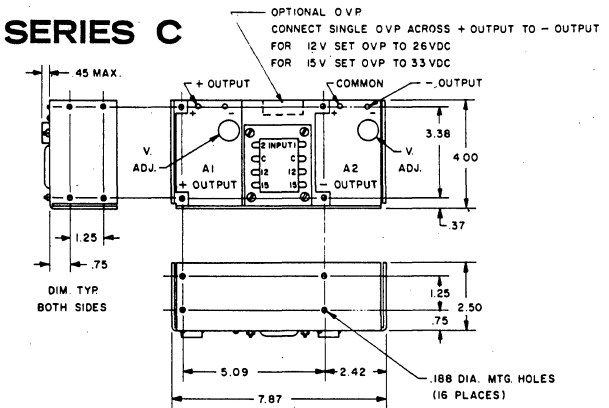
OUTPUT CURRENT vs. TEMPEROTURE: Unit is rated for full current output at temperature between 0°C and +40°C and is linearly derated from +40°C to 65% of the full output at +71°C.

COOLING: Convection cooled, no fans or external heat sinks required.

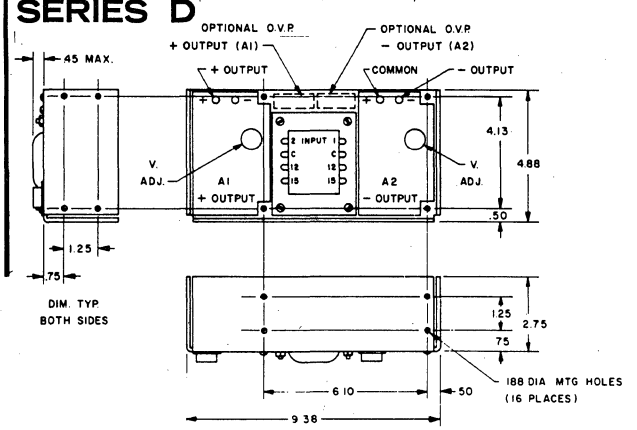
MOUNTING: Easily mounted on either of 3 surfaces.

MECHANICAL DATA

SERIES C



SERIES D



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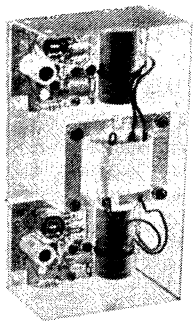
ET DUAL OUTPUT POWER SUPPLIES

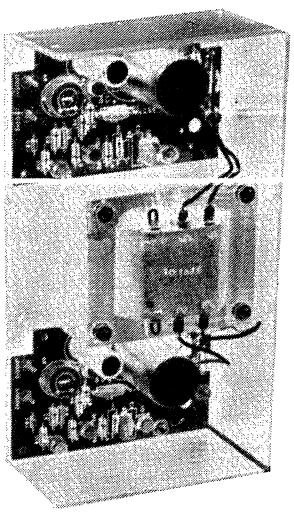
only
$59.95



ET SERIES "C"

Model	Power Outputs	
	Output "A"	Output "B"
ET-12C	+12V @ 1.5A	−12V @ 1.5A
ET-15C	+15V @ 1.3A	−15V @ 1.3A
ET-5C	5V @ 3.0A or 6V @ 2.5A	5V @ 3.0A or 6V @ 2.5A
ET-515C	5V @ 3.0A or 6V @ 2.5A	12V @ 1.5A or 15V @ 1.3A
ET-524C	5V @ 3.0A or 6V @ 2.5A	18V @ 1.0A or 24V @ 1.0A

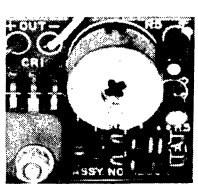
only
$99.95



ET SERIES "D"

Model	Power Outputs	
	Output "A"	Output "B"
ET-12D	+12V @ 3.0A	−12V @ 3.0A
ET-15D	+15V @ 2.8A	−15V @ 2.8A
ET-5D	5V @ 6.0A or 6V @ 5.0A	5V @ 6.0A or 6V @ 5.0A
ET-515D	5V @ 6.0A or 6V @ 5.0A	12V @ 3.0A or 15V @ 2.8A
ET-524D	5V @ 6.0A or 6V @ 5.0A	18V @ 2.0A or 24V @ 2.3A

only
$12.95



OVERVOLTAGE PROTECTION MODULES

Model	For Use with Series C	For Use with Series D	Price
OVP-4	1 required	2 required	12.95 ea.

SAME DAY SHIPMENT

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

THE POWER/MATE MANAGEMENT COMMITMENT TO QUALITY IS TOTAL

POWER/MATE MEANS PEOPLE

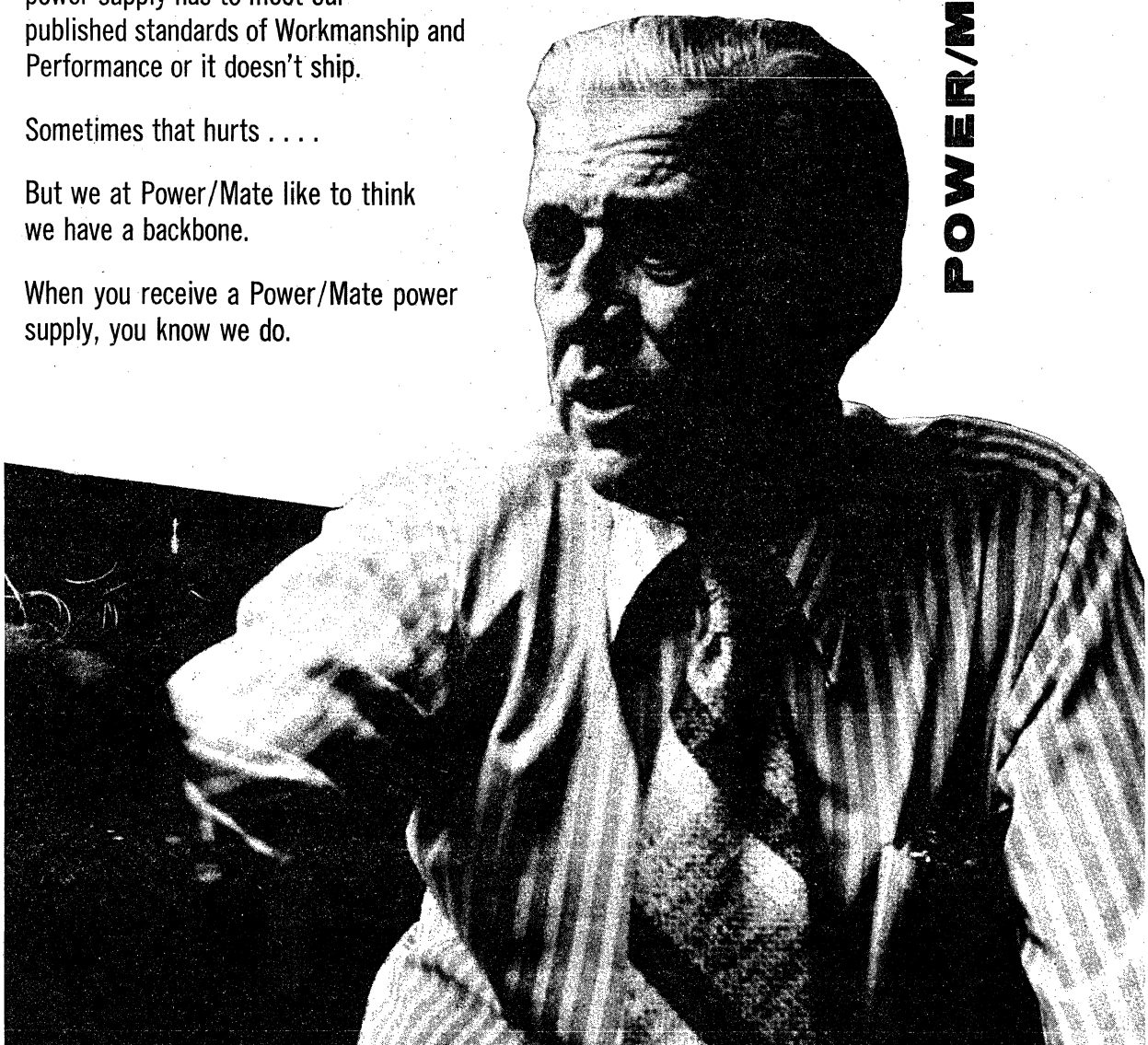
IT Also Takes Dedication, Guts, and Backbone . . . .

That's because there is no compromise or rationalization when it comes to to shipping out a quality product. Your power supply has to meet our published standards of Workmanship and Performance or it doesn't ship.

Sometimes that hurts . . . .

But we at Power/Mate like to think we have a backbone.

When you receive a Power/Mate power supply, you know we do.



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Phone: (201) 343-6294 TWX: (710) 990-5023

OEM POWER SUPPLIES

PRODUCT DIGEST

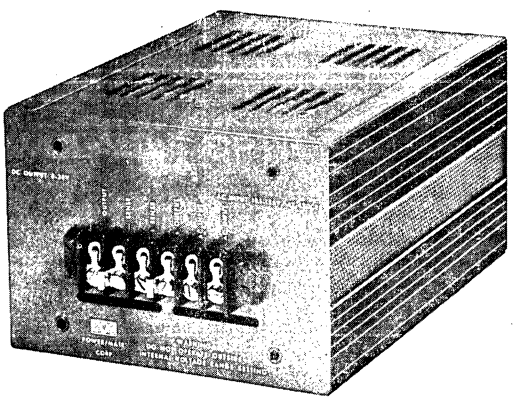
The POWER/MATE OEM Series of DC, regulated power supplies is available to manufacturers at liberal quantity discounts. This, combined with the fact that the OEM Series is based on the proven principles of the UNI Series, and is Underwriter Laboratory Approved, provides a quality, regulated voltage power supply that can save space, weight, and money.

One of the OEM Series space-saving features is a built-in over-voltage protection option that doesn't add a fraction to the basic module dimensions. Over-voltage protection is inside the module case, so there is no need for design changes in your product.

Complete freedom of mounting is another design advantage, by virtue of the fact that these power supplies are convection cooled. No heat sinking or forced air is required; however, substantial increases in ratings are possible with small amounts of forced air cooling.

The OEM power supplies can tolerate a wide input voltage and frequency range; therefore, they are suitable for field gear and worst-case conditions, reducing the need for special provisions.

Consider, too, that OEM units can be connected in series, parallel, or series/parallel for various outputs, and that the wide variety of POWER/MATE racks and metered or non-metered control panels and other accessories are compatible with the OEM Series. You can assemble virtually any supply system on the spot to meet your precise requirements.



SPECIFICATIONS

VOLTAGE INPUT: 105-125 VAC, 47-420 cps.

CURRENT OUTPUT: Up to 34 amps.

VOLTAGE OUTPUT: 3 to 48 volts.

REGULATION: ±0.01% line and load +1 mv.

RIPPLE: Less than 250 microvolts.

RESPONSE TIME: Less than 20 microseconds.

TEMPERATURE COEFFICIENT: Better than 0.01%/°C.

LONG TERM STABILITY: Better than 0.025% for 8 hours.

OVERLOAD & SHORT-CIRCUIT PROTECTION: Solid-state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short-circuits or overloads.

POLARITY: May be either positive, negative or floating up to 300 volts.

AMBIENT OPERATING TEMPERATURE: Continuous duty from −20°C to +71°C ambient.

STORAGE TEMPERATURE: −55°C to +85°C.

OUTPUT CURRENT vs TEMPERATURE: Rated for full current output at temperatures between −20°C and +45°C. Linearly derated from +45°C.

REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.

REMOTE OR LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted, or internally adjusted with coarse and fine controls. Fine control is accessible through hole in terminal end of supply.

MECHANICAL DATA

OEM power supplies may be mounted on any of their three surfaces.

They will function when mounted in any position.
10-32 screws and studs are supplied for mounting each power supply.

3½ and 5¼-inch rack mounting assemblies are available, along with other accessories.

UL APPROVED

POWER/MATE's power supplies are listed as a recognized component in Underwriter Laboratory's recognized component index. (UL 478-1967).

5-YEAR WARRANTY

5 Year Warranty

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

MIL/SPEC PERFORMANCE

Independently tested to meet the environment of MIL-E-5272 and related specs. See MIL SPEC Section of this catalog.

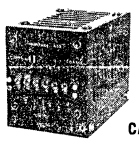
POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

OEM POWER SUPPLIES

OEM SERIES A

3 5/16"W x 3 7/8"H x 5 1/8"D
Net Weight: 3¾ lbs.
Shipping Weight: 4¾ lbs.
Price:
$79.00*


CASE A

Model	Adjustable Voltage Range, ±0.5 volts	Ambient Temperature 45°C	50°C	60°C	71°C
OEM-3-A	3.0 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-3.6-A	3.6 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-4-A	4.0 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-4.5-A	4.5 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-5-A	5.0 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-6-A	6.0 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-8-A	8.0 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-10-A	10.0 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-12-A	12.0 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-15-A	15.0 ± .5 volts	1.25 amps	1.17	1.03	.88
OEM-18-A	18.0 ± .5 volts	1.00 amps	.94	.82	.70
OEM-20-A	20.0 ± .5 volts	.90 amps	.84	.74	.63
OEM-24-A	24.0 ± .5 volts	.80 amps	.75	.66	.56
OEM-28-A	28.0 ± .5 volts	.70 amps	.66	.58	.49
OEM-36-A	36.0 ± .5 volts	.60 amps	.56	.49	.42
OEM-48-A	48.0 ± .5 volts	.30 amps	.28	.25	.21

OEM SERIES B

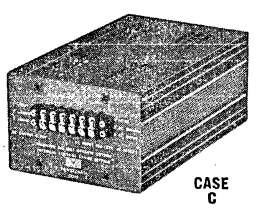
3 5/16"W x 3 7/8"H x 6 7/8"D
Net Weight: 5¼ lbs.
Shipping Weight: 6¾ lbs.
Price:
$102.00*

CASE B

Model	Adjustable Voltage Range, ±0.5 volts	Ambient Temperature 45°C	50°C	60°C	71°C
OEM-3-B	3.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-3.6-B	3.6 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-4-B	4.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-4.5-B	4.5 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-5-B	5.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-6-B	6.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-8-B	8.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-10-B	10.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-12-B	12.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-15-B	15.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-18-B	18.0 ± .5 volts	2.25 amps	2.1	1.8	1.6
OEM-20-B	20.0 ± .5 volts	2.00 amps	1.9	1.6	1.4
OEM-24-B	24.0 ± .5 volts	1.90 amps	1.8	1.5	1.3
OEM-28-B	28.0 ± .5 volts	1.80 amps	1.7	1.4	1.2
OEM-36-B	36.0 ± .5 volts	1.20 amps	1.1	1.0	0.8
OEM-48-B	48.0 ± .5 volts	0.60 amps	.56	0.5	.42

OEM SERIES C

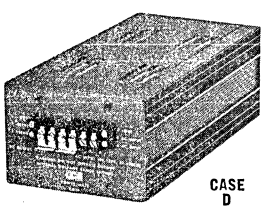
5 3/32"W x 3 5/16"H x 7 5/8"D
Net Weight: 8¼ lbs.
Shipping Weight: 10¼ lbs.
Price:
$137.00*


CASE C

Model	Adjustable Voltage Range, ±0.5 volts	Ambient Temperature 45°C	50°C	60°C	71°C
OEM-3-C	3.0 ± .5 volts	4.00 amps	3.7	3.3	2.8
OEM-3.6-C	3.6 ± .5 volts	4.00 amps	3.7	3.3	2.8
OEM-4-C	4.0 ± .5 volts	4.00 amps	3.7	3.3	2.8
OEM-4.5-C	4.5 ± .5 volts	4.00 amps	3.7	3.3	2.8
OEM-5-C	5.0 ± .5 volts	4.00 amps	3.7	3.3	2.8
OEM-6-C	6.0 ± .5 volts	4.00 amps	3.7	3.3	2.8
OEM-8-C	8.0 ± .5 volts	4.00 amps	3.7	3.3	2.8
OEM-10-C	10.0 ± .5 volts	4.00 amps	3.7	3.3	2.8
OEM-12-C	12.0 ± .5 volts	3.75 amps	3.5	3.1	2.6
OEM-15-C	15.0 ± .5 volts	3.50 amps	3.3	2.9	2.4
OEM-18-C	18.0 ± .5 volts	3.25 amps	3.0	2.6	2.2
OEM-20-C	20.0 ± .5 volts	3.00 amps	2.8	2.4	2.1
OEM-24-C	24.0 ± .5 volts	2.75 amps	2.6	2.2	1.9
OEM-28-C	28.0 ± .5 volts	2.50 amps	2.3	2.0	1.7
OEM-36-C	36.0 ± .5 volts	2.00 amps	1.9	1.6	1.4
OEM-48-C	48.0 ± .5 volts	1.25 amps	1.17	1.03	.88

OEM SERIES D

5 3/32"W x 3 5/16"H x 9 3/8"D
Net Weight: 11½ lbs.
Shipping Weight: 14 lbs.
Price:
$154.00*


CASE D

Model	Adjustable Voltage Range, ±0.5 volts	Ambient Temperature 45°C	50°C	60°C	71°C
OEM-3-D	3.0 ± .5 volts	6.00 amps	5.6	4.9	4.2
OEM-3.6-D	3.6 ± .5 volts	6.00 amps	5.6	4.9	4.2
OEM-4-D	4.0 ± .5 volts	6.00 amps	5.6	4.9	4.2
OEM-4.5-D	4.5 ± .5 volts	6.00 amps	5.6	4.9	4.2
OEM-5-D	5.0 ± .5 volts	6.00 amps	5.6	4.9	4.2
OEM-6-D	6.0 ± .5 volts	6.00 amps	5.6	4.9	4.2
OEM-8-D	8.0 ± .5 volts	5.60 amps	5.3	4.6	3.9
OEM-10-D	10.0 ± .5 volts	5.20 amps	4.9	4.3	3.6
OEM-12-D	12.0 ± .5 volts	5.00 amps	4.7	4.1	3.5
OEM-15-D	15.0 ± .5 volts	4.50 amps	4.2	3.7	3.1
OEM-18-D	18.0 ± .5 volts	4.20 amps	3.9	3.4	2.9
OEM-20-D	20.0 ± .5 volts	4.10 amps	3.8	3.3	2.8
OEM-24-D	24.0 ± .5 volts	3.50 amps	3.3	2.9	2.4
OEM-28-D	28.0 ± .5 volts	3.30 amps	3.1	2.7	2.3
OEM-36-D	36.0 ± .5 volts	3.00 amps	2.8	2.4	2.1
OEM-48-D	48.0 ± .5 volts	2.00 amps	1.9	1.6	1.4

Quantity Discounts up to 50%

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Phone: (201) 343-6294 TWX: (710) 990-5023

OEM POWER SUPPLIES

OEM SERIES E

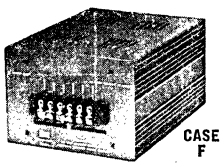
5 3/32"W x 5 3/32"H x 9 3/8"D
Net Weight: 15½ lbs.
Shipping Weight: 19 lbs.
Price:
$177.00*

CASE E

Model	Adjustable Voltage Range, ±0.5 volts	Ambient Temperature 45°C	50°C	60°C	71°C
OEM-3-E	3.0 ± .5 volts	12.00 amps	11.3	9.9	8.4
OEM-3.6-E	3.6 ± .5 volts	12.00 amps	11.3	9.9	8.4
OEM-4-E	4.0 ± .5 volts	12.00 amps	11.3	9.9	8.4
OEM-4.5-E	4.5 ± .5 volts	12.00 amps	11.3	9.9	8.4
OEM-5-E	5.0 ± .5 volts	12.00 amps	11.3	9.9	8.4
OEM-6-E	6.0 ± .5 volts	11.00 amps	10.3	9.1	7.7
OEM-8-E	8.0 ± .5 volts	10.50 amps	9.9	8.6	7.3
OEM-10-E	10.0 ± .5 volts	9.50 amps	8.9	7.8	6.6
OEM-12-E	12.0 ± .5 volts	9.30 amps	8.7	7.7	6.5
OEM-15-E	15.0 ± .5 volts	8.00 amps	7.5	6.6	5.6
OEM-18-E	18.0 ± .5 volts	7.50 amps	7.0	6.2	5.2
OEM-20-E	20.0 ± .5 volts	7.00 amps	6.6	5.8	4.9
OEM-24-E	24.0 ± .5 volts	6.00 amps	5.6	4.9	4.2
OEM-28-E	28.0 ± .5 volts	5.50 amps	5.2	4.5	3.8
OEM-36-E	36.0 ± .5 volts	5.00 amps	4.7	4.1	3.5
OEM-48-E	48.0 ± .5 volts	3.00 amps	2.8	2.5	2.1

OEM SERIES F

7½"W x 5 3/32"H x 9 3/8"D
Net Weight: 20¼ lbs.
Shipping Weight: 24¼ lbs.
Price:
$208.00*


CASE F

Model	Adjustable Voltage Range, ±0.5 volts	Ambient Temperature 45°C	50°C	60°C	71°C
OEM-3-F	3.0 ± .5 volts	15.00 amps	14.1	12.4	10.5
OEM-3.6-F	3.6 ± .5 volts	15.00 amps	14.1	12.4	10.5
OEM-4-F	4.0 ± .5 volts	15.00 amps	14.1	12.4	10.5
OEM-4.5-F	4.5 ± .5 volts	15.00 amps	14.1	12.4	10.5
OEM-5-F	5.0 ± .5 volts	15.00 amps	14.1	12.4	10.5
OEM-6-F	6.0 ± .5 volts	15.00 amps	14.1	12.4	10.5
OEM-8-F	8.0 ± .5 volts	14.20 amps	13.4	11.7	9.9
OEM-10-F	10.0 ± .5 volts	12.80 amps	12.0	10.6	8.9
OEM-12-F	12.0 ± .5 volts	12.00 amps	11.3	9.9	8.4
OEM-15-F	15.0 ± .5 volts	11.00 amps	10.3	9.1	7.7
OEM-18-F	18.0 ± .5 volts	9.90 amps	9.3	8.2	6.9
OEM-20-F	20.0 ± .5 volts	9.40 amps	8.8	7.7	6.5
OEM-24-F	24.0 ± .5 volts	8.70 amps	8.2	7.2	6.1
OEM-28-F	28.0 ± .5 volts	8.00 amps	7.4	6.6	5.6
OEM-36-F	36.0 ± .5 volts	7.40 amps	6.9	6.1	5.2
OEM-48-F	48.0 ± .5 volts	4.50 amps	4.2	3.7	3.15

OEM SERIES G

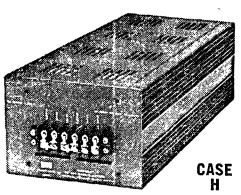
7½"W x 5 3/32"H x 11 7/8"D
Net Weight: 25¾ lbs.
Shipping Weight: 30¼ lbs.
Price:
$268.00*

CASE G

Model	Adjustable Voltage Range, ±0.5 volts	Ambient Temperature 45°C	50°C	60°C	71°C
OEM-3-G	3.0 ± .5 volts	24.00 amps	22.5	19.8	16.8
OEM-3.6-G	3.6 ± .5 volts	23.00 amps	21.6	19.0	16.1
OEM-4-G	4.0 ± .5 volts	23.00 amps	21.6	19.0	16.1
OEM-4.5-G	4.5 ± .5 volts	22.00 amps	20.7	18.2	15.4
OEM-5-G	5.0 ± .5 volts	22.00 amps	20.7	18.2	15.4
OEM-6-G	6.0 ± .5 volts	21.00 amps	19.8	17.4	14.7
OEM-8-G	8.0 ± .5 volts	20.00 amps	18.8	16.5	14.0
OEM-10-G	10.0 ± .5 volts	18.00 amps	16.9	14.8	12.6
OEM-12-G	12.0 ± .5 volts	17.00 amps	16.0	14.0	11.9
OEM-15-G	15.0 ± .5 volts	16.00 amps	15.1	13.2	11.2
OEM-18-G	18.0 ± .5 volts	15.00 amps	14.1	12.4	10.5
OEM-20-G	20.0 ± .5 volts	14.00 amps	13.2	11.5	9.8
OEM-24-G	24.0 ± .5 volts	13.00 amps	12.2	10.7	9.1
OEM-28-G	28.0 ± .5 volts	12.00 amps	11.3	9.9	8.4
OEM-36-G	36.0 ± .5 volts	10.00 amps	9.4	8.7	7.0
OEM-48-G	48.0 ± .5 volts	7.00 amps	6.6	5.8	4.9

OEM SERIES H

7½"W x 5 3/32"H x 16½"D
Net Weight: 34½ lbs.
Shipping Weight: 39½ lbs.
Price:
$318.00*


CASE H

Model	Adjustable Voltage Range, ±0.5 volts	Ambient Temperature 45°C	50°C	60°C	71°C
OEM-3-H	3.0 ± .5 volts	34.00 amps	32.0	28.1	23.8
OEM-3.6-H	3.6 ± .5 volts	33.00 amps	31.0	27.3	23.1
OEM-4-H	4.0 ± .5 volts	33.00 amps	31.0	27.0	23.1
OEM-4.5-H	4.5 ± .5 volts	32.00 amps	30.1	26.5	22.4
OEM-5-H	5.0 ± .5 volts	32.00 amps	30.1	26.5	22.4
OEM-6-H	6.0 ± .5 volts	31.00 amps	29.2	25.6	21.7
OEM-8-H	8.0 ± .5 volts	29.00 amps	27.3	24.0	20.3
OEM-10-H	10.0 ± .5 volts	25.00 amps	23.5	20.7	17.5
OEM-12-H	12.0 ± .5 volts	23.00 amps	21.6	19.0	16.1
OEM-15-H	15.0 ± .5 volts	21.00 amps	19.8	17.4	14.7
OEM-18-H	18.0 ± .5 volts	19.00 amps	17.9	15.7	13.3
OEM-20-H	20.0 ± .5 volts	17.00 amps	16.0	14.0	11.9
OEM-24-H	24.0 ± .5 volts	16.00 amps	15.1	13.2	11.2
OEM-28-H	28.0 ± .5 volts	15.00 amps	14.1	12.4	10.8
OEM-36-H	36.0 ± .5 volts	12.00 amps	11.3	9.9	8.4
OEM-48-H	48.0 ± .5 volts	8.50 amps	8.0	7.0	5.9

Quantity Discounts up to 50%

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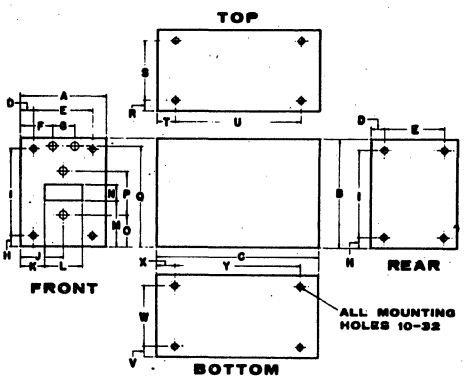
Phone: (201) 343-6294 TWX: (710) 990-5023

MECHANICAL DATA

CASE DIMENSIONS FOR UNI AND OEM SERIES



Model	CASE A	CASE B	CASE BB	CASE C	CASE D	CASE E	CASE F	CASE G	CASE H
A	3 5/16	3 5/16	3 5/16	5 3/32	5 3/32	5 3/32	7 1/2	7 1/2	7 1/2
B	3 7/8	3 7/8	4 3/16	3 5/16	3 5/16	5 3/32	5 3/32	5 3/32	5 3/32
C	5 1/8	6 7/8	6 7/8	7 5/8	9 3/8	9 3/8	9 3/8	11 7/8	16 1/2
D	3/8	3/8	3/8	1 17/64	1 17/64	1 17/64	1 17/64	1 17/64	1 17/64
E	2 9/16	2 9/16	2 9/16	2 9/16	2 9/16	2 9/16	4 31/32	4 31/32	4 31/32
F	1 1/8	1 1/8		2 11/64	2 11/64	2 11/64	3 3/8	3 3/8	3 3/8
G	1 1/16	1 1/16		3/4	3/4	3/4	3/4	3/4	3/4
H	13/16	13/16	13/16	3/8	3/8	43/64	43/64	43/64	43/64
I	2 9/16	2 9/16	2 9/16	2 9/16	2 9/16	3 3/4	3 3/4	3 3/4	3 3/4
J			1 21/32						
K	13/64	13/64	25/64	1 3/32	1 3/32	1 3/32	1 5/64	1 5/64	1 5/64
L	2 29/32	2 29/32	2 17/32	2 29/32	2 29/32	2 29/32	4 11/32	4 11/32	4 11/32
M	1 9/32	1 9/32	1 1/2	1 5/16	1 5/16	2 3/32	1 5/16	1 5/16	1 5/16
N	29/32	29/32	1 3/8	7/8	7/8	7/8	1 5/16	1 5/16	1 5/16
O			1 1/16						
P			2 1/16						
Q	2 5/8	2 5/8		2 11/16	2 11/16	4 5/16	4 5/16	4 5/16	4 5/16
R	3/8	3/8	3/8						
S	2 9/16	2 9/16	2 9/16						
T	15/16	1 1/16	1 1/16						
U	3 1/4	4 3/4	4 3/4						
V				1/4	1/4	1/4	1/4	1/4	1/4
W				4 19/32	4 19/32	4 19/32	7	7	7
X				1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16
Y				5 1/4	7	7	7	9 1/2	14 1/8

HOW TO ORDER POWER/MATE OEM POWER SUPPLIES

To specify voltage and current, including those not listed, place the required voltage after OEM-, and the current after the case size A, B, etc.
For example: OEM-34C-2.25 or OEM-5-HOV for over-voltage protection.

AVAILABLE OPTIONS

1. Built-in over-voltage protection at $30 per unit. Use suffix "OV."
2. Fungus proofing, with MIL-V-173 varnish, for all fungus nutrient components, at $10 per unit. Use suffix "FP."
3. AC input. All units are available with 208 VAC ±10% (use suffix "L") or 230 VAC ±10% (use suffix "LL") at no extra cost.

OTHER VOLTAGE/CURRENT COMBINATIONS AVAILABLE

It is always worthwhile to contact POWER/MATE, even if the exact power supply you need is not shown in this catalog. The supply you want has probably been designed and is in the PMC "design bank" waiting to be specified. Send us your specifications on the sheet provided in the back of this catalog.

4. Dual AC input. All units are available with 208 VAC and 230 VAC (use suffix "Y," at $25 per unit).
5. Dual primary. All units are available with 230 VAC and 115 VAC (use suffix "X," at $25 per unit).

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PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6291 TWX: (710) 990-5023

SUPER/UNI UNIVERSAL POWER SUPPLIES

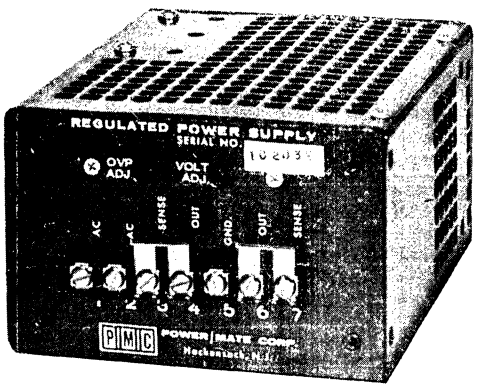
PRODUCT DIGEST

Power/Mate's new SUPER/UNI Series of variable rated modular power supplies represent a major advance in power supply technology. Through Power/Mate's unique design techniques, the SUPER/UNI Series offer all the inherent advantages of Power/Mate's field proven original UNI Series while simultaneously achieving significant power density and high efficiency advantages.

The new SUPER/UNI Series offers optimum rated DC outputs between 0-30 VDC with output currents up to 36 amps. In addition, the SUPER/UNI Series exhibit excellent performance characteristics, high efficiencies and 100,000 hr. MTBF.

All models are designed to meet MIL Spec environment requirements. Also, the SUPER/UNI Series are short-circuit proof, contain built-in over-voltage protection and are designed for efficient operation up to 71°C without the need for external cooling.

All models are UL recognized and carry a full 5-year Warrantee.



REGULATION: SUPER/UNI-76V and SUPER/UNI-88V better than ±0.005% + 1MV for line and load. All other units better than ±0.05% + 1MV for line and load.

RIPPLE: Less than 250 microvolts.

SPECIFICATIONS

INPUT: 105-125V, 47-420 CPS.

OUTPUT VOLTAGE: 0-30 volts for all units.

OUTPUT VOLTAGE RANGE: Set in overlapping ranges by means of internal quick disconnect taps.

OUTPUT CURRENT: See chart on following page.

REGULATION: SUPER/UNI-76V and SUPER/UNI-88V better than ±0.005% +1MV for line and load. All other units better than ±0.05% +1MV for line and load.

RIPPLE: Less than 250 microvolts.

RESPONSE TIME: Less than 50 microseconds.

TEMPERATURE COEFFICIENT: Better than 0.02%/°C.

LONG TERM STABILITY: Better than 0.025% for 8 hours.

OVERLOAD & SHORT CIRCUIT PROTECTION: Solid state short circuit and overload protected. Instantaneous recovery, and automatic reset. Unit cannot be damaged by prolonged short circuits or overloads.

POLARITY: May be either positive, negative or floating up to 300 volts.

AMBIENT OPERATING TEMPERATURE: Continuous duty from −20°C to +71°C ambient.

STORAGE TEMPERATURE: −55°C to +85°C.

OUTPUT CURRENT vs. TEMPERATURE: Unit is rated for full current output at temperatures between −20°C and +45°C and is linearly derated from +45°C to 70% of the full output at +71°C.

REMOTE-LOCAL SENSING: Provision is included to permit remote sensing of the output voltage directly at the load for improved over-all regulation. Unit may be connected for local sensing if desired.

REMOTE-LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted, or internally adjusted with course and fine controls. Both are accessible through holes in the terminal end of the supply.

MECHANICAL DATA

The SUPER/UNI power supplies may be mounted on any of three surfaces (except EE case which mounts only on bottom or side). Units will function when mounted in any position. 3½-inch and 5¼-inch rack mounting assemblies are available, along with other accessories.

SAME-DAY-SHIPMENT

You can be sure that POWER/MATE CORP. will ship any of its UNI series power supplies to you the same day that your order arrives in our offices.

UL APPROVED

POWER/MATE's power supplies are listed as a recognized component in Underwriter Laboratory's recognized component index. (UL 478-1967).

5-YEAR WARRANTY

5 Year Warranty

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

SUPER/UNI UNIVERSAL POWER SUPPLIES

OUTPUT VOLTAGE vs. OUTPUT CURRENT FOR VARI-RATED SUPER/UNI SERIES

Model	VOLTAGE 3	5	6	8	10	12	15	18	20	24	28	30	
Super/UNI-76V	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Super/UNI-88V	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Super/UNI-30AV	2.8	2.8	2.2	2.2	2.2	2.2	2.0	1.8	1.8	1.8	1.7	1.6	CURRENT
Super/UNI-30BV	4.5	4.5	3.2	3.5	3.7	3.8	3.6	2.5	2.7	2.8	2.2	2.2	
Super/UNI-30CV	6.6	6.6	3.9	4.4	5.5	5.5	5.0	3.2	3.6	3.9	3.7	3.4	
Super/UNI-30CCV	13.5	13.5	8.0	8.3	9	10	9	6	6.6	6.6	5.5	5.0	
Super/UNI-30DV	18	18	10	12	13.8	13.8	13	9	10	11	10	9.0	
Super/UNI-30EV	25	25	15	17	18	19	17.5	12	13.2	14.5	13.5	12.0	
Super/UNI-30EEV	36	36	21	23	24	25	24	17	18	18	16.5	15.0	

SUPER/UNI-76V

0-34 VOLTS, 0.5 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

3-5/16" x 3-7/8"H x 5-1/8"D
Weight: Net 3-3/4 lbs.
Shipping: 4-3/4 lbs.

$89.00

SUPER/UNI-88V

0-34 VOLTS, 1.5 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

3-5/16"W x 3-7/8"H x 6-7/8"D
Weight: Net 5-1/4 lbs.
Shipping: 6-3/4 lbs.

$109.00

SUPER/UNI-30AV

0-34 VOLTS, UP TO 2.8 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

3-3/16"H x 3-3/4"W x 6-1/2"L
Weight: Net 5-3/4 lbs.
Shipping: 7 lbs.

$119.00

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

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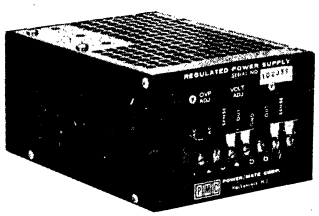
Phone: (201) 343-6294 TWX: (710) 990-5023

SUPER/UNI UNIVERSAL POWER SUPPLIES

"More Power per Penny"



SUPER/UNI-30BV

0-30 VOLTS, UP TO 4.5 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

3-3/16"H x 4-15/16"W x 6-1/2"L
Weight: Net 5-3/4 lbs.
Shipping: 7-1/2 lbs.

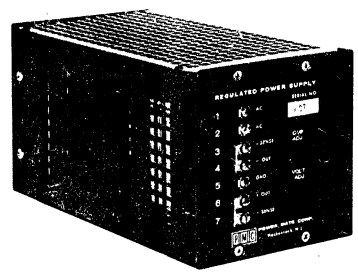
$139.00

SUPER/UNI-30CV

0-30 VOLTS, UP TO 6.6 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

3-3/16"H x 4-15/16"W x 9-3/8"L
Weight: Net 8-1/4 lbs.
Shipping: 10-1/4 lbs.

$159.00



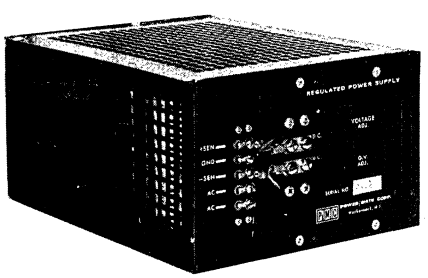
SUPER/UNI-30CCV

0-30 VOLTS, UP TO 13.5 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

4-15/16"H x 4-15/16"W x 9-3/8"L
Weight: Net 8-1/4 lbs.
Shipping 10-1/4 lbs.

$199.00

"More Power per Penny"



SUPER/UNI-30DV

0-30 VOLTS, UP TO 18 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

4-15/16"H x 7-1/2"W x 9-3/8"L
Weight: Net 11-1/2 lbs.
Shipping: 14 lbs.

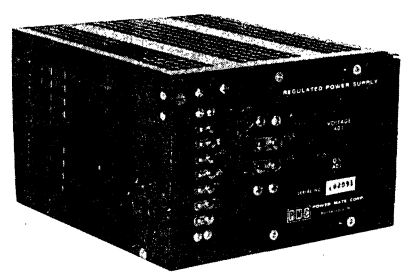
$239.00

SUPER/UNI-30EV

0-30 VOLTS, UP TO 25 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

4-15/16"H x 7-1/2"W x 11-3/4"L
Weight: Net 15-1/2 lbs.
Shipping: 19 lbs.

$289.00



SUPER/UNI-30EEV

0-30 VOLTS, UP TO 36 AMPS
Built-In Overvoltage Protection
Built-In Short Circuit Protection

4-15/16"H x 7-1/2"W x 16-1/2"L
Weight: Net 34-1/2 lbs.
Shipping: 39-1/2 lbs.

$349.00

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

qual•i•ty \'kwäl-ət-ē\ *n*, a degree of excellence, a distinguishing attribute, superiority in kind.

The word QUALITY

Is one of the more mis-applied and insincerely used words in industry today . . .

That's too bad, because it's a word, when properly used, that has a lot of importance to **you** and **your** product.

We at Power/Mate, take the word at face value. We don't rationalize about a product failure. Failures are inexcusable.

At Power/Mate . . . We take Action ! ! . . . .

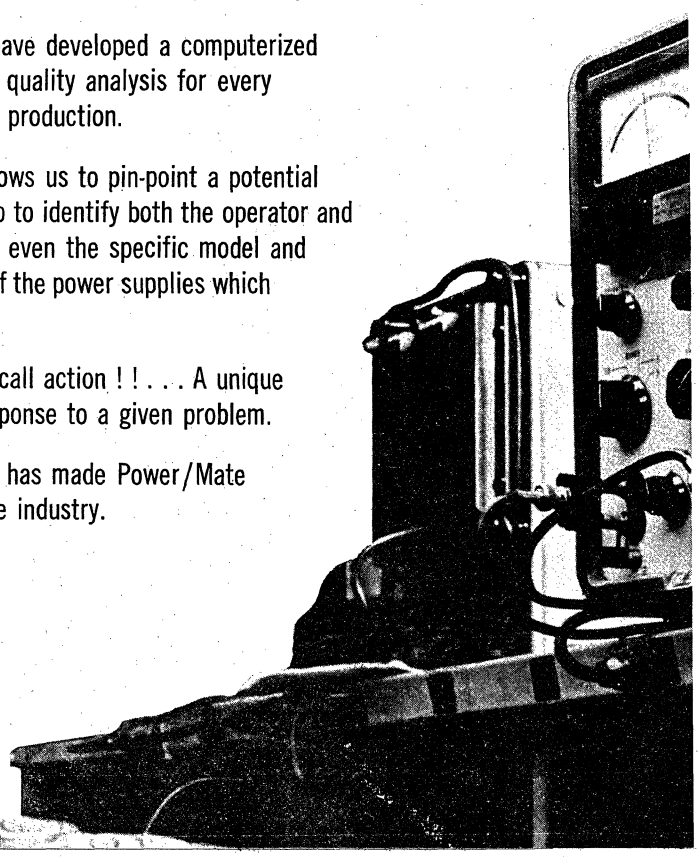
Thats why we thermally cycle and burn-in all power supplies a minimum of 24 hours before shipment to you.

That's why we have developed a computerized system for daily quality analysis for every power supply in production.

This analysis allows us to pin-point a potential problem and also to identify both the operator and the process and even the specific model and serial numbers of the power supplies which may be affected

That's what we call action ! ! . . . A unique and positive response to a given problem.

And that's what has made Power/Mate the leader in the industry.



POWER/MATE CORP.
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

PM MODULAR POWER SUPPLIES

PRODUCT DIGEST

PM Series of regulated power supplies are a 1 for 1 replacement for other manufacturers older model power supplies. Package for package power supplies are identical but the similiarity ceases there.

The Power/Mates' PM Series systems power supply design is modern and uses only the latest state-of-the-art integrated circuits and hybrids of the seventies.

The new PM Series are available to OEM users with liberal quantity discounts. Thus, the PM Series provides a high quality, power supply that saves space, weight and money. And offers a superior alternative to five year old, old fashioned power supply designs.

One of the PM Series space-saving features is a built-in over-voltage protection that doesn't add a fraction to the basic module dimensions. Over-voltage protection is inside the module case and is standard on most models.

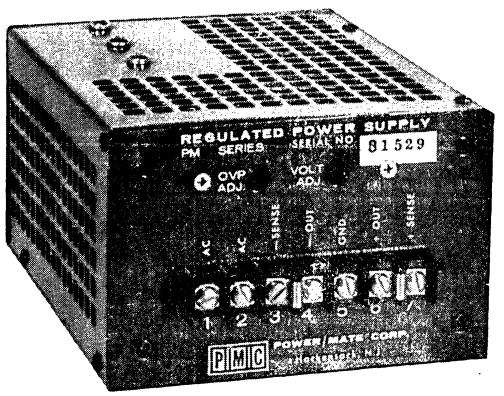
Self-restoring current limiting and built-in circuit protection limit the maximum output available on external loads. In addition a 'fail-safe' thermal device offers even further protection for each PM unit.

The PM Series are available with the same wide variety of options as the other Power/Mate systems power supplies. Typical available options are fungus proofing with MIL-173 varnish, wide input AC ranges and rack accessories.

As with all Power/Mate power supplies, the new PM Series is backed by Power/Mate's Five Year Warranty.

UL APPROVED

POWER/MATE's power supplies are listed as a recognized component in Underwriter Laboratory's recognized component index. (UL 478-1967).



REGULATION (ALL DC OUTPUTS): Line . . . ± 0.015% + 1mV for line variations from 105-132 VAC. Load . . . ± 0.015% 1mV for load variations from 0 to full load.

RIPPLE: Less than 1mV RMS.

SPECIFICATIONS

AC INPUT: 105-132 Vac, 47-440 Hz.

DC OUTPUT VOLTAGES AND CURRENTS: See respective tables.

REGULATION (ALL DC OUTPUTS): Line . . . ± 0.015% + 1mV for line variations from 105-132 VAC. Load . . . ± 0.015% + 1mV for load variations from 0 to full load.

RIPPLE: Less than 1mV RMS.

RESPONSE TIME: Less than 20 micro-seconds.

REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.

REMOTE OR LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted or internally adjusted.

POLARITY: May be either positive, negative or floating up to 300 volts.

TEMPERATURE COEFFICIENT: Better than 0.01%°C.

LONG TERM STABILITY: Better than 0.01%°C.

AMBIENT OPERATING TEMPERATURE: Continuous duty from — 20°C to + 71°C.

STORAGE TEMPERATURE: —55°C to +85°C.

OVERSHOOT: No voltage spikes for turn on-turn off or power failure.

OVERLOAD AND SHORT CIRCUIT PROTECTION: Solid state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short circuits or overloads.

MIL SPECS: Designed to meet the environmental requirements of MIL-E-5272 and RFI requirements of MIL-1-6181. Meantime between failures — in excess of 100,000 hours per MIL HDBK 217.

TRANSFORMERS: Meets MIL-T-27 specs.

INPUT AND OUTPUT CONNECTIONS: Heavy duty terminal blocks.

MECHANICAL DATA

The PX power supplies may be mounted on any of three surfaces (except EE case which mounts only on bottom or side). Units will function when mounted in any position, 3½-inch and 5¼-inch rack mounting assemblies are available, along with other accessories.

AVAILABLE OPTIONS

1. **Fungus proofing, with MIL-V-173 varnish, for all fungus nutrient components, at $10 per unit. Use suffix "F".**
2. **AC. input. All units are available with 208 VAC ±10% (use suffix "L") or 230 VAC ±10% (use suffix "LL") at no extra cost.**

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

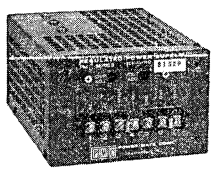
PM MODULAR POWER SUPPLIES

PM SERIES "B" PACKAGE

with Over-Voltage Protection built-in

$3\frac{3}{16}$" x $4\frac{15}{16}$" x 6½"

$115



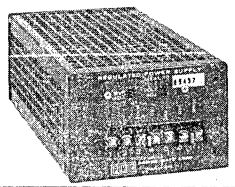
Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PM-B-3.6V	3.6 ± .5 volts	3.8	3.3	2.6	1.6
PM-B-5V	5 ± .5 volts	3.7	3.2	2.5	1.5
PM-B-6V	6 ± .5 volts	3.2	2.9	2.4	1.4
PM-B-10V	10 ± .5 volts	2.7	2.5	2.2	1.4
PM-B-12V	12 ± .5 volts	2.5	2.3	2.1	1.3
PM-B-15V	15 ± .5 volts	2.2	2.0	1.8	1.3
PM-B-18V	18 ± 5 volts	2.0	1.8	1.7	1.3
PM-B-20V	20 ± .5 volts	1.8	1.6	1.5	1.2
PM-B-24V	24 ± .5 volts	1.4	1.3	1.2	1.1
PM-B-28V	28 ± .5 volts	1.3	1.2	1.1	1.0
PM-B-36V	36 ± .5 volts	1.1	1.0	0.90	0.85
PM-B-48V	48 ± .5 volts	0.9	0.85	0.80	0.75
PM-B-100	100 ± .5 volts	0.37	0.34	0.30	0.28
PM-B-120	120 ± .5 volts	0.30	0.28	0.25	0.23
PM-B-150	150 ± .5 volts	0.25	0.23	0.20	0.19

PM SERIES "C" PACKAGE

with Over-Voltage Protection built-in

$3\frac{3}{16}$" x $4\frac{15}{16}$" x 9⅜"

$135



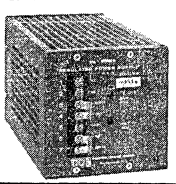
Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PM-C-3.6V	3.6 ± .5 volts	5.2	4.5	3.6	2.5
PM-C-5V	5 ± .5 volts	5.1	4.3	3.4	2.4
PM-C-6V	6 ± .5 volts	4.8	4.1	3.3	2.4
PM-C-10V	10 ± .5 volts	4.2	3.6	3.0	2.0
PM-C-12V	12 ± .5 volts	4.0	3.5	2.9	1.9
PM-C-15V	15 ± .5 volts	3.5	3.2	2.8	1.9
PM-C-18V	18 ± .5 volts	3.2	3.0	2.7	1.9
PM-C-20V	20 ± .5 volts	3.1	2.9	2.6	1.8
PM-C-24V	24 ± .5 volts	2.5	2.4	2.2	1.5
PM-C-28V	28 ± .5 volts	2.3	2.1	2.0	1.4
PM-C-36V	36 ± .5 volts	2.0	1.8	1.7	1.3
PM-C-48V	48 ± .5 volts	1.6	1.4	1.3	1.0
PM-C-100	100 ± .5 volts	0.55	0.51	0.47	0.42
PM-C-120	120 ± .5 volts	0.49	0.45	0.42	0.38
PM-C-150	150 ± .5 volts	0.39	0.36	0.33	0.30

PM SERIES "CC" PACKAGE

with Over-Voltage Protection built-in

$4\frac{15}{16}$" x $4\frac{15}{16}$" x 9⅜"

$175



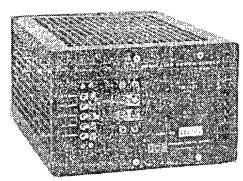
Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PM-CC-3.6V	3.6 ± .5 volts	11.0	9.4	8.2	5.5
PM-CC-5V	5 ± .5 volts	10.5	9.0	8.0	5.5
PM-CC-6V	6 ± .5 volts	9.0	8.4	7.7	5.5
PM-CC-10V	10 ± .5 volts	7.5	7.0	6.3	5.0
PM-CC-12V	12 ± .5 volts	7.3	6.8	5.9	4.7
PM-CC-15V	15 ± .5 volts	6.0	5.6	5.1	4.3
PM-CC-18V	18 ± .5 volts	5.5	5.1	4.7	4.1
PM-CC-20V	20 ± .5 volts	5.0	4.6	4.2	3.6
PM-CC-24V	24 ± .5 volts	4.0	3.7	3.4	3.0
PM-CC-28V	28 ± .5 volts	3.5	3.4	3.1	2.8
PM-CC-36V	36 ± .5 volts	3.0	2.9	2.7	2.4
PM-CC-48V	48 ± .5 volts	2.5	2.4	2.2	1.9
PM-CC-100	100 ± .5 volts	1.0	0.96	0.90	0.80
PM-CC-120	120 ± .5 volts	0.9	0.86	0.80	0.70
PM-CC-150	150 ± .5 volts	0.7	0.67	0.62	0.55

PM SERIES "D" PACKAGE

with Over-Voltage Protection built-in

$4\frac{15}{16}$" x 7½" x 9⅜"

$205



Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PM-D-3.6V	3.6 ± .5 volts	13.1	11.3	9.2	6.2
PM-D-5V	5 ± .5 volts	12.6	10.8	9.2	6.1
PM-D-6V	6 ± .5 volts	12.4	10.6	8.9	6.0
PM-D-10V	10 ± .5 volts	10.8	9.7	8.5	5.7
PM-D-12V	12 ± .5 volts	10.0	9.2	8.3	5.7
PM-D-15V	15 ± .5 volts	9.0	8.4	7.9	5.3
PM-D-18V	18 ± .5 volts	7.9	7.4	6.9	5.0
PM-D-20V	20 ± .5 volts	7.4	6.9	6.5	4.9
PM-D-24V	24 ± .5 volts	6.7	6.3	5.8	4.8
PM-D-28V	28 ± .5 volts	6.0	5.6	5.2	4.7
PM-D-36V	36 ± .5 volts	5.4	5.0	4.7	4.3
PM-D-48V	48 ± .5 volts	4.1	3.9	3.6	3.1
PM-D-100	100 ± .5 volts	1.7	1.5	1.3	1.1
PM-D-120	120 ± .5 volts	1.5	1.3	1.1	1.0
PM-D-150	150 ± .5 volts	1.1	1.0	0.90	0.80

Quantity Discounts up to 50%

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

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514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

PM MODULAR POWER SUPPLIES

PM SERIES "E" PACKAGE

with Over-Voltage Protection built-in

4 5/16" x 7½" x 11⅞"

$265

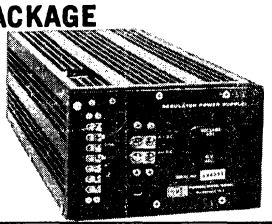
Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PM-E-3.6V	3.6 ± .5 volts	21.0	19.0	16.5	10.0
PM-E-5V	5 ± .5 volts	20.0	18.0	16.4	10.0
PM-E-6V	6 ± .5 volts	19.0	17.3	15.6	10.0
PM-E-10V	10 ± .5 volts	16.0	14.5	13.0	9.5
PM-E-12V	12 ± .5 volts	15.0	13.6	12.3	9.5
PM-E-15V	15 ± .5 volts	14.0	12.7	11.5	8.6
PM-E-18V	18 ± .5 volts	13.0	11.8	10.6	8.6
PM-E-20V	20 ± .5 volts	12.0	10.9	9.8	8.5
PM-E-24V	24 ± .5 volts	11.0	10.0	9.0	7.6
PM-E-28V	28 ± .5 volts	10.0	9.0	8.0	7.1
PM-E-36V	36 ± .5 volts	8.0	7.3	6.5	5.7
PM-E-48V	48 ± .5 volts	6.0	5.4	4.9	4.3
PM-E-100	100 ± .5 volts	2.0	1.7	1.6	1.5
PM-E-120	120 ± .5 volts	1.7	1.5	1.4	1.2
PM-E-150	150 ± .5 volts	1.4	1.3	1.2	1.0

PM SERIES "EE" PACKAGE

with Over-Voltage Protection built-in

4 13/16" x 7½" x 17"

$315



Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PM-EE-3.6V	3.6 ± .5 volts	32.0	26.0	22.0	18.3
PM-EE-5V	5 ± .5 volts	31.0	24.6	20.8	17.3
PM-EE-6V	6 ± .5 volts	30.0	24.6	20.8	17.3
PM-EE-10V	10 ± .5 volts	24.0	20.4	16.8	13.8
PM-EE-12V	12 ± .5 volts	21.0	19.0	16.1	13.2
PM-EE-15V	15 ± .5 volts	19.0	18.0	15.5	12.7
PM-EE-18V	18 ± .5 volts	16.5	14.8	12.4	10.1
PM-EE-20V	20 ± .5 volts	15.2	13.7	11.8	9.7
PM-EE-24V	24 ± .5 volts	14.0	12.5	10.8	9.0
PM-EE-28V	28 ± .5 volts	13.0	11.5	9.8	8.2
PM-EE-36V	36 ± .5 volts	10.4	9.8	8.6	7.1
PM-EE-48V	84 ± .5 volts	7.7	7.1	6.5	5.4
PM-EE-100	100 ± .5 volts	3.3	3.0	2.5	2.1
PM-EE-120	120 ± .5 volts	3.0	2.7	2.2	1.9
PM-EE-150	150 ± .5 volts	2.2	2.0	1.75	1.50

PM, PC, PX MODULAR POWER SUPPLY DIMENSIONS

PM—PX—PC SERIES DIMENSIONS

LETTER	"A"	"B"	"C"	"CC"	"D"	"P"	"EE"
A	3.72	4.91	4.91	9.38	9.38	9.38	16.50
B	3.17	3.17	3.17	4.91	4.91	4.91	4.91
C	6.50	6.50	9.38	4.94	7.50	7.50	7.50
D	2.84	4.03	4.03		3.25	3.25	
E	2.38	2.23	2.23	3.98	6.52	6.52	
F	5.06	5.06	6.89	6.89	6.89	6.89	12.38
G	2.84	3.75	3.75	4.06	6.56	6.56	6.56
H	.42	.56	.56	.44	.48	.48	.48
J	.36	.48	.48	.73	.73	.73	.36
K	1.42	2.02	2.02	2.11	4.20	4.20	4.20
L	5.31	5.31	6.89				
M		3.08	3.08				
N		2.08	2.08				
P		2.48	2.48				
FIG. #	1	1	1	2	2	2	2

NOTE 1

Mounting Screws, #8-32 THD

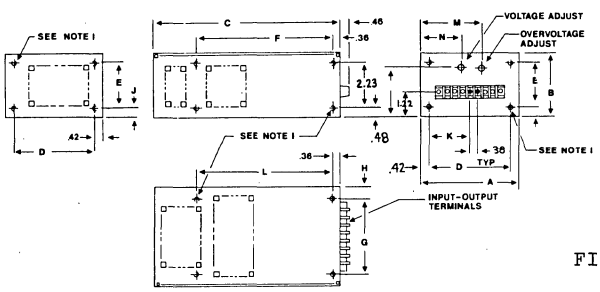


FIG: 1

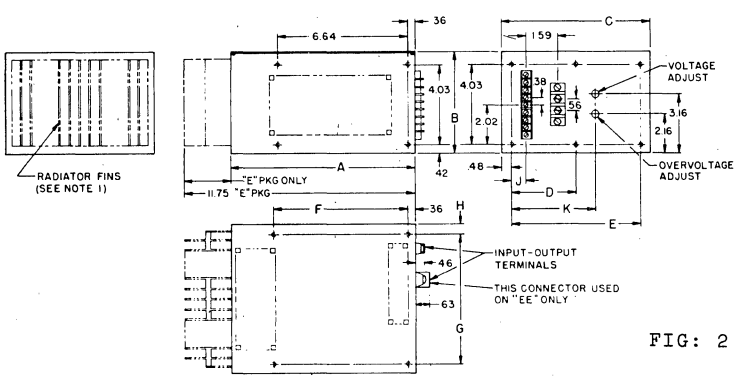


FIG: 2

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

PM FULL RACK POWER SUPPLIES

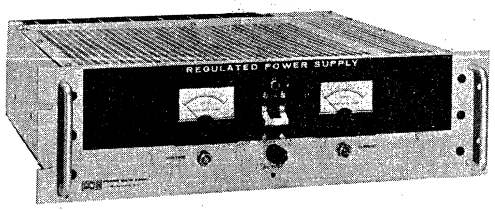
PRODUCT DIGEST

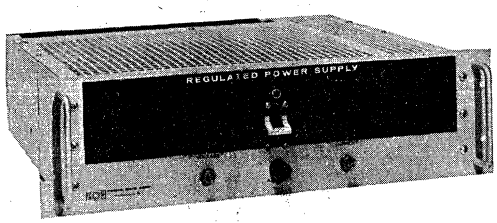
POWER/MATE'S expanded PM Series, an extension of our field proven PM Series Systems Power Supply Modules, now make available "Full Rack" power supplies with voltages up to 150 VDC and currents up to 150 amperes. The expanded PM Series are offered in three additional package sizes (F, G and H case), all of which set into standard 19" racks. The expanded series are ideally suited for use with digital (TTL, ECL, TRL, DTL and HTL) integrated circuits and the new MOS/LSI logic.

The PM Full Rack power supplies are offered in 42 fixed voltage range models and 4 wide range models in metered or nonmetered versions. Built-in over-voltage protection on all PM Series "H" package models is standard. Self-restoring current limiting and over-voltage protection provide complete protection. Advanced electronic circuitry limits the output current on external loads, including short circuit providing protection for the load as well as the power supply. Remote sensing, remote programming and complete serviceability are additional features.

The Full Rack PM Series offer the same wide variety of options as the systems PM power supplies. Typical available options are fungus proofing with MIL-V-173 varnish, metering, dual AC inputs, high performance option, OVP and dual primaries.

As with all Power/Mate power supplies, the Full Rack PM Series are backed by Power/Mate's Five Year Warranty.





REGULATED VOLTAGE:
Line—0.05% · 4mV for line variations from 105-132 VAC.
0.01% · 1.0mV for line variations from 105-132 VAC. (optional)*
Load—0.03% · 3mV for load variations from 0 to full load.
0.02% · 2mV for load variations from 0 to full load. (optional)*

RIPPLE: .5mV RMS with either positive or negative terminal grounded.

SPECIFICATIONS

AC INPUT: 105-132 VAC, 47-420 Hz.

OUTPUT VOLTAGE AND CURRENT: See respective tables.

REGULATED VOLTAGE:
Line—0.05% +4mV for line variations from 105-132 VAC.
0.01% +1.0mV for line variations from 105-132 VAC. (optional)*
Load—0.03% +3mV for load variations from 0 to full load.
0.02% +2mV for load variations from 0 to full load. (optional)*

RIPPLE: .5mV RMS with either positive or negative terminal grounded.

METERS: Voltmeter and ammeter, rated accurate to 2% of full scale value, are provided on the front panel. See options.

POLARITY: The output may be "floated" up to 300V peak above ground. Either polarity may be grounded to chassis by means of terminals provided.

FINISH: Front panel is finished with dual tone gray and black baked enamel with brushed aluminum handles. Panel marking is gray. All other finishes are appropriate paint, plating, or chemical film, as required.

TEMPERATURE COEFFICIENT: Better than 0.01%°C.

LONG TERM STABLITY: Better than 0.025% for 8 hours.

REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.

REMOTE OR LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted or internally adjusted with course and fine control.

OVERLOAD AND SHORT CIRCUIT PROTECTION: Solid state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short circuits or overloads.
Thermal—Thermostat; automatic rest when overtemperature condition is eliminated.

AMBIENT OPERATING TEMPERATURE: Continuous duty from −20°C to +71°C ambient.

STORAGE TEMPERATURE: −55°C to +85°C.

INPUT AND OUTPUT CONNECTIONS: Heavy duty terminal block on rear of chassis.

*See Options.

5 Year Warranty

5-YEAR WARRANTY

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

MIL/SPEC PERFORMANCE

Independently tested to meet the environment of MIL-E-5272 and related specs. See MIL SPEC Section of this catalog.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

PM FULL RACK POWER SUPPLIES

AVAILABLE OPTIONS

METERS: Prices of "F" and "G" packages are for non-metered models. For metered models add suffix "M" to model number and $30 to price.
Package "H" models are available only with overvoltage protection, high performance option, and meters, all of which are included in the price.

OVERVOLTAGE PROTECTION: Built-in overvoltage protection is standard on all package "H" models and available as an option on all package "F" and "G" models. To order OVP for "F" and "G" packages, add suffix "OV" to the model number and add $50 to price. Price of package "H" models includes overvoltage protection.

CHASSIS SLIDES: "F", "G" and "H" packages are available with mounted chassis slides. Add suffix "CS" to model number, and add $50 to the price of "F" and "G" models, $89 to the price of "H" models.

HIGH PERFORMANCE: Better regulation, ripple, and temperature coefficient for extra performance and safety margin in your system.

All package "F" and "G" units are available with the following high performance specifications at a $15 surcharge.

Load Regulation: .02% +2mV.
Line Regulation: .01% +1mV
Ripple and Noise: with 60 Hz input: 0.5mV RMS; 1.5mV p-To-p.
Temperature Coeff; .01%°C.

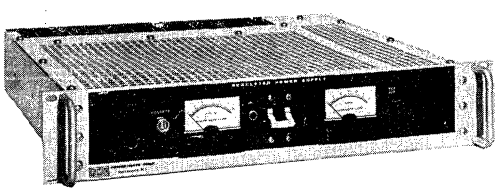
Add suffix "Y" to package "F" and "G" model numbers.
High performance option standard on "H" case units.

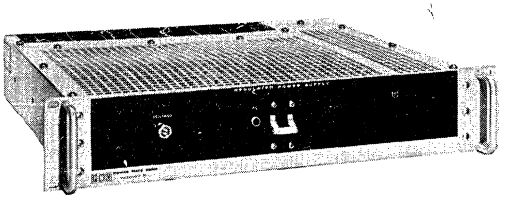
AC INPUT: All models are available with 205-265 VAC input voltage at no extra cost. Add suffix "LJ" to model number. (40°C rating not applicable).

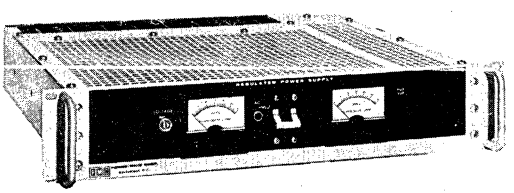
FUNGUS PROOFING: All models available with fungus proofing with MIL-V-173 varnish for all fungi Nutrient components. To order add suffix "FP" to model number and add $15 to the price of "F", "G" and "H" package models.

"F" PACKAGE

3-1/2" x 19" x 16-1/2"







FIXED VOLTAGE MODELS

Model	Output Volt.	Volt. Adj.	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PM-F-3	3	±5%	48.0	42.0	34.0	25.0	$439
PM-F-3-P-6	3.6	±5%	48.0	42.0	34.0	25.0	439
PM-F-4	4	±5%	48.0	42.0	34.0	25.0	439
PM-F-4-P-5	4.5	±5%	48.0	42.0	34.0	25.0	439
PM-F-5	5	±5%	48.0	41.0	33.0	25.0	439
PM-F-6	6	±5%	47.0	40.0	32.0	24.0	439
PM-F-8	8	±5%	44.0	37.0	30.0	23.0	439
PM-F-10	10	±5%	38.0	33.0	27.0	21.0	439
PM-F-12	12	±5%	33.0	28.0	22.0	17.0	439
PM-F-15	15	±5%	25.0	22.0	18.0	14.0	439
PM-F-18	18	±5%	25.0	22.0	18.0	14.0	439
PM-F-20	20	±5%	23.0	20.0	17.0	13.0	439
PM-F-24	24	±5%	20.0	17.0	14.0	11.0	439
PM-F-28	28	±5%	19.0	16.0	13.0	10.0	439
PM-F-36	36	±5%	13.0	11.0	10.0	7.5	489
PM-F-48	48	±5%	10.0	9.0	7.5	6.0	489
PM-F-60	60	±5%	8.0	7.0	6.0	5.0	489

WIDE RANGE MODELS

Model	Adj. Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PM-F-0-7	0-7	25.0	21.0	17.0	14.0	$445
PM-F-0-20	0-20	10.0	9.0	8.0	7.0	445

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
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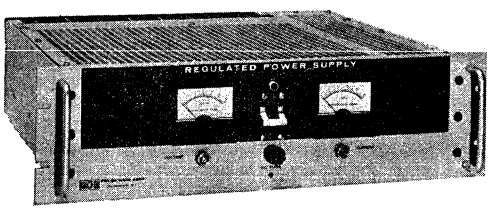
Phone: (201) 343-6294 TWX: (710) 990-5023

PM FULL BACK POWER SUPPLIES

"G" PACKAGE

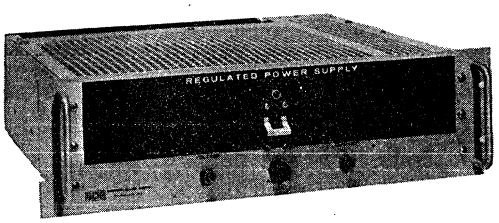
5-1/4" x 19" x 16-1/2"



SHOWN WITH METERS

FIXED VOLTAGE MODELS

Model	Output Volt.	Volt. Adj.	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PM-G-3	3	±5%	95.0	80.0	62.0	45.0	$565
PM-G-3-P-6	3.6	±5%	85.0	80.0	62.0	45.0	565
PM-G-4	4	±5%	85.0	80.0	62.0	45.0	565
PM-G-4-P-5	4.5	±5%	85.0	80.0	62.0	45.0	565
PM-G-5	5	±5%	80.0	75.0	62.0	45.0	565
PM-G-6	6	±5%	80.0	75.0	62.0	45.0	565
PM-G-8	8	±5%	68.0	62.0	53.0	41.0	565
PM-G-10	10	±5%	64.0	53.0	44.0	35.0	565
PM-G-12	12	±5%	56.0	46.0	37.0	29.0	565
PM-G-15	15	±5%	45.0	42.0	36.0	28.0	565
PM-G-18	18	±5%	38.0	34.0	28.0	21.0	565
PM-G-20	20	±5%	35.0	32.0	28.0	21.0	565
PM-G-24	24	±5%	32.0	26.0	21.0	16.0	565
PM-G-28	28	±5%	28.0	25.0	21.0	16.0	565
PM-G-36	36	±5%	22.0	20.0	16.0	13.0	570
PM-G-48	48	±5%	17.0	14.0	12.0	9.0	570
PM-G-60	60	±5%	13.0	11.0	9.0	7.0	570

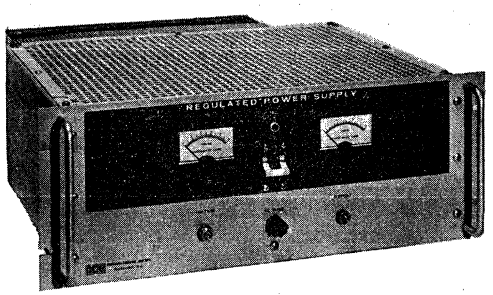


WIDE RANGE MODELS

Model	Adj. Volt. Range VDC	Max. Amps at Ambient of: 40°C	50°C	60°C	71°C	Price
PM-G-7	0-7	35.0	29.0	24.0	20.0	$565
PM-G-20	0-20	18.0	15.0	12.0	10.0	565

"H" PACKAGE

7" x 18" x 18-1/2"



FIXED VOLTAGE MODELS

Model	Output Volt.	Volt. Adj.	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PM-H-3-OV-Y-M	3	±5%	150	140	125	91	$950
PM-H-3-P-6-OV-Y-M	3.6	±5%	130	109	90	69	950
PM-H-4-OV-Y-M	4	±5%	135	118	100	74	950
PM-H-4-P-5-OV-Y-M	4.5	±5%	120	104	84	66	950
PM-H-5-OV-Y-M	5	±5%	130	110	90	70	950
PM-H-6-OV-Y-M	6	±5%	117	100	84	66	950
PM-H-10-OV-Y-M	10	±5%	95	83	69	56	950
PM-H-12-OV-Y-M	12	±5%	90	77	63	50	950

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

PX MODULAR POWER SUPPLIES

PRODUCT DIGEST

Power/Mates new PX Series power supplies consist of 90 different models in 6 convection cooled package sizes. The PX Series utilizes state-of-the-art Integrated Circuit regulators and high efficiency internal heat dissipating devices to achieve their compact size and high reliability.

The PX Series are ideally suited for IC Logic and Systems applications. The new models provide DC outputs to 3.6VDC to 150VDC with currents to 40 amps. Most models contain built-in overvoltage protection. All PX Series power supplies are short circuit and overload protected. In addition, all models contain built-in "fail-safe" thermal protection devices.

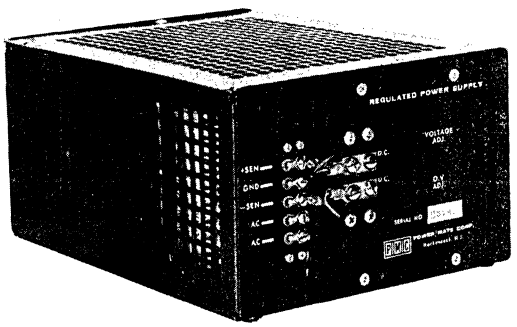
Power/Mates' unique PX Series power supplies offer the same wide variety of options as other Power/Mate systems power supplies. Typical available options are fungus proofing with MIL-173 varnish, wide input AC ranges, and standard Power/Mate racks and accessories.

The PX Series power supplies are also a direct form-fit-function replacement for LXS, RS and other manufacturers older model units.

As with all Power/Mate power supplies, the new PX Series is backed by Power Mate's Five Year Warranty.

UL APPROVED

POWER/MATE's power supplies are listed as a recognized component in Underwriter Laboratory's recognized component index. (UL 478-1967).



REGULATION (ALL DC OUTPUTS): Line 0.1% — Load 0.1%.

NOISE AND RIPPLE: 1.5mv RMS, 5mv PK-PK with pos. or neg. grounded.

SPECIFICATIONS

AC INPUT: 105-132 Vac, 47-440 Hz.

DC OUTPUT VOLTAGES AND CURRENTS: See respective tables.

REGULATION (ALL DC OUTPUTS): Line 0.1% — Load 0.1%.

NOISE AND RIPPLE: 1.5mv RMS, 5mv PK-PK with pos. or neg. grounded.

REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.

REMOTE OR LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted or internally adjusted.

POLARITY: May be either positive, negative or floating up to 300 volts.

DC OUTPUT CONTROL: Simple screwdriver voltage adjustment.

AMBIENT OPERATING TEMPERATURE: Continuous duty from 0°C to +71°C.

STORAGE TEMPERATURE: −55°C to +85°C.

OVERLOAD AND SHORT CIRCUIT PROTECTION: Solid state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short circuits or overloads.

OVERSHOOT: No voltage spikes for turn on-turn off or power failure.

TRANSFORMERS: Meets MIL-T-27 specs.

MIL SPECS: Designed to meet the environmental requirements of MIL-E-5272 and RFI requirements of MIL-I-6181. Meantime between failures — in excess of 100,000 hours per MIL HDBK 217.

INPUT AND OUTPUT CONNECTIONS: Heavy duty terminal blocks or rear of module.

MECHANICAL DATA

The **PX** power supplies may be mounted on any of three surfaces (except EE case which mounts only on bottom or side). Units will function when mounted in any position, 3½-inch and 5¼-inch rack mounting assemblies are available, along with other accessories.

AVAILABLE OPTIONS

1. **Fungus proofing, with MIL-V-173 varnish, for all fungus nutrient components, at $10 per unit. Use suffix "F".**
2. **AC input. All units are available with 208 VAC ±10% (use suffix "L") or 230 VAC ±10% (use suffix "LL") at no extra cost.**

5 Year Warranty

5-YEAR WARRANTY

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

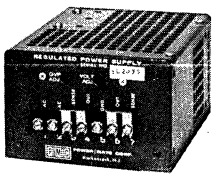
PX HIGH CURRENT POWER SUPPLIES

PX SERIES "B"

with built-in
Over-Voltage Protection

$3\frac{3}{16}$" x $4\frac{15}{16}$" x 6½"

$119



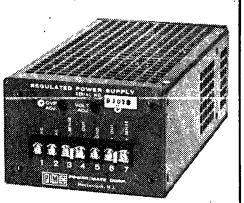
Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PXS-B-3.6V	3.6 ± .5 volts	6.1	5.3	4.0	3.4
PXS-B-5V	5 ± .5 volts	6.0	5.2	3.9	3.3
PXS-B-6V	6 ± .5 volts	5.5	4.7	3.8	3.0
PXS-B-10V	10 ± .5 volts	4.0	3.6	3.2	2.8
PXS-B-12V	12 ± .5 volts	3.8	3.6	3.0	2.5
PXS-B-15V	15 ± .5 volts	3.2	2.8	2.5	2.1
PXS-B-18V	18 ± .5 volts	2.6	2.3	2.0	1.8
PXS-B-20V	20 ± .5 volts	2.4	2.1	1.9	1.6
PXS-B-24V	24 ± .5 volts	2.0	1.8	1.6	1.4
PXS-B-28V	28 ± .5 volts	1.8	1.6	1.4	1.2
PXS-B-36V	36 ± .5 volts	1.3	1.1	1.0	.91
PXS-B-48V	48 ± .5 volts	1.1	1.0	.94	.87
PXS-B-100	100 ± .5 volts	.40	.35	.30	.28
PXS-B-120	120 ± .5 volts	35	.30	.25	.23
PXS-B-150	150 ± .5 volts	.30	.25	.20	.19

PX SERIES "C"

with built-in
Over-Voltage Protection

$3\frac{3}{16}$" x $4\frac{15}{16}$" x 9⅜"

$143



Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PXS-C-3.6	3.6 ± .5 volts	9.2	7.8	6.2	5.9
PXS-C-5V	5 ± .5 volts	9.0	7.6	6.0	5.8
PXS-C-6V	6 ± .5 volts	8.8	7.6	6.3	5.6
PXS-C-10V	10 ± .5 volts	6.5	6.1	5.4	4.8
PXS-C-12V	12 ± .5 volts	6.5	6.1	5.4	4.8
PXS-C-15V	15 ± .5 volts	5.0	4.5	4.0	3.5
PXS-C-18V	18 ± .5 volts	4.5	4.3	3.8	2.7
PXS-C-20V	20 ± .5 volts	4.2	3.9	3.5	2.5
PXS-C-24V	24 ± .5 volts	3.6	3.4	3.1	2.2
PXS-C-28V	28 ± .5 volts	3.0	2.7	2.6	1.8
PXS-C-36V	36 ± .5 volts	2.3	2.1	1.9	1.5
PXS-C-48V	48 ± .5 volts	1.8	1.6	1.5	1.1
PXS-C-100	100 ± .5 volts	.55	.51	.47	.42
PXS-C-120	120 ± .5 volts	.50	.45	.42	.38
PXS-C-150	150 ± .5 volts	.40	.36	.33	.30

PX SERIES "CC"

with built-in
Over-Voltage Protection

$4\frac{15}{16}$" x $4\frac{15}{16}$" x 9⅜"

$189

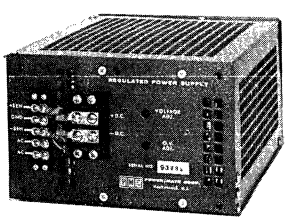
Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PXS-CC-3.6V	3.6 ± .5 volts	16.0	14.5	12.7	10.5
PXS-CC-5V	5 ± .5 volts	16.0	14.5	12.7	10.5
PXS-CC-6V	6 ± .5 volts	16.0	14.5	12.7	10.5
PXS-CC-10V	10 ± .5 volts	10.5	9.4	8.2	5.0
PXS-CC-12V	12 ± .5 volts	10.5	9.4	8.2	5.0
PXS-CC-15V	15 ± .5 volts	9.5	8.6	7.4	4.8
PXS-CC-18V	18 ± .5 volts	7.7	7.2	6.5	4.4
PXS-CC-20V	20 ± .5 volts	7.7	7.2	6.5	4.4
PXS-CC-24V	24 ± .5 volts	6.8	6.4	5.7	4.4
PXS-CC-28V	28 ± .5 volts	6.0	5.6	5.0	4.3
PXS-CC-36V	36 ± .5 volts	5.0	4.4	3.8	3.0
PXS-CC-48V	48 ± .5 volts	3.5	3.1	2.6	2.1
PXS-CC-100	100 ± .5 volts	1.8	1.6	1.4	1.1
PXS-CC-120	120 ± .5 volts	1.5	1.3	1.1	.9
PXS-CC-150	150 ± .5 volts	1.2	1.0	.9	.6

PX SERIES "D"

with built-in
Over-Voltage Protection

$4\frac{15}{16}$" x 7½" x 9⅜"

$229



Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PXS-D-3.6V	3.6 ± .5 volts	27.5	24.2	20.5	16.5
PXS-D-5V	5 ± .5 volts	27.5	24.2	20.5	16.5
PXS-D-6V	6 ± .5 volts	27.5	24.2	20.5	16.5
PXS-D-10V	10 ± .5 volts	16.0	14.0	11.9	8.0
PXS-D-12V	12 ± .5 volts	16.0	14.0	11.9	8.0
PXS-D-15V	15 ± .5 volts	14.0	12.3	10.4	7.5
PXS-D-18V	18 ± .5 volts	14.0	12.3	10.4	7.5
PXS-D-20V	20 ± .5 volts	11.5	10.0	8.6	6.8
PXS-D-24V	24 ± .5 volts	10.0	8.8	7.5	6.0
PXS-D-28V	28 ± .5 volts	9.0	8.0	6.8	5.5
PXS-D-36V	36 ± .5 volts	7.0	6.0	5.2	4.0
PXS-D-48V	48 ± .5 volts	5.0	4.3	3.8	3.0
PXS-C-100	100 ± .5 volts	2.5	2.2	1.9	1.5
PXS-D-120	120 ± .5 volts	2.0	1.8	1.5	1.2
PXS-D-150	159 ± .5 volts	1.5	1.3	1.1	.9

Quantity Discounts up to 50%

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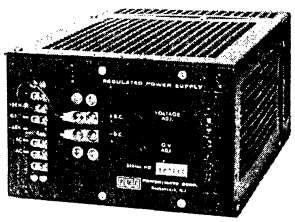
PX HIGH CURRENT POWER SUPPLIES

PX SERIES "E"

with built-in
Over-Voltage Protection

4 1/16" x 7½" x 11⅞"

$289



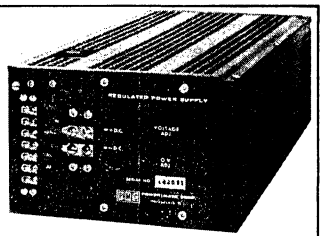
Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PXS-E-3.6V	3.6 ± .5 volts	32	28	24	19
PXS-E-5V	5 ± .5 volts	30	27.2	22.5	17.5
PXS-E-6V	6 ± .5 volts	30	27.2	22.5	17.5
PXS-E-10V	10 ± .5 volts	25	22	19	15
PXS-E-12V	12 ± .5 volts	20	17.5	15	12
PXS-E-15V	15 ± .5 volts	18	16	13.5	11
PXS-E-18V	18 ± .5 volts	17	15	12.8	10
PXS-E-20V	20 ± .5 volts	16	14	12.0	9
PXS-E-24V	24 ± .5 volts	15	13	11.3	8.2
PXS-E-28V	28 ± .5 volts	14	12.2	10.5	7.5
PXS-E-36V	36 ± .5 volts	10	8.8	7.5	6
PXS-E-48V	48 ± .5 volts	7.5	6.5	5.6	4.5
PXS-E-100	100 ± .5 volts	3.5	3.1	2.6	2.1
PXS-E-120	120 ± .5 volts	2.5	2.2	1.9	1.5
PXS-E-150	150 ± .5 volts	2.3	2.0	1.7	1.4

PX SERIES "EE"

with built-in
Over-Voltage Protection

4 1/16" x 7½" x 17"

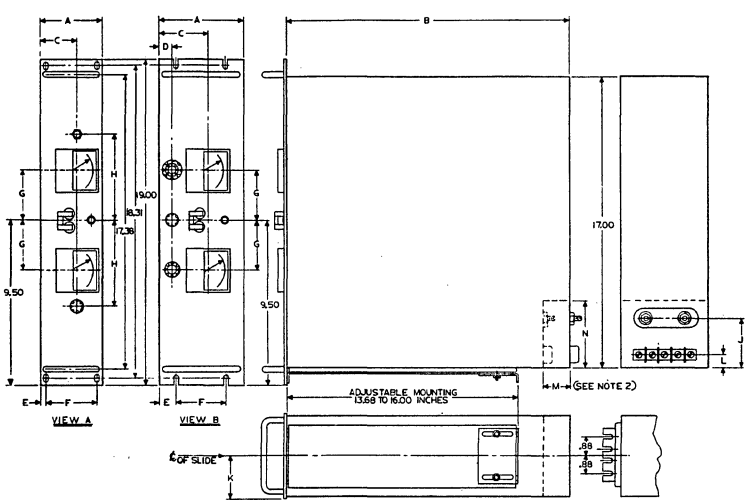
$339



Model	Adjustable Voltage Range	Max. Amps at Ambient Temp. of			
		40°C	50°C	60°C	71°C
PXS-EE-3.6V	3.6 ± .5 volts	40	35	30	24
PXS-EE-5V	5 ± .5 volts	40	35	30	24
PXS-EE-6V	6 ± .5 volts	40	35	30	24
PXS-EE-10V	10 ± .5 volts	35	30.5	27.2	21
PXS-EE-12V	12 ± .5 volts	30	26	22.5	18
PXS-EE-15V	15 ± .5 volts	25	22	19.0	15
PXS-EE-18V	18 ± .5 volts	23	20	17.3	13.5
PXS-EE-20V	20 ± .5 volts	22	19.0	16.5	13
PXS-EE-24V	24 ± .5 volts	20.0	17.5	15.0	12
PXS-EE-28V	28 ± .5 volts	18.0	16.0	13.5	10.5
PXS-EE-36V	36 ± .5 volts	15	13.0	11.3	9.0
PXS-EE-48V	48 ± .5 volts	10	8.8	7.5	5.5
PXS-EE-100	100 ± .5 volts	5.0	4.4	3.8	3.0
PXS-EE-120	120 ± .5 volts	4.0	3.5	3.0	2.4
PXS-EE-150	150 ± .5 volts	3.0	2.6	2.3	1.8

PM-PX FULL RACK POWER SUPPLIES

MODEL / DIM	VIEW A		VIEW B
	PM-F PX-F	PM-G PX-G	PM-H PX-H
A	3.47	5.22	6.97
*B	16.50	16.50	16.50
*C	2.00	3.12	4.68
*D	----	1.06	1.62
E	0.23	1.48	1.48
F	3.00	2.25	4.00
*G	2.94	2.94	2.94
*H	4.94	----	----
*J	2.50	4.06	4.06
K	1.75	3.50	3.50
*L	1.88	1.12	1.12
*M	0.88	----	----
*N	3.50	----	----



NOTE:

1. * Denotes approximate dimensions
2. Dotted area denotes recessed corner and terminals on model PM-F only.

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Phone: (201) 343-6294 TWX: (710) 990-5023

PX FULL RACK POWER SUPPLIES

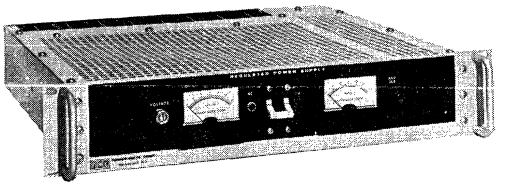
PRODUCT DIGEST

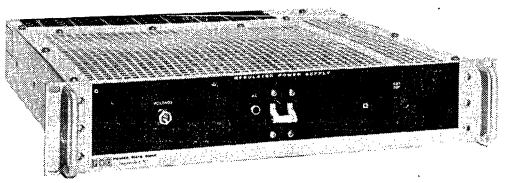
Power/Mate's "PX Series" full rack power supplies are offered in over 40 fixed voltage models and 4 wide range models are ideally suited for use with any digital IC system or with MOS/LSI logic. All models are designed to set into standard 19" racks.

Built-in over-voltage protection is standard on all full rack PX Series "H" package models. Self-restoring current limiting and over-voltage protection provide complete protection. Advanced electronic circuitry limits the output current on external loads, including short circuit protection for the load as well as the power supply. Remote sensing, remote programming and complete serviceability are additional features.

The Full Rack PX Series offer the same wide variety of options as the systems OEM power supplies. Typical available options are fungus proofing with MIL-V-173 varnish, metering, dual AC inputs, high performance option, OVP and dual primaries.

As with all Power/Mate power supplies, the Full Rack PX Series are backed by Power/Mate's Five Year Warranty.





REGULATED VOLTAGE:
Line— 0.015 % + 1mV for line variations from 105-132 VAC.
Load— 0.015 % + 1mV for load variations from 0 to full load.

RIPPLE: Less than .5mV RMS with either positive or negative terminal grounded.

SPECIFICATIONS

AC INPUT: 105-132 VAC, 47-420 HZ.

OUTPUT VOLTAGE AND CURRENT: See respective tables.

REGULATED VOLTAGE:
Line—0.1% +1MV for line variations from 105-132 VAC.
Load—0.1% +1MV for load variations from 0 to full load.

RIPPLE: .5mV RMS with either positive or negative terminal grounded.

METERS: Voltmeter and ammeter, rated accurate to 2% of full scale value, are provided on the front panel. See options.

POLARITY: The output may be "floated" up to 300V peak above ground. Either polarity may be grounded to chassis by means of terminals provided.

FINISH: Front panel is finished with dual tone gray and black baked enamel with brushed aluminum handles. Panel marking is gray. All other finishes are appropriate paint, plating, or chemical film, as required.

TEMPERATURE COEFFICIENT: Better than 0.01%°C.

LONG TERM STABILITY: Better than 0.025% for 8 hours.

REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.

REMOTE OR LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted or internally adjusted with coarse and fine control.

OVERLOAD AND SHORT CIRCUIT PROTECTION: Solid state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short circuits or overloads.
Thermal—Thermostat; automatic reset when overtemperature condition is eliminated.

AMBIENT OPERATING TEMPERATURE: Continuous duty from —20°C to +71°C ambient.

STORAGE TEMPERATURE: —55°C to +85°C.

INPUT AND OUTPUT CONNECTIONS: Heavy duty terminal block on rear of chassis.

MECHANICAL DATA

see Vol.1•815

5 Year Warranty

5-YEAR WARRANTY

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

MIL/SPEC PERFORMANCE

Independently tested to meet the environment of MIL-E-5272 and related specs. See MIL SPEC Section of this catalog.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PIMC **POWER/MATE CORP.**
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Phone: (201) 343-6294 TWX: (710) 990-5023

PX FULL RACK POWER SUPPLIES

AVAILABLE OPTIONS

METERS: Prices of "F" and "G" packages are for non-metered models. For metered models add suffix "M" to model number and $30 to price.

Package "H" models are available only with overvoltage protection, high performance option, and meters, all of which are included in the price.

OVERVOLTAGE PROTECTION: Built-in overvoltage protection is standard on all package "H" models and available as an option on all package "F" and "G" models. To order OVP for "F" and "G" packages, add suffix "OV" to the model number and add $50 to price. Price of package "N" models includes overvoltage protection.

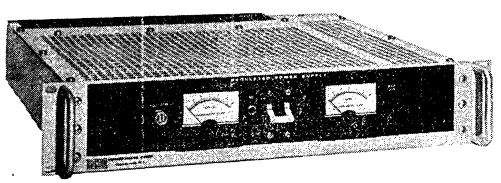
CHASSIS SLIDES: "F", "G" and "H" packages are available with mounted chassis slides. Add suffix "CS" to model number, and add $50 to the price of "F" and "G" models, $89 to the price of "H" models.

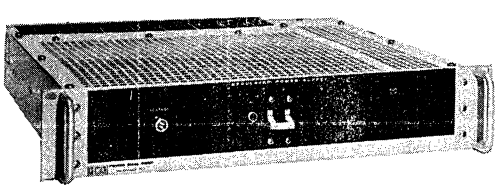
AC INPUT: All models are available with 205-265 VAC input voltage at no extra cost. Add suffix "LJ" to model number. (40°C rating not applicable).

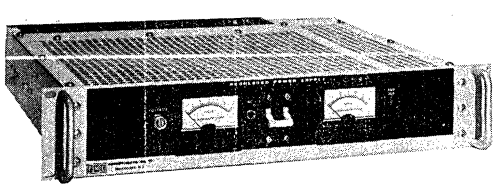
FUNGUS PROOFING: All models available with fungus proofing with MIL-173 varnish for all fungi Nutrient components. To order add suffix "FP" to model number and add $15 to the price of "F", "G" and "H" package models.

"F" PACKAGE

3-1/2" x 19" x 16-1/2"







FIXED VOLTAGE MODELS

Model	Adj. Volt. Range	VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PX-F-3	3	±5%	52	44	35	26	$479
PX-F-3-P-6	3.6	±5%	52	44	35	26	479
PX-F-4	4	±5%	52	44	35	26	479
PX-F-4-P-5	4.5	±5%	52	44	35	26	479
PX-F-5	5	±5%	52	44	35	26	479
PX-F-6	6	±5%	51	42	34	25	479
PX-F-8	8	±5%	47	39	32	24	479
PX-F-10	10	±5%	41	35	28	22	479
PX-F-12	12	±5%	35	29	24	18	479
PX-F-15	15	±5%	27	23	19	15	479
PX-F-18	18	±5%	27	22	18	15	479
PX-F-20	20	±5%	25	21	18	14	479
PX-F-24	24	±5%	22	18	15	12	479
PX-F-28	28	±5%	21	17	14	11	479
PX-F-36	36	±5%	14	11.5	10.5	8	529
PX-F-48	48	±5%	11	9.5	8	6.5	529
PX-F-60	60	±5%	9	8	6.5	5.5	529

WIDE RANGE MODELS

Model	Adj. Volt. Range VDC	Max. Amps at Ambient of: 40°	50°C	60°C	71°C	Price
PX-F-0-7	0-7	27	23	19	15	$499
PX-F-0-20	0-20	11	9.5	9	7.5	499

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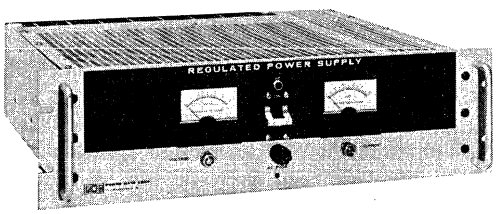
Phone: (201) 343-6294 TWX: (710) 990-5023

PX FULL RACK POWER SUPPLIES

"G" PACKAGE

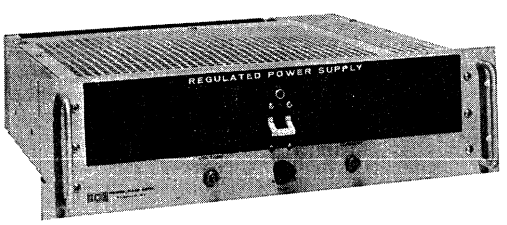
5-1/4" x 19" x 16-1/2"



SHOWN WITH METERS

FIXED VOLTAGE MODELS

Model	Adj. Volt. Range	VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PX-G-3	3	±5%	100	83	66	46	$599
PX-G-3-P-6	3.6	±5%	91	83	66	46	599
PX-G-4	4	±5%	91	83	66	46	599
PX-G-4-P-5	4.5	±5%	91	83	66	46	599
PX-G-5	5	±5%	86	78	66	46	599
PX-G-6	6	±5%	86	78	66	46	599
PX-G-8	8	±5%	73	68	58	43	599
PX-G-10	10	±5%	69	58	48	37	599
PX-G-12	12	±5%	58	48	40	32	599
PX-G-15	15	±5%	48	44	36	28	599
PX-G-18	18	±5%	41	36	30	21	599
PX-G-20	20	±5%	37	33	28	21	599
PX-G-24	24	±5%	34	30	24	18	599
PX-G-28	28	±5%	30	26	21	17	599
PX-G-36	36	±5%	23	21	17	13	619
PX-G-48	48	±5%	18	15	12	9	619
PX-G-60	60	±5%	14	12	10	7	619

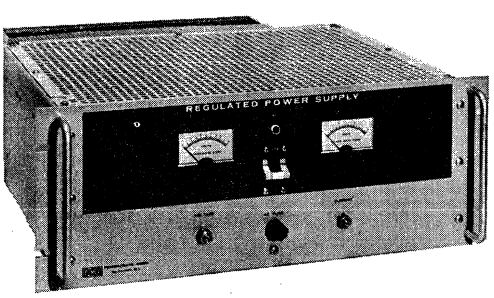


WIDE RANGE MODELS

Model	Adj. Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PX-G-0-7	0-7	38	32	26	21	$599
PX-G-0-20	0-20	20	16	13	11	599

"H" PACKAGE

7" x 18" x 18-1/2"



FIXED VOLTAGE MODELS

Model	Adj. Volt. Range	VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PX-H-3-OV-Y-M	3	±5%	180	165	145	100	$950
PX-H-3-P-6-OV-Y-M	3.6	±5%	150	130	100	80	950
PX-H-4-OV-Y-M	4	±5%	150	130	100	80	950
PX-H-4-P-5-OV-Y-M	4.5	±5%	140	115	95	70	950
PX-H-5-OV-Y-M	5	±5%	130	110	90	70	950
PX-H-6-OV-Y-M	6	±5%	127	100	90	67	950
PX-H-10-OV-Y-M	10	±5%	100	85	75	60	950
PX-H-12-OV-Y-M	12	±5%	97	80	70	55	950

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PC MODULAR POWER SUPPLIES

PRODUCT DIGEST

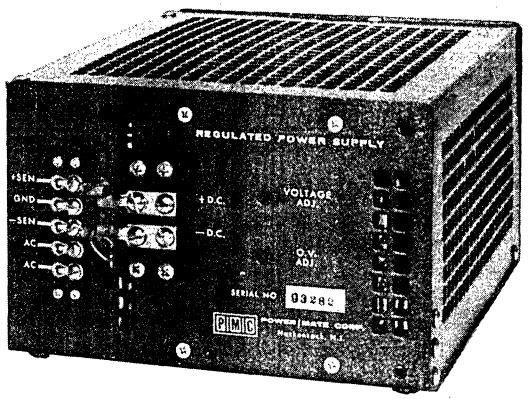
Power/Mate's high performance "PC" Series modular power supplies are the result of over 2 years of development and research. Power/Mate engineers followed critical design criteria in developing these new high reliability power supply modules. First, the electrical parameters were carefully designed to insure all components operate well within their own individual "worst case" condition. Second, each module was painstakingly designed for 'thermal considerations' to insure that the maximum temperature limits of each component is never exceeded. Even the individual packages were specially constructed for maximum heat transfer and dissipation.

The PC Series are completely short circuit and overvoltage protected. Any output may be shorted indefinitely without damaging the power supply. Unique Power/Mate circuitry reduces both the output current and output voltage if the full load rating of the supply is exceeded. In addition, each PC Series power supply has a "fail-safe" built-in thermostat to insure the power supply is protected in the event a malfunction should occur in any of the other protection circuitry. The PC Series power supplies will automatically restore itself to normal operations after the short or overload is removed.

The new PC Series are designed to meet the most critical performance specification including MIL-STD-810B, -454, -461, -462, -463, MIL-E-5272C, MIL-E-16400F, MIL-E-4158D, MIL-E-54001C and others.

The PC Series are available with the same wide variety of options as the other Power/Mate systems power supplies. Typical available options are fungus proofing with MIL-173 varnish, wide input AC ranges and rack accessories.

As with all Power/Mate power supplies, the new PC Series is backed by Power/Mate's Five Year Warranty.



SPECIFICATIONS

AC INPUT: 105-132 Vac, 47-440HZ.

DC OUTPUT VOLTAGES: See respective tables.

REGULATION (All DC Outputs):

Line—±0.005% +4mV for line variations from 105-132 VAC.

Load—±0.005% +4mV for load variations from 0 to full load.

RIPPLE: Less than 1mV RMS.

RESPONSE TIME: Less than 20 micro-seconds.

REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.

REMOTE OR LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted or internally adjusted.

MIL SPECS: Designed to meet the environmental requirements of MIL-E-5272, MIL-STD-810B, MIL-E-16400F, MIL-E-4158D and MIL-E-5400K. Meantime, between failures — in excess of 160,000 hours per MIL HDBK 217.

POLARITY: May be either positive, negative or floating up to 300 volts.

TEMPERATURE COEFFICIENT: Better than 0.01%°C.

LONG TERM STABILITY: Better than 0.01%°C.

AMBIENT OPERATING TEMPERATURE: Continuous duty from —20°C to +71°C.

OVERLOAD AND SHORT CIRCUIT PROTECTION: Solid state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short circuits or overloads.

OVERSHOOT: No voltage spikes for turn on, turn off or power failure.

TRANSFORMERS: Meets MIL-T-27 specs.

INPUT AND OUTPUT CONNECTIONS: Heavy duty terminal blocks.

The PC Series power supplies may be mounted on any of their three mounting surfaces.

MECHANICAL DATA

The PC power supplies may be mounted on any of three surfaces (except EE case which mounts only on bottom or side). Units will function when mounted in any position, 3½-inch and 5¼-inch rack mounting assemblies are available, along with other accessories.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

PC MODULAR POWER SUPPLIES

PC SERIES "B" PACKAGE

with Over-Voltage Protection built-in

3-3/16" x 4-15/16" x 6-1/2"

$159

Model	Voltage Range Adjustable	Max. Amps at Ambient Temp. of 40°C	50°C	60°C	71°C
PC-B-3.6V	3.6 ± .5 volts	3.8	3.3	2.6	1.6
PC-B-5V	5 ± .5 volts	3.7	3.2	2.5	1.5
PC-B-6V	6 ± .5 volts	3.2	2.9	2.4	1.4
PC-B-10V	10 ± .5 volts	2.7	2.5	2.2	1.4
PC-B-12V	12 ± .5 volts	2.5	2.3	2.1	1.3
PC-B-15V	15 ± .5 volts	2.2	2.0	1.8	1.3
PC-B-18V	18 ± .5 volts	2.0	1.8	1.7	1.3
PC-B-20V	20 ± .5 volts	1.8	1.6	1.5	1.2
PC-B-24V	24 ± .5 volts	1.4	1.3	1.2	1.1
PC-B-28V	28 ± .5 volts	1.3	1.2	1.1	1.0
PC-B-36V	36 ± .5 volts	1.1	1.0	0.90	0.85
PC-B-48V	48 ± .5 volts	0.9	0.85	0.80	0.75
PC-B-100	100 ± .5 volts	0.37	0.34	0.30	0.28
PC-B-120	120 ± .5 volts	0.30	0.28	0.25	0.23
PC-B-150	150 ± .5 volts	0.25	0.23	0.20	0.19

PC SERIES "C" PACKAGE

With Over-Voltage Protection built-in

3-3/16" x 4-15/16" x 9-3/8"

$179

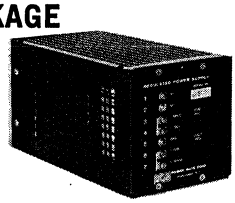
Model	Voltage Range Adjustable	Max. Amps at Ambient Temp. of 40°C	50°C	60°C	71°C
PC-C-3.6V	3.6 ± .5 volts	5.2	4.5	3.6	2.5
PC-C-5V	5 ± .5 volts	5.1	4.3	3.4	2.4
PC-C-6V	6 ± .5 volts	4.8	4.1	3.3	2.4
PC-C-10V	10 ± .5 volts	4.2	3.6	3.0	2.0
PC-C-12V	12 ± .5 volts	4.0	3.5	2.9	1.9
PC-C-15V	15 ± .5 volts	3.5	3.2	2.8	1.9
PC-C-18V	18 ± .5 volts	3.2	3.0	2.7	1.9
PC-C-20V	20 ± .5 volts	3.1	2.9	2.6	1.8
PC-C-24V	24 ± .5 volts	2.5	2.4	2.2	1.5
PC-C-28V	28 ± .5 volts	2.3	2.1	2.0	1.4
PC-C-36V	36 ± .5 volts	2.0	1.8	1.7	1.3
PC-C-48V	48 ± .5 volts	1.6	1.4	1.3	1.0
PC-C-100	100 ± .5 volts	0.55	0.51	0.47	0.42
PC-C-120	120 ± .5 volts	0.49	0.45	0.42	0.38
PC-C-150	150 ± .5 volts	0.39	0.36	0.33	0.30

PC SERIES "CC" PACKAGE

with Over-Voltage Protection built-in

4-15/16" x 4-15/16" x 9-3/8"

$219



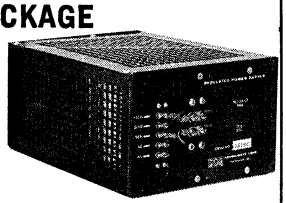
Model	Voltage Range Adjustable	Max. Amps at Ambient Temp. of 40°C	50°C	60°C	71°C
PC-CC-3.6V	3.6 ± .5 volts	11.0	9.4	8.2	5.5
PC-CC-5V	5 ± .5 volts	10.5	9.0	8.0	5.5
PC-CC-6V	6 ± .5 volts	9.0	8.4	7.7	5.5
PC-CC-10V	10 ± .5 volts	7.5	7.0	6.3	5.0
PC-CC-12V	12 ± .5 volts	7.3	6.8	5.9	4.7
PC-CC-15V	15 ± .5 volts	6.0	5.6	5.1	4.3
PC-CC-18V	18 ± .5 volts	5.5	5.1	4.7	4.1
PC-CC-20V	20 ± .5 volts	5.0	4.6	4.2	3.6
PC-CC-24V	24 ± .5 volts	4.0	3.7	3.4	3.0
PC-CC-28V	28 ± .5 volts	3.5	3.4	3.1	2.8
PC-CC-36V	36 ± .5 volts	3.0	2.9	2.7	2.4
PC-CC-48V	48 ± .5 volts	2.5	2.4	2.2	1.9
PC-CC-100	100 ± .5 volts	1.0	0.96	0.90	0.80
PC-CC-120	120 ± .5 volts	0.9	0.86	0.80	0.70
PC-CC-150	150 ± .5 volts	0.7	0.67	0.62	0.55

PC SERIES "D" PACKAGE

with Over-Voltage Protection built-in

4-15/16" x 7-1/2" x 9-3/8"

$249



Model	Voltage Range Adjustable	Max. Amps at Ambient Temp. of 40°C	50°C	60°C	71°C
PC-D-3.6V	3.6 ± .5 volts	13.1	11.3	9.2	6.2
PC-D-5V	5 ± .5 volts	12.6	10.8	9.2	6.1
PC-D-6V	6 ± .5 volts	12.4	10.6	8.9	6.0
PC-D-10V	10 ± .5 volts	10.8	9.7	8.5	5.7
PC-D-12V	12 ± .5 volts	10.0	9.2	8.3	5.7
PC-D-15V	15 ± .5 volts	9.0	8.4	7.9	5.3
PC-D-18V	18 ± .5 volts	7.9	7.4	6.9	5.0
PC-D-20V	20 ± .5 volts	7.4	6.9	6.5	4.9
PC-D-24V	24 ± .5 volts	6.7	6.3	5.8	4.8
PC-D-28V	28 ± .5 volts	6.0	5.6	5.2	4.7
PC-D-36V	36 ± .5 volts	5.4	5.0	4.7	4.3
PC-D-48V	48 ± .5 volts	4.1	3.9	3.6	3.1
PC-D-100	100 ± .5 volts	1.7	1.5	1.3	1.1
PC-D-120	120 ± .5 volts	1.5	1.3	1.1	1.0
PC-D-150	150 ± .5 volts	1.1	1.0	0.90	0.80

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PC MODULAR POWER SUPPLIES

PC SERIES "E" PACKAGE

with Over-Voltage Protection built-in

4-15/16" x 7-1/2" x 11-7/8"

$309

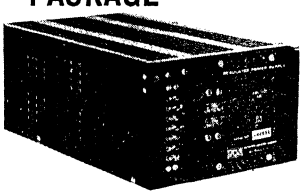
Model	Voltage Range Adjustable	Max. Amps at Ambient Temp. of 40°C	50°C	60°C	71°C
PC-E-3.6V	3.6 ± .5 volts	21.0	19.0	16.5	10.0
PC-E-5V	5 ± .5 volts	20.0	18.0	16.4	10.0
PC-E-6V	6 ± .5 volts	19.0	17.3	15.6	10.0
PC-E-10V	10 ± .5 volts	16.0	14.5	13.0	9.5
PC-E-12V	12 ± .5 volts	15.0	13.6	12.3	9.5
PC-E-15V	15 ± .5 volts	14.0	12.7	11.5	8.6
PC-E-18V	18 ± .5 volts	13.0	11.8	10.6	8.6
PC-E-20V	20 ± .5 volts	12.0	10.9	9.8	8.5
PC-E-24V	24 ± .5 volts	11.0	10.0	9.0	7.6
PC-E-28V	28 ± .5 volts	10.0	9.0	8.0	7.1
PC-E-36V	36 ± .5 volts	8.0	7.3	6.5	5.7
PC-E-48V	48 ± .5 volts	6.0	5.4	4.9	4.3
PC-E-100	100 ± .5 volts	2.0	1.7	1.6	1.5
PC-E-120	120 ± .5 volts	1.7	1.5	1.4	1.2
PC-E-150	150 ± .5 volts	1.4	1.3	1.2	1.0

PC SERIES "EE" PACKAGE

with Over-Voltage Protection built-in

4-15/16" x 7-1/2" x 17"

$359



Model	Voltage Range Adjustable	Max. Amps at Ambient Temp. of 40°C	50°C	60°C	71°C
PC-EE-3.6V	3.6 ± .5 Volts	32.0	26.0	22.0	18.3
PC-EE-5V	5 ± .5 volts	31.0	24.6	20.8	17.3
PC-EE-6V	6 ± .5 volts	30.0	24.6	20.8	17.3
PC-EE-10V	10 ± .5 volts	24.0	20.4	16.8	13.5
PC-EE-12V	12 ± .5 volts	21.0	19.0	16.1	13.2
PC-EE-15V	15 ± .5 volts	19.0	18.0	15.5	12.7
PC-EE-18V	18 ± .5 volts	16.5	14.8	12.4	10.1
PC-EE-20V	20 ± .5 volts	15.2	13.7	11.8	9.1
PC-EE-24V	24 ± .5 volts	14.0	12.5	10.8	9.0
PC-EE-28V	28 ± .5 volts	13.0	11.5	9.8	8.2
PC-EE-36V	36 ± .5 volts	10.4	9.8	8.6	7.1
PC-EE-48V	48 ± .5 volts	7.7	7.1	6.5	5.4
PC-EE-100	100 ± .5 volts	3.3	3.0	2.5	2.1
PC-EE-120	120 ± .5 volts	3.0	2.7	2.2	1.9
PC-EE-150	150 ± .5 volts	2.2	2.0	1.75	1.5

PM, PC, PX MODULAR POWER SUPPLY DIMENSIONS

PM—PX—PC SERIES DIMENSIONS

LETTER	"A"	"B"	"C"	"CC"	"D"	"E"	"EE"
A	3.72	4.91	4.91	9.38	9.38	9.38	16.50
B	3.17	3.17	3.17	4.91	4.91	4.91	4.91
C	6.50	6.50	9.38	4.94	7.50	7.50	7.50
D	2.84	4.03	4.03		3.25	3.25	
E	2.38	2.23	2.23	3.98	6.52	6.52	
F	5.06	5.06	6.89	6.89	6.89	6.89	12.38
G	2.84	3.75	3.75	4.06	6.56	6.56	6.56
H	.42	.56	.56	.44	.48	.48	.48
J	.36	.48	.48	.73	.73	.73	.36
K	1.42	2.02	2.02	2.11	4.20	4.20	4.20
L	5.31	5.31	6.89				
M		3.08	3.08				
N		2.08	2.08				
P		2.48	2.48				
FIG. #	1	1	1	2	2	2	2

NOTE 1

Mounting Screws, #8-32 THD

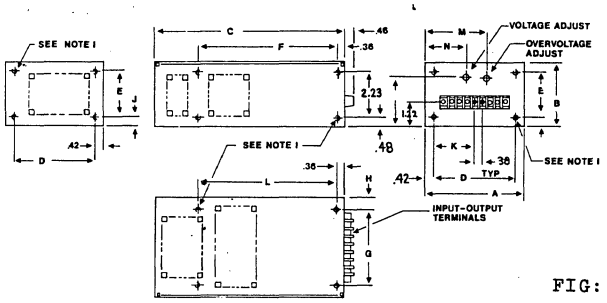


FIG: 1

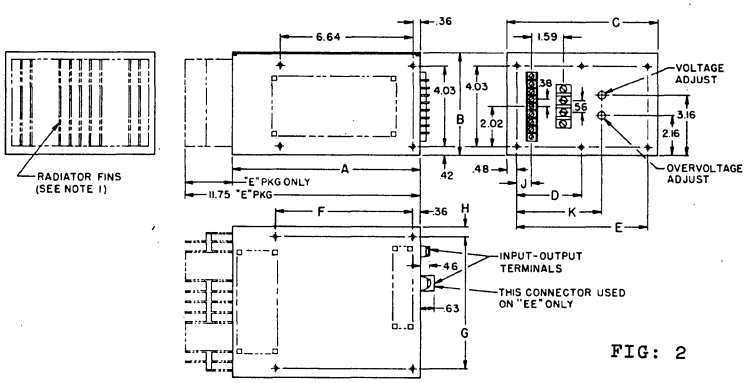
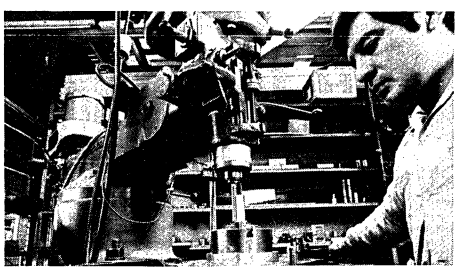


FIG: 2

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

AT POWER/MATE...
QUALITY IS A SIMPLE MATTER



Simply Stated . . . "Every Power/Mate power supply must surpass its published performance specifications and conform to Power/Mate's rigid workmanship standards . . . OR . . . it doesn't leave our plant".

At Power/Mate, there is no compromise on Quality ! ! !

This high level of performance was **not simple** to achieve. It took much effort on everyone's part. Many of our employees and managers spent countless hours "burning the midnight oil". It took a total commitment to quality by everyone . . . from production to president. It means that our entire plant has to work together. It means a lot of training. It means skilled hands . . . specialized equipment . . . automated testing and much more. But it's worth it. "Because at Power/Mate we know how important it is to produce a quality power supply product".

Today we are proud of our achievements . . . We have combined a team of skilled men with machines, together with understanding, all producing power supplies you can depend on.

POWER/MATE MEANS PEOPLE

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

WR FULL RANGE POWER SUPPLIES

PRODUCT DIGEST

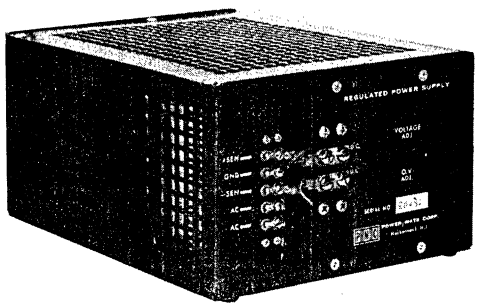
The new Power/Mate "WR" Full Range Modular Power Supply Series combines the field proven reliability of our Uni-Power and PM/PX Series with the benefits of our same day off-the-shelf delivery to give the Systems Engineer a new dimension in design flexibility.

Now, with the new "WR" Series, the full wide voltage ranges of these modular power supplies may be accomplished without the necessity of internal power supply adjustments or changes. The power supplies may be set at any voltage within the specified range by merely a simple pot adjustment.

Built-in overvoltage protection is optional and does not add a fraction to the module dimensions. Thus, all components are internal — no need for design changes or extra space in your product.

All "WR" power supply modules feature remote sensing and programming, built-in current limiting with automatic recovery, thermal overload protection, excellent temperature stability and may be connected in series, parallel or series/parallel for virtually any voltage and/or current output. Plus, the new "WR" Series is backed by Power/Mate's Five Year Warranty.

Accessories available for use with the "WR" Series include Power/Mate's full line of rack adapters and metered panels.



REGULATION: ±0.01% line and load +1 mv.
RIPPLE: Less than 250 microvolts.

SPECIFICATIONS

VOLTAGE INPUT: 105-125 VAC, 47-420 cps.
CURRENT OUTPUT: Refer to applicable chart.
VOLTAGE OUTPUT: Refer to applicable chart.
REGULATION: ±0.01% line and load +1 mv.
RIPPLE: Less than 250 microvolts.
RESPONSE TIME: Less than 20 microseconds.
TEMPERATURE COEFFICIENT: Better than 0.01%/°C.
LONG TERM STABILITY: Better than 0.25% for 8 hours.
OVERLOAD & SHORT-CIRCUIT PROTECTION: Solid state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short-circuits or overloads.
POLARITY: May be either positive, negative or floating up to 300 volts.
AMBIENT OPERATING TEMPERATURE: Continuous duty from −20C° to +71°C ambient.
STORAGE TEMPERATURE: −55°C to +85°C.
OUTPUT CURRENT vs. TEMPERATURE: Rated for full current output at temperatures between −20°C and +45°C. Linearly derated from +45°C as shown in charts.
REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.
REMOTE OR LOCAL VOLTAGE ADJUST: Output voltage may be remotely adjusted, or internally adjusted with coarse and fine controls. Fine control is accessible through hole in terminal end of supply.

MECHANICAL DATA

The "WR" Series power supplies may be mounted on any of three surfaces. They will function when mounted in any position.

10-32 screws and studs are supplied for mounting each power supply.

3½-inch and 5¼-inch rack mounting assemblies are available, along with other accessories.

AVAILABLE OPTIONS

1. Fungus proofing, with MIL-V-173 varnish, for all fungus nutrient components, at $10 per unit. Use suffix "F".
2. AC input. All units are available with 208 VAC ±10% (use suffix "L") or 230 VAC ±10% (use suffix "LL") at no extra cost.

5 Year Warranty

5-YEAR WARRANTY

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

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514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

WR FULL RANGE POWER SUPPLIES

WR SERIES A

3-5/16"W x 3-7/8"H x 5-1/8"D
Net Weight: 3-3/4 lbs.
Shipping Weight: 4-3/4 lbs.
Price:

$99

Model	Voltage Adj Range ±0.5 Volts	Ambient Temperature 40°C	50°C	60°C	71°C
WRA-7	0-7	2.10	1.9	1.7	1.37
WRA-12	0-12	1.50	1.35	1.2	1.0
WRA-15	0-15	1.25	1.13	1.0	.82
WRA-18	0-18	1.10	1.0	.9	.72
WRA-24	0-24	.85	.76	.7	.55
WRA-32	0-32	.69	.62	.55	.45
WRA-3-6	3-6	2.6	2.34	2.1	1.7
WRA-5-8	5-8	2.2	2.0	1.77	1.43
WRA-6-10	6-10	2.2	2.0	1.77	1.43
WRA-10-15	10-15	2.0	1.8	1.6	1.3
WRA-10-20	10-20	1.3	1.2	1.06	.86
WRA-15-20	15-20	1.8	1.62	1.44	1.2
WRA-60	0-60	.37	.33	.30	.24
WRA-120	0-120	.12	.11	.1	.08

WR SERIES B

3-3/16" x 4-15/16" x 6-1/2"
Net Weight: 5-1/4 lbs.
Shipping Weight: 6-3/4 lbs.
Price:

$139

Model	Voltage Adj Range ±0.5 Volts	Ambient Temperature 40°C	50°C	60°C	71°C
WRB-7	0-7	3.7	3.33	3.0	2.4
WRB-12	0-12	2.5	2.25	2.0	1.63
WRB-15	0-15	2.1	1.9	1.7	1.36
WRB-18	0-18	2.0	1.8	1.6	1.3
WRB-24	0-24	1.6	1.45	1.3	1.
WRB-32	0-32	1.1	1.0	.9	.72
WRB-3-6	3-6	4.4	4.0	3.5	2.9
WRB-5-8	5-8	3.5	3.15	2.8	2.3
WRB-6-10	6-10	3.5	3.15	2.8	2.3
WRB-10-15	10-15	3.6	3.25	2.9	2.35
WRB-10-20	10-20	2.0	1.8	1.6	1.3
WRB-15-20	15-20	2.7	2.45	2.2	1.75
WRB-60	0-60	.6	.55	.45	.3
WRB-110	0-110	.3	.25	.22	.16

WR SERIES C

3-3/16" x 4-15/16" x 9-3/8"
Net Weight: 8-1/4 lbs.
Shipping Weight: 10-1/4 lbs.
Price:

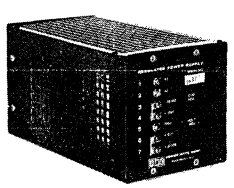
$159

Model	Voltage Adj Range ±0.5 Volts	Ambient Temperature 40°C	50°C	60°C	71°C
WRC-7	0-7	4.7	4.23	3.76	3.06
WRC-12	0-12	3.33	3.00	2.67	2.16
WRC-15	0-15	2.75	2.5	2.2	1.79
WRC-18	0-18	2.30	2.1	1.85	1.5
WRC-24	0-24	1.85	1.67	1.50	1.2
WRC-32	0-32	1.60	1.44	1.28	1.1
WRC-3-6	3-6	6.0	5.4	4.8	3.9
WRC-5-8	5-8	5.5	5	4.4	3.6
WRC-6-10	6-10	5.5	5	4.4	3.6
WRC-10-15	10-15	5.0	4.5	4.0	3.25
WRC-10-20	10-20	3.5	3.2	2.8	2.28
WRC-15-20	15-20	3.6	3.25	2.9	2.35
WRC-15-24	15-24	3.9	3.5	3.1	2.54
WRC-20-32	20-32	3.33	3.0	2.67	2.16
WRC-24-32	24-32	3.4	3.1	2.72	2.2
WRC-60	0-60	.85	.76	.7	.55
WRC-120	0-120	.35	.32	.28	.23
WRC-30-60	30-60	1.5	1.35	1.2	1.0

WR SERIES CC

4-15/16" x 4-15/16" x 9-3/8"
Net Weight: 11-1/2 lbs.
Shipping Weight: 14 lbs.
Price:

$179.00



Model	Voltage Adj Range ±0.5 Volts	Ambient Temperature 40°C	50°C	60°C	71°C
WRCC-7	0-7	6.8	6.1	5.44	4.42
WRCC-12	0-12	4.5	4.1	3.6	2.92
WRCC-15	0-15	3.8	3.4	3	2.5
WRCC-18	0-18	3.25	2.92	2.6	2.11
WRCC-24	0-24	2.5	2.25	2.0	1.63
WRCC-32	0-32	2.0	2.0	1.6	1.3
WRCC-3-6	3-6	11.5	10.35	9.2	7.5
WRCC-5-8	5-8	11.5	10.35	9.2	7.5
WRCC-6-10	6-10	7.6	6.85	6.1	5
WRCC-10-15	10-15	8.5	7.65	6.8	5.5
WRCC-10-20	10-20	4.9	4.41	3.9	3.19
WRCC-15-20	15-20	7.7	6.93	6.2	5
WRCC-15-24	15-24	5.7	5.13	4.6	3.7
WRCC-20-32	20-32	4.5	4.05	3.6	2.9
WRCC-24-32	24-32	5.0	4.5	4.0	3.25
WRCC-60	0-60	1.0	.9	.8	.65
WRCC-120	0-120	.5	.45	.4	.33
WRCC-30-60	30-60	2.1	1.9	1.4	1.2

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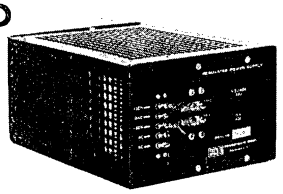
WR FULL RANGE POWER SUPPLIES

WR SERIES D

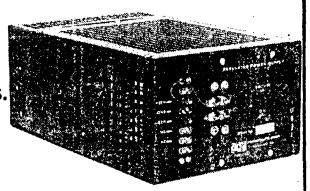
4-15/16" x 7-1/2" x 9-3/8"
Net Weight: 15-1/2 lbs.
Shipping Weight: 19 lbs.
Price:
$209.00



Model	Voltage Adj Range ±0.5 Volts	Ambient Temperature 40°C	50°C	60°C	71°C
WRD-7	0-7	9.5	8.6	7.6	6.2
WRD-12	0-12	6.33	5.7	5.06	4.15
WRD-15	0-15	5.3	4.8	4.25	3.45
WRD-18	0-18	4.5	4	3.6	2.9
WRD-24	0-24	3.5	3.2	2.8	2.3
WRD-32	0-32	2.7	2.4	2.2	1.8
WRD-3-6	3-6	15.0	13.5	12	9.8
WRD-5-8	5-8	15.0	13.5	12	9.8
WRD-6-10	6-10	10.5	9.5	8.4	6.8
WRD-10-15	10-15	12	10.8	9.6	7.8
WRD-10-20	10-20	6.7	6	5.36	4.35
WRD-15-20	15-20	10.0	9	8	6.5
WRD-15-24	15-24	7.9	7.1	6.32	5.14
WRD-20-32	20-32	6.33	5.7	5.06	4.12
WRD-24-32	24-32	8.5	7.6	6.8	5.5
WRD-60	0-60	1.35	1.21	1.1	.88
WRD-120	0-120	.65	.58	.5	.42
WRD-30-60	30-60	2.7	2.4	2.2	1.75

WR SERIES E

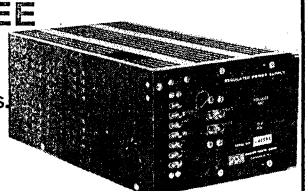
4-15/16" x 7-1/2" x 11-7/8"
Net Weight: 20-1/4 lbs.
Shipping Weight: 24-1/4 lbs.
Price:
$269.00



Model	Voltage Adj Range ±0.5 Volts	Ambient Temperature 40°C	50°C	60°C	71°C
WRE-7	0-7	12.5	11.25	10	8.13
WRE-12	0-12	8.6	7.74	6.88	5.6
WRE-15	0-15	7.5	6.75	6.0	4.88
WRE-18	0-18	6.2	5.4	5.0	4
WRE-24	0-24	4.8	4.32	3.8	3.12
WRE-32	0-32	3.7	3.33	3.0	2.4
WRE-3-6	3-6	21.5	19.35	17.2	14
WRE-5-8	5-8	18	16.2	14.4	11.7
WRE-6-10	6-10	18	16.2	14.4	11.7
WRE-10-15	10-15	16	14.4	11.2	10.4
WRE-10-20	10-20	9.2	8.3	7.4	6
WRE-15-20	15-20	11	10.9	8.8	7.15
WRE-15-24	15-24	10	8	8.0	6.5
WRE-20-32	20-32	8.6	7.74	6.2	5.6
WRE-24-32	24-32	12	10.8	9.6	7.8
WRE-60	0-60	1.85	1.67	1.48	1.2
WRE-120	0-120	.90	.8	.72	.6
WRE-30-60	30-60	4.0	3.6	3.2	2.6

WR SERIES EE

4-15/16" x 7-1/2" x 17"
Net Weight: 25-3/4 lbs.
Shipping Weight: 30-1/4 lbs.
Price:
$319.00



Model	Voltage Adj Range ±0.5 Volts	Ambient Temperature 40°C	50°C	60°C	71°C
WREE-7	0-7	18	16	14.4	11.6
WREE-12	0-12	12	11	9.5	7.7
WREE-15	0-15	10.5	9.5	8.5	6.7
WREE-18	0-18	9	8	7.2	5.8
WREE-24	0-24	7	6.3	5	4.5
WREE-32	0-32	5.5	5.0	4.4	3.5
WREE-3-6	3-6	30	27.0	24	20
WREE-5-8	5-8	20	18.0	16	13
WREE-6-10	6-10	20	18.0	16	13
WREE-10-15	10-15	20	18.0	16	13
WREE-10-20	10-20	11.0	10	8.8	7
WREE-15-24	15-24	16	14.4	13	10.5
WREE-20-32	20-32	12.5	11.2	10	8
WREE-24-32	24-32	15	13.5	12	70
WREE-60	0-60	2.7	2.4	21.5	17.5
WREE-120	0-120	1.35	1.2	1.1	.88
WREE-30-60	30-60	5.5	5.0	4.5	3.6

FOR
MECHANICAL DRAWINGS
SEE Vol.1•809

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

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Phone: (201) 343-6294 TWX: (710) 990-5023

PT DUAL OUTPUT POWER SUPPLIES

PRODUCT DIGEST

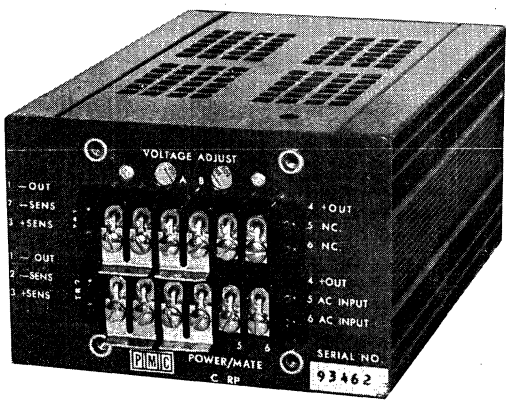
Power/Mate's new "PT" Power Twin Series are dual output modular power supplies designed for use with operational amplifiers, digital logic, integrated circuit devices and any application where + and − voltages are required.

The PT Series utilize all silicon semiconductor components for reliable operation to 71°C. Unit can be connected for (master/slave) 'series' tracking operation to keep the output voltage proportional to the master voltage, thereby reducing any input offset voltage variations of op-amps or integrated circuits due to power supply changes.

Because each output has its own individual regulator the new Power Twin (PT) Series may also be used as two separate and independent power supplies. The outputs may be connected in (master/slave) 'parallel' to give approximately twice the output current with automatic load sharing. Tracking or non-tracking feature is selectable via linkages on the printed circuit board.

All components are of the highest possible quality, computer rated for long life. The PT Series cannot be damaged by prolonged short circuit or over-loads. Each supply is isolated up to 600 VDC from output to chassis or output to output.

As with all Power/Mate power supplies, the New "PT" Series are backed by Power/Mate's Five Year Warranty.



REGULATION:
Line— ±0.05% for line variations from 105-125 VAC.
Load— ±0.05% +3mV for load variations from 0 to full load.
RIPPLE: 1mV RMS maximum.

SPECIFICATIONS

A/C INPUT: 105-125 VAC, 47-420 Hz.

OUTPUT VOLTAGE AND CURRENT: See respective tables.

REGULATION:
Line— ±0.05% for line variations from 105-125 VAC.
Load— ±0.05% +3mV for load variations from 0 to full load.

RIPPLE: 1mV RMS maximum.

POLARITY: Either output may be "floated" up to 300V peak above ground and/or either polarity may be grounded to chassis by means of terminals provided.

TEMPERATURE COEFFICIENT: Better than 0.01%C.

LONG TERM STABILITY: Better than 0.025% for 8 hours.

AMBIENT OPERATING TEMPERATURE: Continuous duty from −20°C to +71°C.

STORAGE TEMPERATURE: 55° to +85°C.

OVERLOAD PROTECTION: Unit will withstand direct short circuit across either output to common or + to − output terminals for an indefinite period without damage to the supply.

OUTPUT CURRENT vs. TEMPERATURE: Each output is rated for full current at temperatures between −20°C and +50°C and is linearly derated from +50°C to 70% of the full output at +71°C.

MIL SPECS: Designed to meet the environmental requirements of MIL-E-5272 and RFI requirements of MIL-1-6181. Mean-Time bewteen failures—In excess of 100,000 hours per MIL HDBK 217.

TRANSFORMERS: Meet MIL-T-27 specs.

INPUT AND OUTPUT CONNECTIONS: Heavy duty terminal block on rear of chassis.

MECHANICAL DATA

The PT Series power supplies may be mounted on either of two surfaces.

Included with each power supply and 10-32 screws and studs for mounting.

For detailed dimensions (see page 21). In addition both 3½ and 5¼ rack mounting assemblies are available along with other PMC accessories.

OPTIONS

1. Fungus proofing, with MIL-V-173 varnish, for all fungus nutrient components, at $10 per unit. Use suffix F.
2. AC Input. All units are available with 208 VAC ±10% (use suffix L) or 230 VAC ±10% (use suffix LL), at $15 per unit.
3. Dual AC primary 115/230 VAC permits operations at either AC input voltage. (use suffix X) at $25 per unit.

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PT DUAL OUTPUT POWER SUPPLIES

		MODEL	Output Voltage Range	Output Current
PACKAGE "A" 4"W x 3"H x 5"D	**$99**	PT-5A	±5Vdc ±.5 Volts	.5 amps per output
		PT-12A	±12Vdc ±.5 volts	.5 amps per output
		PT-15A	±15Vdc ±.5 volts	.5 amps per output
		PT-18A	±18Vdc ±.5 volts	.5 amps per output
PACKAGE "B" 3 5/16"W x 3 7/8"H x 6 7/8"D	**$129**	PT-5B	±5Vdc ±.5 Volts	1.6 amps per output
		PT-12B	±12Vdc ±.5 volts	1.5 amps per output
		PT-15B	±15Vdc ±.5 volts	1.5 amps per output
		PT-18B	±18Vdc ±.5 volts	1.2 amps per output
PACKAGE "C" 5 3/32"W x 3 5/16"H x 7 5/8"D	**$159**	PT-5C	±5Vdc ±.5 Volts	2.5 amps per output
		PT-12C	±12Vdc ±.5 volts	2.0 amps per output
		PT-15C	±15Vdc ±.5 volts	2.0 amps per output
		PT-18C	±18Vdc ±.5 volts	1.7 amps per output
PACKAGE "D" 5 3/32"W x 3 5/16"H x 9 3/8"D	**$189**	PT-5D	±5Vdc ±.5 Volts	3.5 amps per output
		PT-12D	±12Vdc ±.5 volts	3.0 amps per output
		PT-15D	±15Vdc ±.5 volts	3.0 amps per output
		PT-18D	±18Vdc ±.5 volts	2.5 amps per output
PACKAGE "E" 5 3/32"W x 5 3/32"H x 9 3/8"D	**$209**	PT-5E	±5Vdc ±.5 Volts	6.0 amps per output
		PT-12E	±12Vdc ±.5 volts	4.5 amps per ouput
		PT-15E	±15Vdc ±.5 volts	4.0 amps per output
		PT-18E	±18Vdc ±.5 volts	3.5 amps per output
PACKAGE "F" 7 1/2"W x 5 3/32"H x 9 3/8"D	**$249**	PT-5F	±5Vdc ±.5 Volts	8.0 amps per output
		PT-12F	±12Vdc ±.5 volts	6.0 amps per output
		PT-15F	±15Vdc ±.5 volts	5.0 amps per output
		PT-18F	±18Vdc ±.5 volts	4.2 amps per output
PACKAGE "G" 7 1/2"W x 5 3/32"H x 11 7/8"D	**$299**	PT-5G	±5Vdc ±.5 Volts	12.0 amps per output
		PT-12G	±12Vdc ±.5 volts	10.0 amps per output
		PT-15G	±15Vdc ±.5 volts	8.5 amps per output
		PT-18G	±18Vdc ±.5 volts	7.5 amps per output
PACKAGE "H" 7 1/2"W x 5 3/32"H x 16 1/2"D	**$369**	PT-5H	±5Vdc ±.5 Volts	17.5 amps per output
		PT-12H	±12Vdc ±.5 volts	13 amps per output
		PT-15H	±15Vdc ±.5 volts	10 amps per output
		PT-18H	±18Vdc ±.5 volts	9 amps per output

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RACKS AND ACCESSORIES

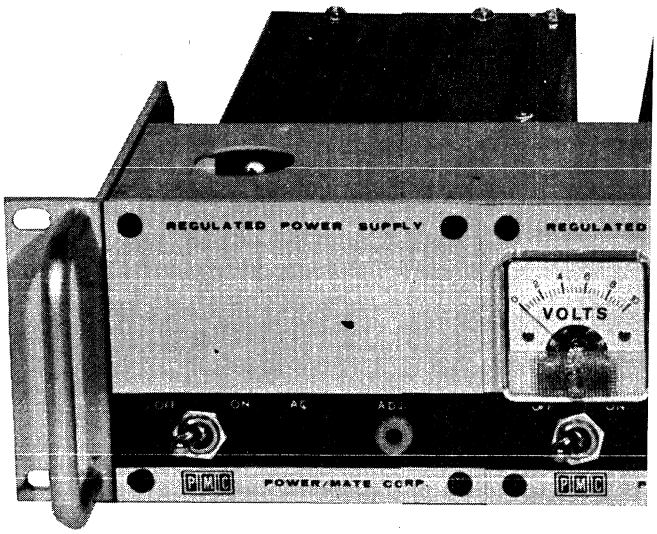
PRODUCT DIGEST

All PMC racks and accessories accommodate a variety of PMC modules in any configuration in a standard 19" rack, 3½" high or 5¼" high, with 5 different styles. All of the racks and panels are finished in durable baked gray enamel, with predrilled and tapped holes, ready for easy assembly.

THE PMC "BUILDING BLOCK" APPROACH

Because most PMC power supply modules are compatible with PMC racks, panels and other accessories, an infinite variety of combinations is possible to produce the exact requirements of the application. Assembly of a CUSTOM power supply, instead of specifying a "special order," gains the substantial benefits of lower cost and the use of industry proven and accepted PMC power supplies.

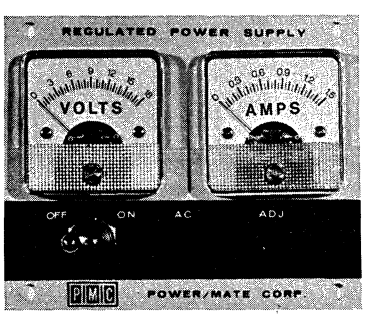
This approach also gives the engineer a new dimension in design freedom. He chooses from readily available, off-the-shelf, standard modules (at standard prices), and from matching off-the-shelf mounting racks, metered and non-metered control panels, in addition to the complete assortment of other accessories.



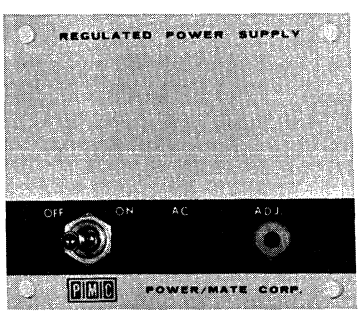
PANELS

HOW TO ORDER PANELS: Select desired voltmeter range and ammeter range from listing below. Insert voltmeter range selected in first bracket, followed by ammeter range. For example, a CPM-525-36-1.5 indicates a metered quarter rack panel with a 0-36 voltmeter and a 0-1.5 ammeter.

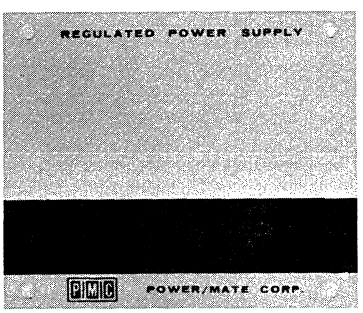
FOR USE WITH AR-35 RACK SERIES



MODEL CPM-35-( )-( ) Quarter rack metered control panel with voltmeter and ammeter, on-off switch, and AC indicator. Screwdriver output voltage adjust from front panel. On panel rear is input cable, AC fuse and output solder terminals.
VOLTMETERS: 0-10, 0-18, 0-36, 0-50, 0-150 volts
AMMETERS: 0-0.5, 0-1.5, 0-6, 0-15, 0-36 amps
Price $50.00



MODEL CP-35 Quarter rack control panel with same features as above, but without meters.
Price $35.00



BLANK PANELS for use in AR-35 series racks. For completing front panel after selection of desired control panels, or for use in adding your own controls or instrumentation.
MODEL P-35-4 ¼ rack size blank panel
Price $7.00
MODEL P-35-2 ½ rack size blank panel
Price $8.00
MODEL P-35-1 Full size blank panel
Price $10.00

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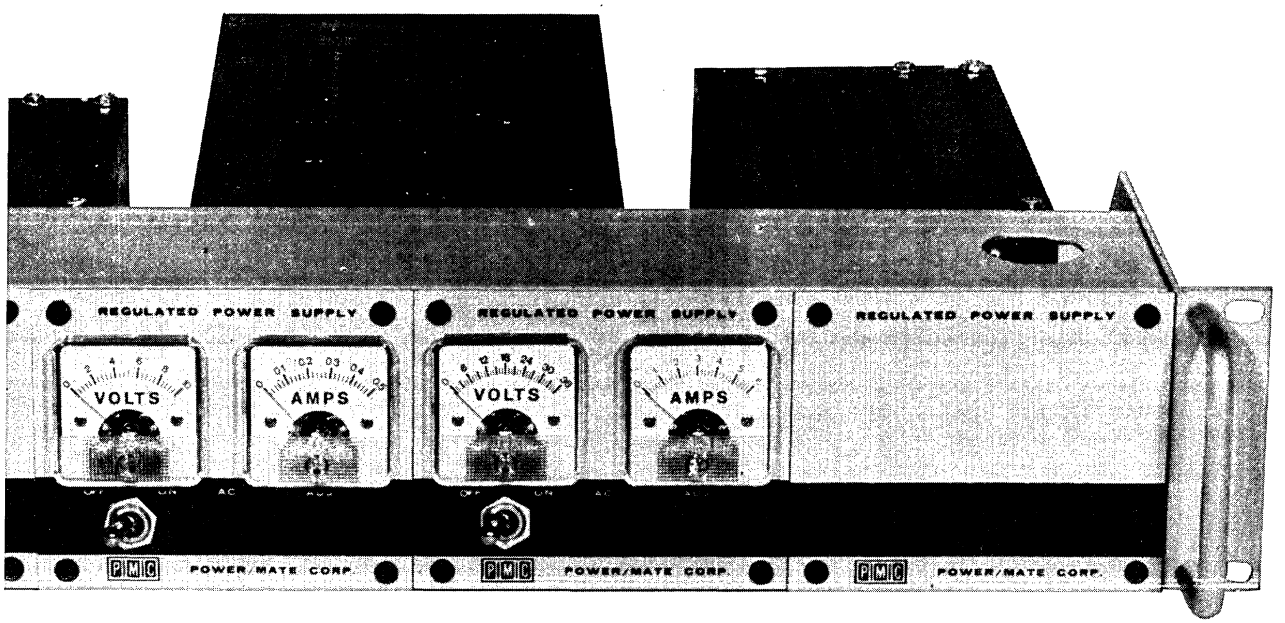
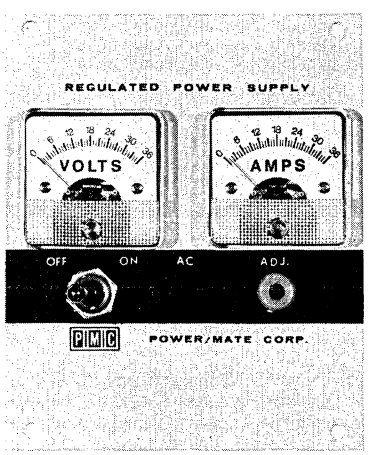
RACKS AND ACCESSORIES



FOR USE WITH AR-525 RACK SERIES

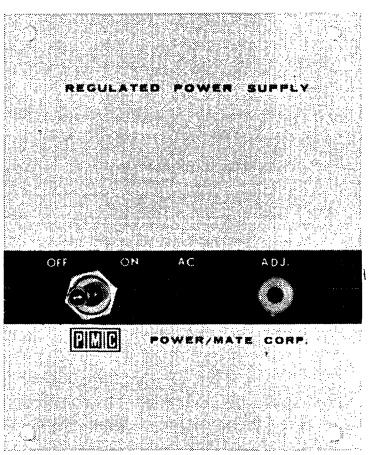


MODEL CPM-525-( )-( ) Quarter rack metered control panel with voltmeter and ammeter, on-off switch, and AC indicator. Screwdriver output voltage adjust from front panel. On panel rear is input cable, AC fuse, and output solder terminals.

VOLTMETERS: 0-10, 0-18, 0-36, 0-50, 0-150 volts full scale

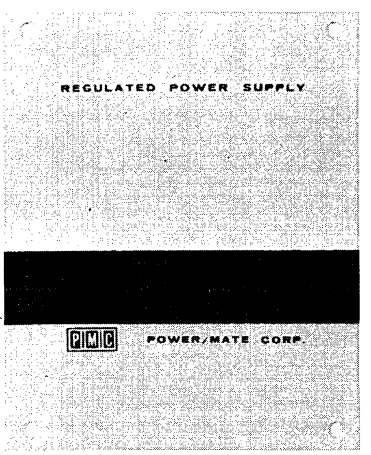
AMMETERS: 0-0.5, 0-1.5, 0-6, 0-15, 0-36 amps full scale

PRICE $50.00



MODEL CP-525 Quarter rack control panel with same features as above but with no meters.

Price $35.00.



BLANK PANELS for use in AR-525 series racks. For filling spaces in front panel after selection of above control panels, or for use in

MODEL P-525-4 ¼ rack size blank panel

MODEL P-525-4 ¾ rack size blank panel Price $7.00

MODEL P-525-2 ½ rack size blank panel Price $8.00

MODEL P-525-1 Full size blank panel Price $10.00

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RACKS AND ACCESSORIES

HOW TO SELECT RACKS TO FIT YOUR MODULES

1 Select the POWER/MATE power supply modules which will satisfy the electrical requirements of your application.

2 From TABLE A, list the effective width and depth of each module selected. Arrange in a list so that the effective width can be readily added up.

3 To make the general applicable rack selection, compare the models selected in Step 1 with the module types shown for each type of rack from TABLE B.

4 Add up the effective width of the modules from Step 2. Also note the maximum effective depth of the modules.

5 Check the maximum effective depth of the modules against the depth shown in TABLE C. This will indicate if the maximum effective depth is within the capacity of the rack type selected.

6 Next, compare the total module width and the width dimensions in TABLE C for the selected rack type. This will determine if the total effective width of the power supplies required will fit within the rack.

If the total module width is larger than that of the rack selected, then two choices are available: a) use two racks, or b) place more than one similar case width power supply (See TABLE A) in tandem. For example, two B cases with an individual depth of 7½ can readily fit in the 19⅜ depth of the AR525-21 rack.

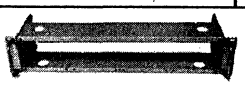
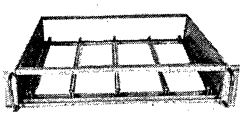
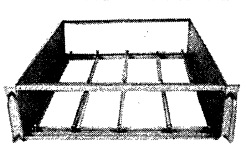
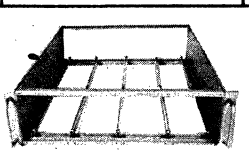
TABLE A

Case Size	Effective Module Width (Inches)		Effective Module Depth (Includes ¾" for termina strip and wiring)
	When Used In AR35 Series	When Used In AR525 Series	
A	3-3/4	3-3/4	7-1/2
B	4-15/16	4-15/16	7-1/2
C	4-15/16	4-15/16	10-1/8
CC	4-15/16	4-15/16	10-1/8
D	7-1/2	7-1/2	10-1/8
E	7-1/2	7-1/2	12-1/2
EE	7-1/2	7-1/2	17-1/4

TABLE C

	Effective Internal Rack Width (Inches)				Effective Internal Rack Depth (Inches)
	Number of Modules to be Mounted Across Width 1	2	3	4	
AR35	17	17	17	17	NOT APPLICABLE
AR35-14	16¼	15⅞	15½	15⅛	12¼
AR525	16¾	16¾	16¾	16¾	NOT APPLICABLE
AR525-14	16	15⅝	15¼	14⅞	12¼
AR525-21	16	15⅝	15¼	14⅞	19⅜

TABLE B

Model	Racks For Use With	Panels For Use With
		
AR-35 $40.00 W H D 19 x 3½ x 5¼	FOR USE WITH POWER SUPPLY CASE SIZE A, B, & C	P-35-1 P-35-2 P-35-4 CP35 CPM35-(....)-(....)*
		
AR-35-14 $65.00 W H D 19 x 3½ x 14⅝	FOR USE WITH POWER SUPPLY CASE SIZE A, B, & C	P-35-1 P-35-2 P-35-4 CP35 CPM35-(....)-(....)*
AR-525 $40.00 W H D 19 x 5¼ x 5⅝	FOR USE WITH POWER SUPPLY CASE SIZE A,** B,** BB,** C, CC, D, E & EE	P525-1 P525-2 P525-4 CP525 CPM525-(....)-(....)*
		
AR-525-14 $65.00 W H D 19 x 5¼ x 14⅝	FOR USE WITH POWER SUPPLY CASE SIZE A,** B,** BB,** C, CC, D, E & EE	P525-1 P525-2 P525-4 CP525 CPM525-(....)-(....)*
		
AR-525-21 $75.00 W H D 19 x 5¼ x 21⅝	FOR USE WITH POWER SUPPLY CASE SIZE A,** B,** BB,** C, CC, D, E & EE	P525-1 P525-2 P525-4 CP525 CPM525-(....)-(....)*

*See description of CPM panels for complete ordering data.
**These models to be used with adapter A-525-1.

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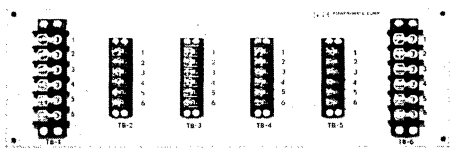
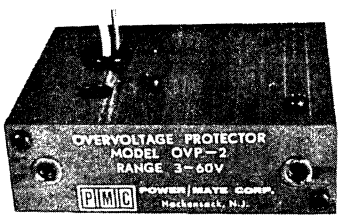
RACKS AND ACCESSORIES

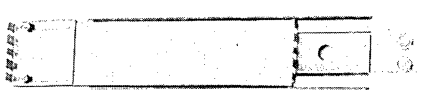
ACCESSORIES



REAR PANELS for use with AR-35 and AR-525 series accessory racks. Six terminal barrier strips are mounted on each panel for ease of input/output connection. Complete with mounted hardware and all terminals marked for ease of wiring.
Models RP-35-1 and RP-525-1 Price $30.00 each



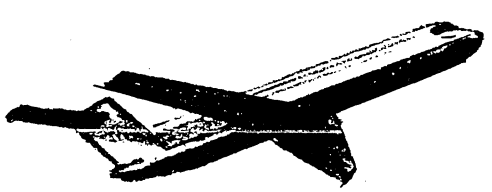
OVERVOLTAGE PROTECTOR for use on any POWER/MATE power supply up to 34 amps. Self contained crowbar type solid state unit. Independent of power supply or type of failure. Output adjustable to trip between 3 and 60 volts. Trips within 10 microseconds. Dimensions 2⅞ x 3⅜ x 1
Model OVP-2 Price $35.00



RACK SLIDE for use with all POWER/MATE CORP. racks. Feature quick disconnect and ball bearing action. Includes hardware for mounting.
Model CS-1 Price $55.00

ADAPTER for mounting type A, B, C and D cases in AR525 rack. Permits mounting 3½ inch height modules in 5¼ inch mounting space on AR525 rack. Permits complete intermixing of both 3½ and 5¼ inch supplies in this rack. Complete with hardware.
Model A525-1 Price $6.00 per pair

SAME DAY SHIPMENT



Determine the quantity of each unit you will need and order them by the model numbers shown above. Notice that numbers ending in 35 represent the 3½ inch rack and those ending in 525 indicate the 5¼ inch rack.

PMC racks and accessores plus PMC's high quality power supplies give you the best possible combination of design freedom and proven reliability. If you have further questions, please contact either your local PMC Representative or POWER/MATE CORPORATION.

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HV/HW HIGH EFFICIENCY POWER SUPPLIES

PRODUCT DIGEST

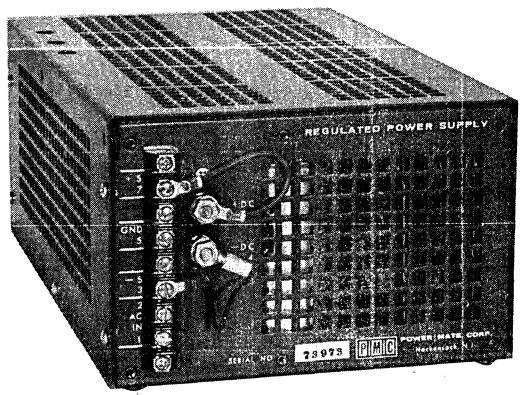
Power/Mate's new HV/HW High Efficiency Power Supply Series, utilizes Power/Mate's "SIMAG" circuitry (patent pending), a breakthrough in power supply design and is the result of a development program to provide high efficiency power supplies for use with digital (TTL, ECL, TRL, DTL, and HTL) integrated circuits and MOS/LSI logic.

The new HV/HW series operates at efficiencies greater than 50% and are offered in a wide range of voltages up to 150 VDC with current ratings up to 200 amps.

Power/Mate's unique mechanical and electrical design allows the power supplies to be packaged in almost half the space required for equivalent conventional series power supplies.

Built-in overvoltage protection and self-restoring current limiting provide complete protection. Advanced electronic circuitry limits the output current on external loads, including short circuit providing protection for the load as well as the power supply. Remote sensing, remote programming and complete serviceability are additional features.

The HV/HW Series are backed by Power/Mate's Five Year Warranty.



LINE REGULATION: ±0.1% 10 mv for line variations from 105-132 VAC.
LOAD REGULATION: ±0.1% 10 mv from no load to full load.
RIPPLE: 10 mv RMS MAX.

HV SERIES SPECIFICATIONS

INPUT VOLTAGE: 105-132 VAC, 57-63 HZ.
OUTPUT VOLTAGE: Refer to applicable charts.
LINE REGULATION: ±0.1% + 10 mv for line variations from 105-132 VAC.
LOAD REGULATION: ±0.1% + 10 mv from no load to full load.
RIPPLE: 10 mv RMS MAX.
TEMPERATURE COEFFICIENT: .015% + 0:5 mv/°C.
EFFICIENCY: Greater than 50%.
OPERATING AMBIENT TEMPERATURE: 0-71°C.
STORAGE TEMPERATURE: −55°C to +85°C.
REMOTE OR LOCAL SENSING: Provision included for remote sensing of the DC output voltage directly at the load.
OVERLOAD PROTECTION: Both thermal and adjustable electronic current limiting overload protection and circuit breaker on all models.
OVERVOLTAGE PROTECTION: "Built-in" continuously adjustable overvoltage protection is standard on all models. Response time 5-10 microseconds.
NO OVRESHOOT ON TURN ON/OFF OR POWER WAILURE.
DC OUTPUT CONTROL: Voltage adjustment over entire voltage range.
OVERVOLTAGE PROTECTOR CONTROL: Overvoltage adjustment covers entire operating range.
OVERVOLTAGE PROTECTION: Built-in, continuously adjustable overvoltage protection crowbars output when trip level is exceeded. Included on all models.

OVERLOAD PROTECTION: (Thermal) Thermostat—Automatic reset of thermostat on all models when overtemperature condition is eliminated.
OVERLOAD PROTECTION: (Electrical) External overload protection; fixed, automatic electronic current limiting circuit limits the output current upon external overloads, including short circuit, thereby providing protection for load as well as power supply. On EE and G packages, ON-OFF circuit breaker must be manually reset.
MOUNTING: One surface with tapped mounting holes for E and EE packages; package G is rack mounted.
INPUT CONNECTIONS: Heavy duty terminal block on rear of chassis.
OUTPUT CONNECTIONS: Two heavy-duty studs on rear of chassis.

AVAILABLE OPTIONS

G case models are available with mounted chassis slides. Add suffix "—CS" to the model number and $60 to the price.

G case models are available with meters. For meters use suffix "M" and add $75 to the price.

5 Year Warranty

5-YEAR WARRANTY

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

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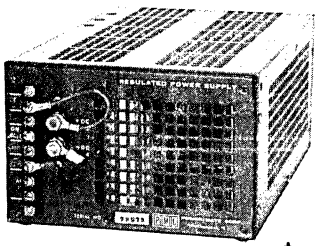
HV/HW HIGH EFFICIENCY POWER SUPPLIES

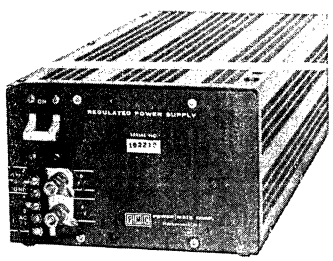
HV "E" CASE



$319.00

Model	Fixed Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
HV-E-3-P-3-OV	2.8-3.8	47	39	28	13	$319
HV-E-4-OV	5±5%	44	39	28	13	319
HV-E-4-P-5-OV	4.5±5%	41	38	28	12	319
HV-E-5-OV	5±5%	37	34	28	13	319
HV-E-6-OV	6±5%	33	30	27	18	319

HV "EE" CASE

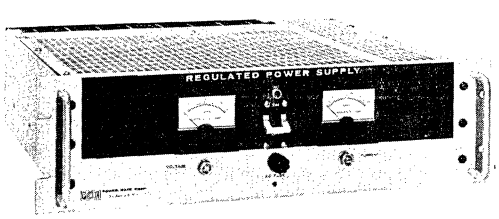


$400.00
Above 10 Volts

$479.00
Up to 10 Volts

Model	Fixed Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
HV-EE-3-OV	3±5%	98	90	74	61	$479
HV-EE-3-P-6-OV	3.6±5%	92	85	70	57	479
HV-EE-4-OV	4±5%	87	82	70	54	479
HV-EE-4-P-5-OV	4.5±5%	81	77	70	52	479
HV-EE-5-OV	5±5%	74	70	65	45	479
HV-EE-6-OV	6±5%	64	61	56	40	479
HV-EE-10-OV	10±5%	41	39	36	25	400
HV-EE-12-OV	12±5%	34	32	30	21	400
HV-EE-15-OV	15±5%	28	26	24	18	400

HV "G" CASE



$735.00

Model	Fixed Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
HV-G-3-OV	3±5%	170	160	150	135	$735
HV-G-3-P-6-OV	3.6±5%	160	155	140	125	735
HV-G-4-OV	4±5%	150	145	132	120	735
HV-G-4-P-5-OV	4.5±5%	135	131	119	108	735
HV-G-5-OV	5±5%	130	126	115	100	735
HV-G-6-OV	6±5%	110	107	98	90	735
HV-G-10-OV	10±5%	74	71	65	61	735
HV-G-12-OV	12±5%	65	63	57	54	735
HVG-15-OV	15±5%	50	48	44	40	735

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HV/HW HIGH EFFICIENCY POWER SUPPLIES

SPECIFICATIONS

The specifications for the HW Series are identical to those of the HV Series except that:

OUTPUT VOLTAGE: Refer to applicable charts.

LINE REGULATION: 1.0% for line variations from 105=132 VAC.

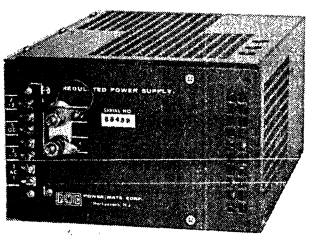
LOAD REGULATION: 1% for a 20% load to full load or full load to 20% load; or 1% full load to no load with a 20% preload throughout the voltage adjust range.

RIPPLE: 150 mv RMS or 1% of output voltage, whichever is greater.

OVERLOAD PROTECTION: (Electrical) External overload protection: fixed, automatic electronic current limiting circuit limits the output current upon external overloads, including short circuit, thereby providing protection for load as well as power supply. In addition, an automatic thermal reset switch is incorporated to sense overtemperature.

OVERVOLTAGE PROTECTION: (OPTIONAL) Built-in continuously adjustable overvoltage protection crowbars output when trip level is exceeded. Optional on all models. Add suffix OV to model number and $50 to price.

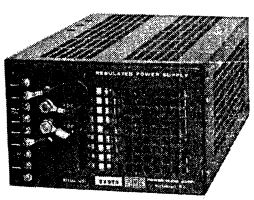
HW "D" CASE



$243.00

Model	Fixed Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
HW-D-10	10±5%	27	25	23	17	$243
HW-D-12	12±5%	26.5	20	13.7	8.8	243
HW-D-15	15±5%	22.5	20	13.7	8.8	243
HW-D-18	18±5%	19	18.3	13.7	8.8	243
HW-D-20	20±5%	17.5	16.7	13.7	8.8	243
HW-D-24	24±5%	14.7	14	13.2	8.8	243
HW-D-28	28±5%	12.5	12	11.1	7.7	243
HW-D-48	48±5%	7.6	7.3	6.8	6.2	243
HW-D-60	60±5%	6.0	5.8	5.5	5.0	243
HW-D-150	150±5%	2.4	2.3	2.1	2.0	243

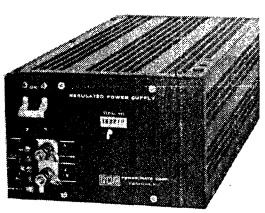
HW "E" CASE



$260.00

HW-E-3-P-3	2.8-3.8	55	52	49	45	$260
HW-E-4	4±5%	53	50	47	43	260
HW-E-4-P-5	4.5±5%	49	46	43	40	260
HW-E-5	5±5%	45	42	40	37	260
HW-E-6	6±5%	39	37	35	32	260

HW "EE" CASE



$339.00
Above 10 Volts

$389.00
Up to 10 Volts

HW-EE-3	3±5%	120	113	98	80	$389
HW-EE-3-P-6	3.6±5%	113	108	98	77	389
HW-EE-4	4±5%	107	102	96	74	389
HW-EE-4-P-5	4.5±5%	99	95	89	70	389
HW-EE-5	5±5%	91	87	82	62	389
HW-EE-6	6±5%	78	75	70	54	389
HW-EE-10	10±5%	51	48	45	35	339
HW-EE-12	12±5%	42	40	37	28	339
HW-EE-15	15±5%	35	33	31	24	339
HW-EE-18	18±5%	33	32	30	23	339
HW-EE-20	20±5%	31	30	28	22	339
HW-EE-24	24±5%	26	25	23	17	339
HW-EE-28	28±5%	22	21	20	15	339
HW-EE-48	48±5%	13	13	12	9	339
HW-EE-60	60±5%	10	10	9	8	339
HW-EE-150	150±5%	4	4	4	3	339

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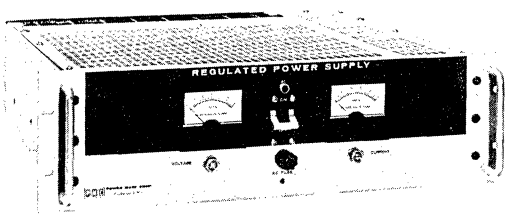
HV/HW HIGH EFFICIENCY POWER SUPPLIES

HW "G" CASE

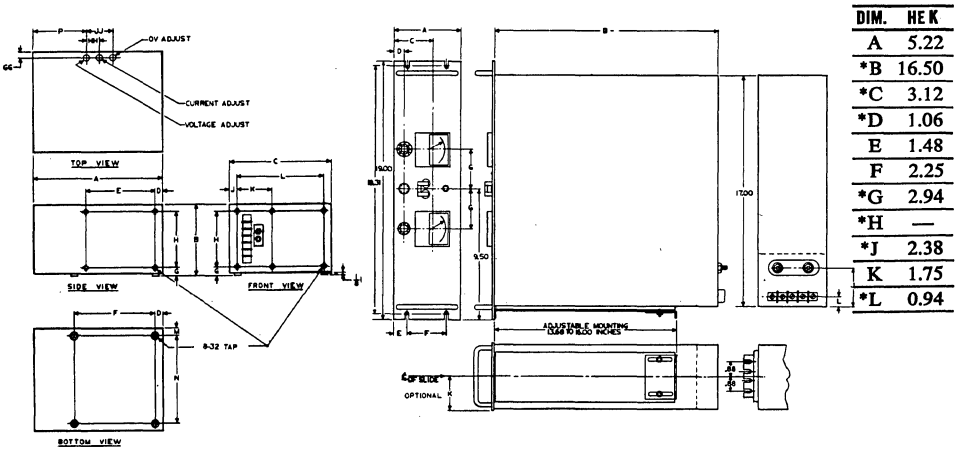


$663.00

Model	Fixed Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
HW-G-3	3±5%	200	195	180	165	$663
HW-G-3-P-6	3.6±5%	190	185	170	155	663
HW-G-4	4±5%	180	175	162	148	663
HW-G-4-P-5	4.5±5%	160	155	142	132	663
HW-G-5	5±5%	150	146	135	123	663
HW-G-6	6±5%	128	123	115	105	663
HW-G-10	10±5%	88	85	79	72	663
HW-G-12	12±5%	75	72	67	61	663
HW-G-15	15±5%	60	57	53	49	663
HW-G-18	18±5%	58	56	52	47	663
HW-G-20	20±5%	53	51	47	43	663
HW-G-24	24±5%	48	46	42	39	663
HW-G-28	28±5%	39	37	34	32	663
HW-G-48	48±5%	24	23	21	19	663
HW-C-60	60±5%	19	18	17	15	663
HW-G-150	150±5%	7.5	7	6.5	6	663

MECHANICAL DIMENSIONS FOR HV/HW "G" CASE

LETTER	MODEL HE"D"	HE"E"	HE"EE"
A	9⅜	11¾	16½
B	4 29/32	4 29/32	4 29/32
C	7½	7½	7½
D	23/64	23/64	23/64
E	6 41/64	6 41/64	—
F	6 57/64	6 57/64	12⅜
G	27/64	27/64	—
H	4 1/32	4 1/32	—
J	⅜	⅜	—
K	2¾	2¾	—
L	6¾	6¾	—
M	31/64	31/64	31/64
N	6 9/16	6 9/16	.6 9/16
P	2 9/16	6 31/32	5 15/16
GG	½	½	½
HH	1 9/32	1 9/32	1 9/32
JJ	2 11/16	2 11/16	2 11/16



DIM.	HE K
A	5.22
*B	16.50
*C	3.12
*D	1.06
E	1.48
F	2.25
*G	2.94
*H	—
*J	2.38
K	1.75
*L	0.94

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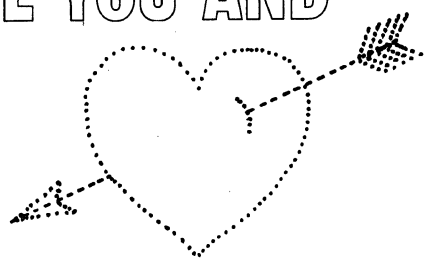
POWER/MATE DOESN'T LOVE YOU AND LEAVE YOU



Because SERVICE to our CUSTOMERS is one of our KEY policies.

That's why we have automated and computerized our entire paper work system . . . so our people can spend more time serving you and your needs.

And that's why our Customer Service group is under one responsible operating manager. His task encompasses order handling, processing applications, field service and technical publications; and most importantly over $1,000,000 worth of finished power supply inventory on the shelf! ! !

All these services are coordinated to serve you better and more efficiently than anyone else.

POWER/MATE MEANS PEOPLE

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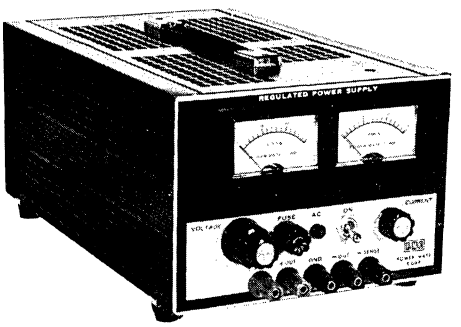
BP LABORATORY POWER SUPPLIES

PRODUCT DIGEST

The POWER/MATE Bench Pac (BP) line of laboratory power supplies consists of 23 different models. This versatile group of DC bench units, voltage and current regulated, can meet every laboratory and systems power supply requirement, offering a complete range of outputs from 0 to 60 volts with currents up to 15 amperes.

Special features of the UniPower Bench Pacs include: high accuracy, adjustable current limiting, concentric controls for course and fine voltage adjustment, constant voltage and/or constant current, front panel remote sensing of output voltage (Models "E" through "H"), AC indicator, on/off switch, five-way binding posts, easy-to-read dual meters, and the added feature of built-in short-circuit protection.

Low in cost and high in performance, these general-purpose bench supplies employ the same field-proven designs and state-of-the-art solid state silicon circuitry found in POWER/MATE's UNI Series and OEM Series power modules. The UNI concept provides a combination of mechanical and electrical maximum reliability features, and the Bench Pacs carry the full 5-Year POWER/MATE Warranty.



REGULATION —
Load: The regulation for load changes is less than .01% +1 millivolt, whichever is greater from no load to full load.

Line: The regulation is less than 0.01% +1 millivolt, whichever is greater, for a line change from 125V to 105V at constant load.

RIPPLE: Less than 250 microvolts.

SPECIFICATIONS

INPUT: 105-125 Volts, 47-420 cps, single phase.

OUTPUT VOLTAGE AND CURRENT: See Respective Tables.

REGULATION —

Load: The regulation for load changes is less than .01% +1 millivolt, whichever is greater from no load to full load.

Line: The regulation is less than 0.01% +1 millivolt, whichever is greater, for a line change from 125V to 105V at constant load.

RIPPLE: Less than 250 microvolts.

TRANSIENT RESPONSE: For a ±10 Volt step change in line voltage, or for a no load to full load, or a full load to no load step change, the output voltage will return to within 10 millivolts of the regulated region in less than 20 microseconds.

METERS: Voltmeter and ammeter, rated accurate to 2% of full scale value, are provided on the front panel.

POLARITY: The output may be "floated" up to 300V peak above ground. Either polarity may be grounded to chassis by means of terminals provided.

CONSTANT CURRENT, CONSTANT VOLTAGE: Constant current and constant voltage levels may be preset within the maximum rated voltage and current levels specified in appropriate tables. The intersection of the constant voltage and constant current operation lines called the "Crossover Point" may be located anywhere within the output volt-ampere range of the unit. Regardless of the demands of the load, the output voltage and/or the output current will never exceed the limits (1% or better) preset by the output voltage and output current controls.

CONTROLS —

Voltage: Continuously variable coarse and vernier DC OUTPUT ADJUST potentiometers on concentric shafts provide variable DC Output.

Current: Continuously variable single turn potentiometer provides current limiting adjustment.

TEMPERATURE COEFFICIENT: Better than 0.01%/°C.

LONG TERM STABILITY: Better than 0.025% for 8 hours.

DUTY: Continuous at ambient temperatures from 0°C to 50°C. Operation above 50°C is allowed provided the output current is derated 20% for every 10°C rise above 50°C.

REMOTE SENSING: Sensing terminals, separate from the Output terminals, provide sensing and load regulation against the voltage at the load rather than the voltage at the power supply output terminals. This eliminates the otherwise unavoidable load regulation due to the voltage drop in the wires connecting the supply to the adjacent load.

REMOTE PROGRAMMING: The output voltage may be controlled accurately from a remote point if desired by inserting a resistance across the REMOTE PROGRAM terminals. The sensitivity of this circuit is approximately 100 ohms per volt.

PARALLELING: Two or more units may be operated in series to provide higher voltage output at rated current. Units of the same voltage and current ratings may be operated in parallel.

PROTECTION: Load and power supply protection for any overload condition is accomplished by an adjustable electronic current limiting circuit controlled by a front panel potentiometer.

AIRFLOW: All units are convection cooled and do not require internal blowers or depend on internal forced air cooling.

INSPECTION: MIL-Q-9858 Procedures.

MECHANICAL DATA

FINISH: Front panel is finished with dual tone grey and black baked enamel. Panel marking is grey. All other finishes are appropriate paint, plating, or chemical film as required.

MOUNTING: Units are designed for bench operation, however, rack adapters are available
Consult factory for special systems configurations.

ACCESSORIES: Bench Pacs can be rack mounted as required. Up to three Series "C," or two Series "D" power supplies will mount in a standard 19" rack, just 3½" high.

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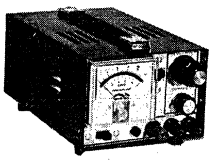
BP LABORATORY POWER SUPPLIES



"SERIES C" BENCH PACS

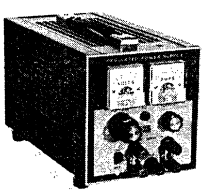
$89.00

Model	DC Output Volts	DC Output Amperes	Case Size Height Width Depth	Price	Shipping Weight
BP-8C	0-8	0-1.5	3⅜ x 5⅜ x 7¼	$89.00	6.5 lbs.
BP-18C	0-18	0-1.0	3⅜ x 5⅜ x 7¼	$89.00	6.5 lbs.
BP-34C	0-34	0-5	3⅜ x 5⅜ x 7¼	$89.00	6.5 lbs.

"SERIES D" BENCH PACS

$129.00

Model	DC Output Volts	DC Output Amperes	Case Size Height Width Depth	Price	Shipping Weight
BP-8D	0- 8	0-4	3⅜ x 6⅞ x 7¼	129.00	8.0 lbs.
BP-18D	0-18	0-2.5	3⅜ x 6⅞ x 7¼	129.00	8.0 lbs.
BP-20D	0-20	0-2.0	3⅜ x 6⅞ x 7¼	129.00	8.0 lbs.
BP-34D	0-34	0-1.5	3⅜ x 6⅞ x 7¼	129.00	8.0 lbs.
BP-40D	0-40	0-1.0	3⅜ x 6⅞ x 7¼	129.00	8.0 lbs.
BP-60D	0-60	0-.750	3⅜ x 6⅞ x 7¼	129.00	8.0 lbs.



"SERIES E" BENCH PACS

$225.00

Model	DC Output Volts	DC Output Amperes	Case Size Height Width Depth	Price	Shipping Weight
BP-8E	0-8	0-6.5	5 3/32 x 5 3/32 x 9⅜	225.00	20.0 lbs.
BP-18E	0-18	0-3.5	5 3/32 x 5 3/32 x 9⅜	225.00	20.0 lbs.
BP-20E	0-20	0-3.0	5 3/32 x 5 3/32 x 9⅜	225.00	20.0 lbs.
BP-34E	0-34	0-2.5	5 3/32 x 5 3/32 x 9⅜	225.00	20.0 lbs.
BP-40E	0-40	0-2.2	5 3/32 x 5 3/32 x 9⅜	225.00	20.0 lbs.
BP-60E	0-60	0-1.25	5 3/32 x 5 3/32 x 9⅜	225.00	20.0 lbs.

BENCH PAC ACCESSORIES

POWER/MATE's Bench Pac may be rack mounted when desired. Up to 3 BP Series C Bench Pacs or 2 Series D, E, F, G or H Bench Pacs can be mounted in a standard 19" rack. Adaptors available are:

1. Model RK 89 for 1, 2, or 3 Series C Bench Pacs
   Price—$22.00 each.
2. Model RK 118 for 1, or 2 Series D Bench Pacs
   Price $22.00 each.
3. Model RK 125 for 1 Series E Bench Pac
   Price—$33.00 each.
4. Model RK 129 for 2 Series E Bench Pacs
   Price—$35.00 each.
5. Model RK 135 for 1 Series F, G, or H Bench Pacs
   Price—$37.00 each.
6. Model RK 139 for 2 Series F, G, or H Bench Pacs
   Price—$39.00.

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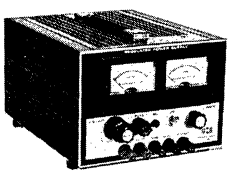
BP LABORATORY POWER SUPPLIES

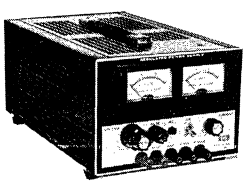
"SERIES F" BENCH PACS



$249.00

Model	DC Output Volts	DC Output Amperes	Case Size Height x Width x Depth	Price	Shipping Weight
BP-8F	0-8	0-9	5 3/32 x 7 1/2 x 9 3/8	249.00	25.0 lbs.
BP-18F	0-18	0-5	5 3/32 x 7 1/2 x 9 3/8	249.00	25.0 lbs.
BP-20F	0-20	0-4.5	5 3/32 x 7 1/2 x 9 3/8	249.00	25.0 lbs.
BP-34F	0-34	0-3.5	5 3/32 x 7 1/2 x 9 3/8	249.00	25.0 lbs.
BP-40F	0-40	0-3.0	5 3/32 x 7 1/2 x 9 3/8	249.00	25.0 lbs.
BP-60F	0-60	0-1.75	5 3/32 x 7 1/2 x 9 3/8	249.00	25.0 lbs.

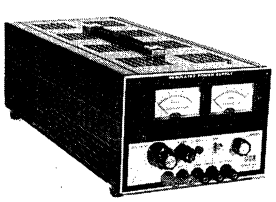
"SERIES G" BENCH PACS



$319.00

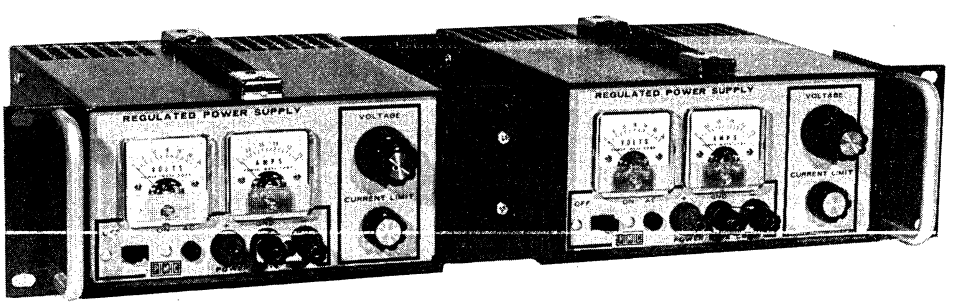
Model	DC Output Volts	DC Output Amperes	Case Size Height x Width x Depth	Price	Shipping Weight
BP-8G	0-8	0-12	5 3/32 x 7 1/2 x 11 7/8	319.00	31.0 lbs.
BP-18G	0-18	0-6.5	5 3/32 x 7 1/2 x 11 7/8	319.00	31.0 lbs.
BP-20G	0-20	0-6.0	5 3/32 x 7 1/2 x 11 7/8	319.00	31.0 lbs.
BP-34G	0-34	0-5	5 3/32 x 7 1/2 x 11 7/8	319.00	31.0 lbs.
BP-40G	0-40	0-4.5	5 3/32 x 7 1/2 x 11 7/8	319.00	31.0 lbs.
BP-60G	0-60	0-2.5	5 3/32 x 7 1/2 x 11 7/8	319.00	31.0 lbs.

"SERIES H" BENCH PACS



$369.00

Model	DC Output Volts	DC Output Amperes	Case Size Height x Width x Depth	Price	Shipping Weight
BP-8H	0-8	0-15	5 3/32 x 7 1/2 x 16 1/2	369.00	40.0 lbs.
BP-18H	0-18	0-9	5 3/32 x 7 1/2 x 16 1/2	369.00	40.0 lbs.
BP-20H	0-20	0-8	5 3/32 x 7 1/2 x 16 1/2	369.00	40.0 lbs.
BP-34H	0-34	0-6.5	5 3/32 x 7 1/2 x 16 1/2	369.00	40.0 lbs.
BP-40H	0-40	0-6.0	5 3/32 x 7 1/2 x 16 1/2	369.00	40.0 lbs.
BP-60H	0-60	0-3.25	5 3/32 x 7 1/2 x 16 1/2	369.00	40.0 lbs.



POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

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PR HIGH CURRENT RACK POWER SUPPLIES

PRODUCT DIGEST

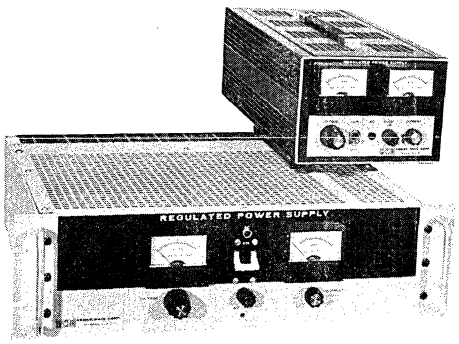
Power/Mate's new Power Rack "PR" Series, high current power supplies, consist of 16 different models in three all convection cooled package sizes (HM, K and L packages). The "PR" Series are both voltage and current regulated and can satisfy virtually every laboratory and systems power supply requirements. A complete range of outputs from 0-60 VDC with currents to 100 amperes are available as standard models.

Special features of the "PR" Series include high accuracy, adjustable current limiting, concentric controls for course and fine voltage adjustment, constant voltage and/or constant current, remote sensing, large easy to read precision meters and built-in short circuit and overload protection. Built-in overvoltage protection is offered on all models.

Power/Mate's unique "SIMAG" design concept (patent pending) allows the power supplies to be packaged in approximately 20% less space than equivalent conventional series power supplies.

The "PR" Series offer the same wide variety of options as the other Power/Mate Corporation systems power supplies. Typical available options are fungus proofing with MIL-173 varnish, wide input AC ranges, chassis slides, and overvoltage protection.

As with all Power/Mate power supplies, the new "PR" Series is backed by Power/Mate's Five Year Warranty.



REGULATED VOLTAGE:
Line-- 0.015 % + 1mV for line variations from 105-132 VAC.
Load— 0.015 % + 1mV for load variations from 0 to full load.

RIPPLE: Less than .5mV RMS with either positive or negative terminal grounded.

SPECIFICATIONS

AC INPUT: 105-132 VAC, 57-63HZ;
Package L 188-238 VAC, 57-63HZ.

OUTPUT VOLTAGE AND CURRENT: See respective tables.

REGULATED VOLTAGE:
Line— 0.015 % + 1mV for line variations from 105-132 VAC.
Load— 0.015 % + 1mV for load variations from 0 to full load.

RIPPLE: Less than .5mV RMS with either positive or negative terminal grounded.

CURRENT REGULATION: Less than 0.05% of maximum rating, 0-95% DC Voltage change.

CURRENT RIPPLE: Less than 0.05% of maximum rating.

METERS: Voltmeter and ammeter, rated accurate of 2% of full scale value, are provided on the front panel.

POLARITY: The output may be "floated" up to 300 V peak above ground. Either polarity may be grounded to chassis by means of terminals provided.

FINISH: Front panel is finished with dual tone gray and black baked enamel with brushed aluminum handles. Panel marking is gray. All other finishes are appropriate paint, plating, or chemical film, as required.

TEMPERATURE COEFFICIENT: Better than 0.015%C.

REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.

OVERLOAD AND SHORT CIRCUIT PROTECTION: Solid state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short circuits or overloads.
Thermal—Thermostat; automatic reset when overtemperature condition is eliminated.

AMBIENT OPERATING TEMPERATURE: Continuous duty from 0 to +71°C ambient.

STORAGE TEMPERATURE: —55°C to +85°C.

INPUT AND OUTPUT CONNECTIONS: Heavy duty terminal block on rear of chassis.

OVERVOLTAGE PROTECTION: Optional

AVAILABLE OPTIONS

OVERVOLTAGE PROTECTION: Built-in overvoltage protection is optional on all models. To order OVP, add suffix "OV" to the model number and add $35 to the price for "H" package, $60 to the price for "K" package, and $100 to the price for "L" package.

5 Year Warranty

5-YEAR WARRANTY

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

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PR HIGH CURRENT RACK POWER SUPPLIES

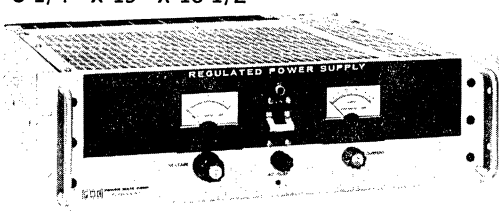
PACKAGE "H"

5-3/32" x 7-1/2" x 16-1/2"

Model	Adj. Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PR-8-HM	0-8	35.0	30.0	25.0	18.0	$ 410
PR-20-HM	0-20	15.0	12.0	11.0	8.0	410
PR-36-HM	0.36	10.0	9.0	8.0	6.5	410
PR-40-HM	0-40	10.0	9.0	8.0	6.5	415
PR-60-HM	0-60	6.0	5.2	4.5	4.0	415

PACKAGE "K"

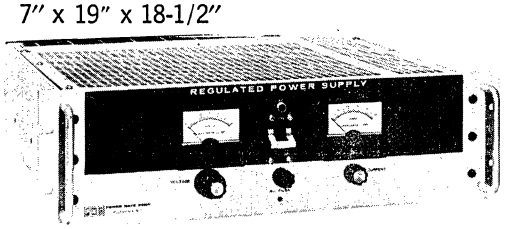
5-1/4" x 19" x 16-1/2"



Model	Adj. Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PR-8-KM	0-8	70.0	60.0	50.0	40.0	$ 689
PR-20-KM	0-20	36.0	31.0	26.0	20.0	689
PR-36-KM	0-36	26.0	23.0	20.0	15.0	659
PR-40-KM	0-40	26.0	23.0	20.0	15.0	669
PR-60-KM	0-60	16.0	14.0	12.0	10.0	669

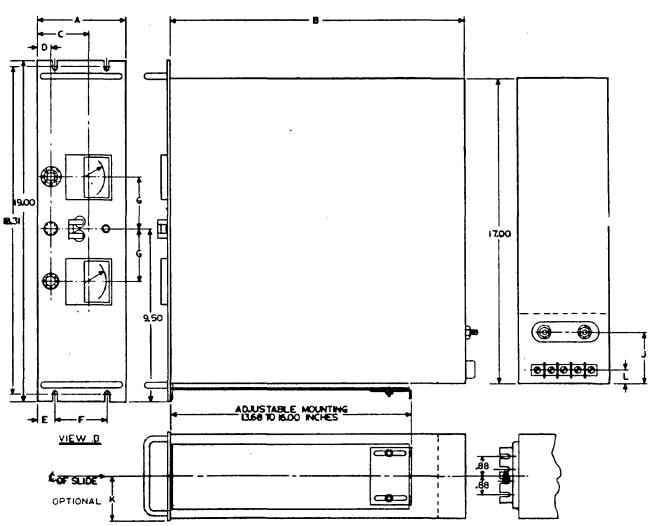
PACKAGE "L"

7" x 19" x 18-1/2"



Model	Adj. Volt. Range VDC	Max. Amps. at Ambient of: 40°C	50°C	60°C	71°C	Price
PR-8-LM	0-8	100.0	85.0	70.0	55.0	$1050
PR-20-LM	0-20	70.0	60.0	50.0	40.0	1050
PR-36-LM	0-36	50.0	45.0	37.0	31.0	989
PR-40-LM	0-40	50.0	45.0	37.0	31.0	999
PR-60-LM	0-60	25.0	24.0	22.0	20.0	999

Dim.	PR K Case	PR L Case
A	5.22	6.97
*B	16.50	16.50
*C	3.12	4.68
*D	1.06	1.62
E	1.48	1.48
F	2.25	4.00
*G	2.94	2.94
*H		
*J	4.06	4.06
K	3.50	3.50
*L	1.12	1.12



Note

1. * Denotes approximate dimensions.

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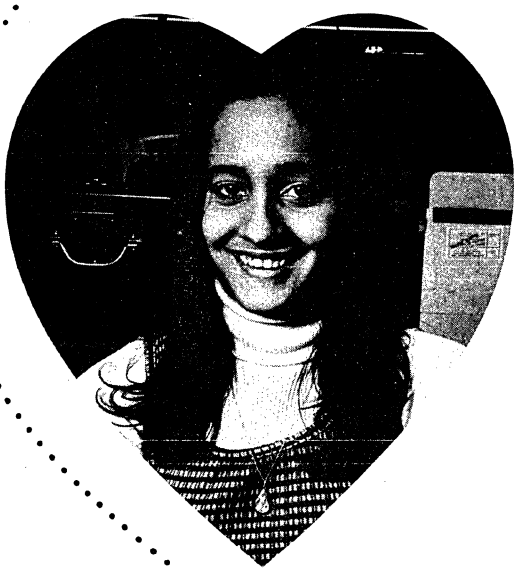

EVERYONE AT POWER/MATE LOVES YOU

WHY?

Because, it's **you,** our customer, that keeps us working and gives us a JOB!

Only when **you** are completely satisfied with our total product and quality performance will you keep coming back to Power/Mate for all your power supply needs.

Everyone at Power/Mate is aware of you, our customer, and your needs, and your importance.

That's why all of us work so hard to continually improve our high standards of quality.

And . . . that's why we love you.

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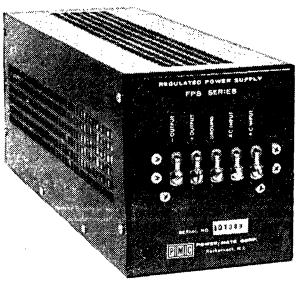
FPS FERRORESONANT POWER SUPPLIES

PRODUCT DIGEST

FPS Power Supplies use PMC's uniquely designed "MAG-POWER" ferroresonant power transformer to provide simple, efficient and economical operation. They deliver more power-per-penny than conventional units. FPS Series units supply DC outputs from 5 to 60 volts with currents to 75 amps. The inherent simplicity of design of these supplies greatly increases the reliability. All components are conservatively rated to further assure optimum performance.

Efficiency is high, in the area of 70-90%. Typical reliability is more than 150,000 hours MTBF. Quality features include built-in limiting for over-voltage and over-current, short circuit protection, and all-silicon semiconductors.

The FPS units, which operate in series or parallel, may be used with many of the standard POWER/MATE racks and metered accessories. This makes the FPS Series compatible with all other PMC supplies to produce a uniquely tailored power supply system to suit your demands.



REGULATION LINE: ±1%, for ±15 volt AC line variation, at 25-100% load. For loads below 25%, line regulation is ±1.5% output change.

REGULATION LOAD: See charts.

SPECIFICATIONS

INPUT: 115 VAC ±15 VAC, 60 Hz ±5% single phase. Input frequency variations produces an approximate equal percentage output voltage change.

OUTPUT VOLTAGE: See charts.

OUTPUT IMPEDANCE: 1 kHz-10 kHz: 0.05 ohms, 10 kHz-100 kHz: 0.05 ohms +0.5 microhenries.

ACCURACY: ±2%, measured at 115 VAC, full load, 30°C. Initial cold output is 1% higher.

REGULATION LINE: ±1%, for ±15 volt AC line variation, at 25-100% load. For loads below 25%, line regulation is ±1.5% output change.

REGULATION LOAD: See charts.

STABILITY (8 hr.): 1% or 0.1V, whichever is greater.

TEMPERATURE COEFFICIENT: 0.05%/C°.

AMBIENT OPERATING TEMPERATURE: −20°C to +55°C.

STORAGE TEMPERATURE: −40°C to +85°C.

COOLING: Convection.

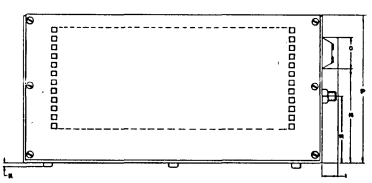
TRANSIENT RESPONSE: (50-100% current) 50 milliseconds.

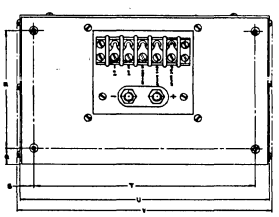
OVERLOAD PROTECTION: Current limiting transformer restricts short circuit current to safe value.

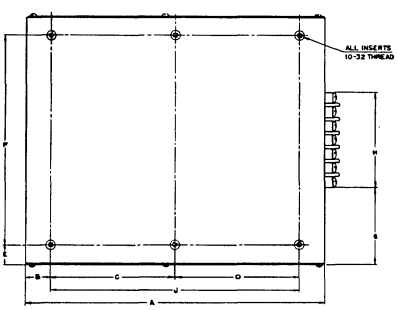
ISOLATION VOLTAGE: 600 volts to chassis.

SERIES/PARALLEL OPERATION: Identical models, can be paralleled for approximately double current (allow for 10% imbalance). Series operation to rated isolation.

MECHANICAL DATA







FPS SERIES				
MODEL	FB	FC	FCF	FD
A	8	10 5/8	14 5/8	12
B	3/8	5 1/16	5 1/16	1
C			4 13/16	5
D			4	5
E	3/8	17/32	17/32	13/16
F	2 9/16	3 3/4	3 3/4	8 3/8
G				3 3/32
H				3 13/16
J	7 1/4	4 13/16		
K	1/8	1/8	1/8	1/8
L	13/32	5/8	5/8	5/8
M				2 11/16
N	2 1/8	2 3/8	2 3/8	3 7/8
O	7/8	1 1/4	1 1/4	1 1/4
P	4	5 13/32	5 13/32	6
Q	13/16	5/8	5/8	5/8
R	2 9/16	4 3/8	4 3/8	4 1/8
S	3/8	17/32	17/32	5/8
T	2 9/16	3 3/4	3 3/4	8 3/4
U	3 5/16	4 27/32	4 27/32	10
V	3 1/2			

5 Year Warranty

5-YEAR WARRANTY

To express our confidence in the skill and care with which our power supplies are designed and built — confidence based on an impressive 100,000 hour MTBF — we offer the POWER/MATE 5-Year Warranty.

MIL/SPEC PERFORMANCE

Independently tested to meet the environment of MIL-E-5272 and related specs. See MIL SPEC Section of this catalog.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

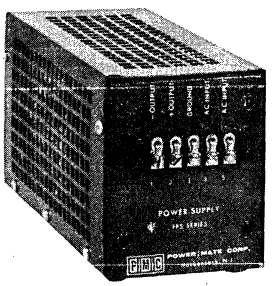
PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

FPS FERRORESONANT POWER SUPPLIES

SERIES 60

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD REGULATION VOLTAGE INCREASE FULL ½ LOAD	LOAD REGULATION VOLTAGE INCREASE FULL ¼ LOAD	RIPPLE V. RMS	NET WEIGHT POUNDS	CASE SIZE	PRICE
FPS-5-7	5	7	.8	1.2	.4	11	FB	$ 83
FPS-5-7	6	7	.8	1.2	.4	11	FB	83
FPS-12-5	12	5	.7	1.2	.4	11	FB	83
FPS-15-4	15	4	.7	1.2	.3	11	FB	83
FPS-18-3.3	18	3.3	.7	1.2	.3	11	FB	83
FPS-24-2.5	24	2.5	.7	1.2	.3	11	FB	83
FPS-28-2	28	2.0	.7	1.2	.3	11	FB	83
FPS-36-1.6	36	1.6	.8	1.3	.3	11	FB	83
FPS-48-1.2	48	1.2	1.0	1.7	.3	11	FB	83
FPS-60-1	60	1.0	1.4	2.4	.3	11	FB	83

$83.00

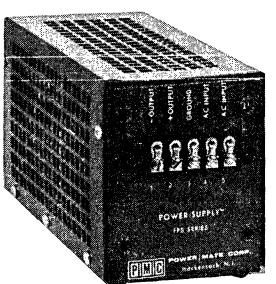


SERIES 90

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD REGULATION VOLTAGE INCREASE FULL ½ LOAD	LOAD REGULATION VOLTAGE INCREASE FULL ¼ LOAD	RIPPLE V. RMS	NET WEIGHT POUNDS	CASE SIZE	PRICE
FPS-5-12	5	12	.5	.8	.4	13	FC	$105
FPS-5-12F	5*	12	.7	1.2	.04	16	FCF	145
FPS-6-12	6	12	.5	.8	.4	13	FC	105
FPS-6-12F	6*	12	.7	1.2	.04	16	FCF	145
FPS-12-7.5	12	7.5	.6	1.0	.4	13	FC	105
FPS-12-7.5F	12*	7.5	.9	1.4	.03	16	FCF	145
FPS-15-6	15	6	.6	1.0	.3	13	FC	105
FPS-15-6F	15*	6	.9	1.4	.02	16	FCF	145
FPS-18-5	18	5	.6	1.0	.3	13	FC	105
FPS-18-5F	18*	5	.9	1.5	.02	16	FCF	145
FPS-24-3.7	24	3.7	.7	1.2	.3	13	FC	105
FPS-24-3.7F	24*	3.7	1.2	2.0	.01	16	FCF	145
FPS-28-3.2	28	3.2	.7	1.2	.3	13	FC	105
FPS-28-3.2F	28*	3.2	1.3	2.1	.01	16	FCF	145
FPS-36-2.5	36	2.5	.8	1.3	.3	13	FC	105
FPS-36-2.5F	36*	2.5	1.5	2.4	.01	16	FCF	145
FPS-48-1.9	48	1.9	1.0	1.8	.3	13	FC	105
FPS-48-1.9F	48*	1.9	1.7	2.9	.005	16	FCF	145
FPS-60-1.5	60	1.5	1.2	2.4	.3	13	FC	105
FPS-60-1.5F	60*	1.5	2.0	3.4	.005	16	FCF	145

*Less 2% Filter Drop

$105.00



SERIES 120

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD REGULATION VOLTAGE INCREASE FULL ½ LOAD	LOAD REGULATION VOLTAGE INCREASE FULL ¼ LOAD	RIPPLE V. RMS	NET WEIGHT POUNDS	CASE SIZE	PRICE
FPS-5-15	5	15	.5	.8	.4	16	FC	$112
FPS-5-15F	5*	15	.7	1.2	.04	22	FCF	165
FPS-6-15	6	15	.5	.8	.4	16	FC	112
FPS-6-15F	6*	15	.7	1.2	.04	22	FCF	165
FPS-12-10	12	10	.6	1.0	.4	16	FC	112
FPS-12-10F	12*	10	.9	1.4	.02	22	FCF	165
FPS-15-8.0	15	8.0	.6	1.0	.3	16	FC	112
FPS-15-8.0F	15*	8.0	.9	1.4	.02	22	FCF	165
FPS-18-6.7	18	6.7	.6	1.0	.3	16	FC	112
FPS-18-6.7F	18*	6.7	.9	1.5	.01	22	FCF	165
FPS-24-5.0	24	5.0	.7	1.2	.3	16	FC	112
FPS-24-5.0F	24*	5.0	1.2	2.0	.005	22	FCF	165
FPS-28-4.3	28	4.3	.7	1.2	.3	16	FC	112
FPS-28-4.3F	28*	4.3	1.3	2.1	.005	22	FCF	165
FPS-36-3.3	36	3.3	.8	1.3	.3	16	FC	112
FPS-36-3.3F	36*	3.3	1.5	2.4	.005	22	FCF	165
FPS-48-2.5	48	2.5	1.0	1.8	.3	16	FC	112
FPS-48-2.5F	48*	2.5	1.7	2.9	.003	22	FCF	165
FPS-60-2.0	60	2.0	1.2	2.0	.3	16	FC	112
FPS-60-2.0F	60*	2.0	1.9	3.0	.002	22	FCF	165

*Less 2% Filter Drop

$112.00

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FPS FERRORESONANT POWER SUPPLIES

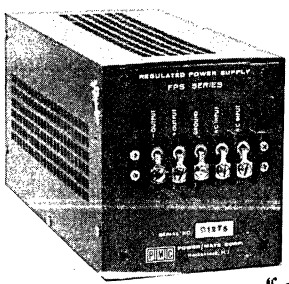
SERIES 180

$135.00

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD REGULATION VOLTAGE INCREASE FULL ½ LOAD	LOAD REGULATION VOLTAGE INCREASE FULL ¼ LOAD	RIPPLE V. RMS	NET WEIGHT POUNDS	CASE SIZE	PRICE
FPS-5-25	5	25	.5	.8	.4	18	FC	$135
FPS-5-25F	5*	25	.7	1.2	.04	24	FCF	185
FPS-6-25	6	25	.5	.8	.4	18	FC	135
FPS-6-25F	6*	25	.7	1.2	.04	24	FCF	185
FPS-12-15	12	15	.6	1.0	.4	18	FC	135
FPS-12-15F	12*	15	.9	1.4	.02	24	FCF	185
FPS-15-12	15	12	.6	1.0	.3	18	FC	135
FPS-15-12F	15*	12	.9	1.4	.02	24	FCF	185
FPS-18-10	18	10	.6	1.0	.3	18	FC	135
FPS-18-10F	18*	10	.9	1.5	.01	24	FCF	185
FPS-24-8	24	8	.7	1.2	.3	18	FC	135
FPS-24-8F	24*	8	1.2	2.0	.005	24	FCF	185
FPS-28-7	28	7	.7	1.2	.4	18	FC	135
FPS-28-7F	28*	7	1.3	2.1	.005	24	FCF	185
FPS-36-5	36	5	.8	1.3	.4	18	FC	135
FPS-36-5F	36*	5	1.5	2.4	.005	24	FCF	185
FPS-48-4	48	4	1.0	1.8	.3	18	FC	135
FPS-48-4F	48*	4	1.7	2.9	.003	24	FCF	185
FPS-60-3	60	3	1.2	2.2	.2	18	FC	135
FPS-60-3F	60*	3	2.0	3.2	.002	24	FCF	185

*Less 2% Filter Drop

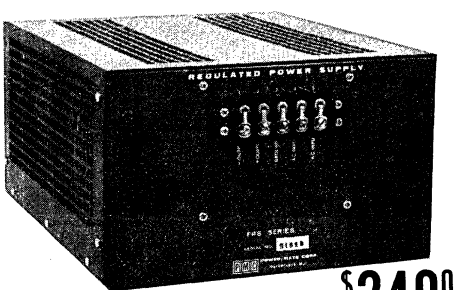
SERIES 300



$175.00

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD REGULATION VOLTAGE INCREASE FULL ½ LOAD	LOAD REGULATION VOLTAGE INCREASE FULL ¼ LOAD	RIPPLE V. RMS	NET WEIGHT POUNDS	CASE SIZE	PRICE
FPS-5-48	5	48	.7	1.0	.5	25	FCF	$175
FPS-6-45	6	45	.7	1.0	.5	25	FCF	175
FPS-12-25	12	25	.9	1.2	.5	25	FCF	175
FPS-15-20	15	20	.9	1.2	.4	25	FCF	175
FPS-18-17	18	17	.9	1.2	.4	25	FCF	175
FPS-24-12	24	12	1.0	1.2	.4	25	FCF	175
FPS-28-11	28	11	1.0	1.2	.4	25	FCF	175
FPS-36-8.5	36	8.5	1.2	1.5	.4	25	FCF	175
FPS-48-6.3	48	6.3	1.2	1.8	.4	25	FCF	175
FPS-60-5.0	60	5.0	1.5	2.4	.4	25	FCF	175

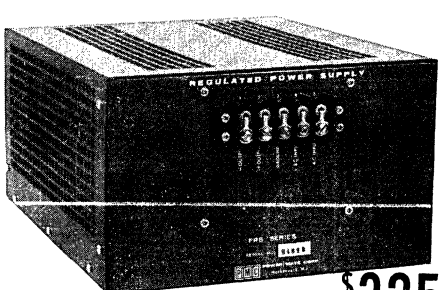
SERIES 500



$240.00

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD REGULATION VOLTAGE INCREASE FULL ½ LOAD	LOAD REGULATION VOLTAGE INCREASE FULL ¼ LOAD	RIPPLE V. RMS	NET WEIGHT POUNDS	CASE SIZE	PRICE
FPS-5-100	5	100	1.0	1.7	.5	45	FD	$240
FPS-6-100	6	100	1.0	1.7	.5	45	FD	240
FPS-12-45	12	45	1.0	1.7	.5	45	FD	240
FPS-15-35	15	35	1.0	1.7	.4	45	FD	240
FPS-18-28	18	28	1.0	1.7	.4	45	FD	240
FPS-24-22	24	22	1.2	1.9	.4	45	FD	240
FPS-28-18	28	18	1.2	1.9	.4	45	FD	240
FPS-36-15	36	15	1.2	1.9	.4	45	FD	240
FPS-48-11	48	11	1.5	2.4	.3	45	FD	240
FPS-60-8.5	60	8.5	1.5	2.4	.3	45	FD	240

SERIES 750



$325.00

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD REGULATION VOLTAGE INCREASE FULL ½ LOAD	LOAD REGULATION VOLTAGE INCREASE FULL ¼ LOAD	RIPPLE V. RMS	NET WEIGHT POUNDS	CASE SIZE	PRICE
FPS-5-125	5	125	1.2	1.7	.7	65	FD	$325
FPS-6-120	6	120	1.2	1.7	.7	65	FD	325
FPS-12-62	12	62	1.2	1.7	.6	65	FD	325
FPS-15-50	15	50	1.2	1.7	.6	65	FD	325
FPS-18-45	18	45	1.4	2.0	.5	65	FD	325
FPS-24-30	24	30	1.4	2.0	.5	65	FD	325
FPS-28-26	28	26	1.4	2.0	.5	65	FD	325
FPS-36-24	36	24	1.4	2.0	.5	65	FD	325
FPS-48-15	48	15	1.7	2.5	.4	65	FD	325
FPS-60-12.5	60	12.5	2.0	3.0	.4	65	FD	325

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

POWER/MATE CORP.
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

MM MINIATURE POWER SUPPLIES

PRODUCT DIGEST

The Power/Mate "Mini/Mate" Series regulated power supplies are a minature encapsulated series of DC power supplies which, in addition to their high performance qualities, are ultra-reliable, compact, rugged and moderate in price.

All Mini/Mate encapsulated power supplies are "potted" with an aluminum oxide filled epoxy. This is among one of the many superior construction techniques which allow higher heat conduction to insure highly reliable operation and virtually any environmental condition.

The Mini/Mate Series contain both AC to DC and DC to DC power supplies, and are available with either single or dual outputs. The output voltage and current ranges of the Mini/Mate Series provide the user with maximum versatility. Over 165 models are available in voltages from 3.6 Vdc to 200 Vdc with current to 2 amp. The Mini/Mates are particularly appropriate for use in today's modern applications. Common uses for the Mini/Mate Series are the power Operational Amplifiers, Digital Logic, Shift Registers, ROM's, RAM's, A to D converters, D to A converters, and other signal conditioning instrumentation.

The Mini/Mate Series are packaged in either the standard rectangular case or Power/Mate's new space saving "Mini-Square" module that saves PC board area for more compact designs.

Whatever your choice, AC to DC, DC to DC, encapsulated or plug-in, each of these miniature DC power supplies is backed by Power/Mate's world-wide reputation for power supply excellence.

LOAD REGULATION: ±0.02% (NL-FL) above 10VDC. ±0.05% (NL-FL) up to 10VDC.

LINE REGULATION: ±0.02% (NL-FL) above 10VDC. ±0.05% (NL-FL) up to 10VDC.

RIPPLE: Less than 500 microvolts up to 15VDC. Less than 1.0 mv above 15 VDC.

SPECIFICATIONS

INPUT VOLTAGE: 115 ±10VAC, 50-400 cps.

OUTPUT VOLTAGE: Up to 200VDC. (See charts).

OUTPUT CURRENT: Up to 2 Amps. (See charts).

LOAD REGULATION: ±0.015% (NL-FL) above 10VDC. ±0.035% (NL-FL) up to 10VDC.

LINE REGULATION: ±0.015% (NL-FL) above 10VDC. ±0.02% (NL-FL) up to 10VDC.

RIPPLE: Less than 500 microvolts up to 15VDC. Less than 1.0 mv above 15 VDC.

OPERATING TEMPERATURE RANGE: 0-71°C.

STORAGE TEMPERATURE: −25°C to +85°C.

OUTPUT IMPEDANCE: 0.2 ohms @ 10KHZ.

TEMPERATURE COEFFICIENT: 0.02%/°C Max.

OUTPUT CURRENT VC TEMPERATURE: Each output is rated for full current at temperatures between −20°C and +50°C and is linearly derated from +50° to 70% of the full output at +71°C.

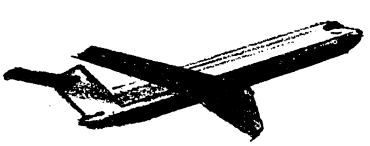
SHORT CIRCUIT PROTECTION: The Mini/Mate Series power supplies are ruggedly constructed, and designed with built-in short circuit protection to withstand substantial overloads for reasonable periods of time. The output can be shorted without causing damage to the power supply. However, prolonged operation with the supply overloaded or shorted is not recommended.

PRECISION OUTPUT ADJUST: The output voltage of each supply is factory set to within ±2% of the specified voltage. The TRIM connection, where provided, allows a means of externally adjusting the output voltage precisely to the labeled voltage.

AVAILABLE OPTIONS

1. For 230VAC, add suffix "-230" to model number and add $5.00 to price.

SAME DAY SHIPMENT



Each MM unit is warranteed for 1 full year.

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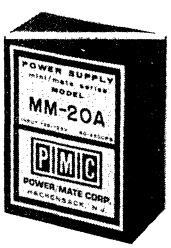
MM MINIATURE POWER SUPPLIES

"STANDARD" CASE IC LOGIC SINGLE OUTPUT POWER SUPPLIES

Model	Output Voltage	Current (MA)	Case (FIG)	Price
MM-3.6B	3.6	250	11	39.95
MM-5AL	5	125	11	29.95
MM-5BL	5	250	11	37.95
MM-5CL	5	250	2	37.95
MM-5H-OV	5	500	2	43.95
MM-5J-OV	5	1000	3	63.95
MM-5M-OV	5	1500	3	89.95
MM-5P-OV	5	2000	5	99.95
MM-6B	6	200	11	39.95

"Standard Case" Models stocked in depth for **SAME DAY SHIPMENT.**

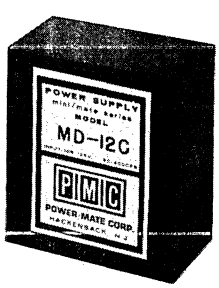
"STANDARD" CASE GENERAL PURPOSE SINGLE OUTPUT POWER SUPPLIES



Model	Output Voltage	Current (MA)	Case (FIG)	Price
MM-10A	10	120	1	26.95
MM-12A	12	100	1	26.95
MM-15A	15	100	1	26.95
MM-18T	18	65	1	26.95
MM-20A	20	60	1	26.95
MM-24A	24	50	1	26.95
MM-28A	28	40	1	26.95

"Standard Case" Models stocked in depth for **SAME DAY SHIPMENT.**

"STANDARD" CASE DUAL OUTPUT OP AMP POWER SUPPLIES



Model	Output Voltage	Current Each Side (MA)	Case (FIG)	Price
MD-10C	±10	120	2	54.95
MD-10D	±10	240	3	59.95
MD-12D	±12	120	2	54.95
MD-12E	±12	240	3	72.95
MD-15J	±15	25	2	26.95
MD-15B	±15	65	2	39.95
MD-15A	±15	100	2	43.95
MD-15W	±15	150	3	54.95
MD-15N	±15	200	3	69.95
MD-15P	±15	300	5	96.95
MD-18C	±18	65	3	59.95

"Standard Case" Models stocked in depth for **SAME DAY SHIPMENT.**

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Phone: (201) 343-6294 TWX: (710) 990-5023

MM MINIATURE POWER SUPPLIES

"MULTIPLE OUTPUT" SYSTEMS POWER SUPPLIES

Model	Output	Current Each Output	Case	Price
MT-15/5	±15 + 5	100 250	4	86.95
MT-15/5A	±15 + 5	100 500	4	96.95
MT-15/5B	±15 + 5	150 300	6	89.95

NEW "MINI-SQUARE" IC LOGIC SINGLE OUTPUT POWER SUPPLIES

Model	Output Voltage	Current (MA)	Case (FIG)	Price
MM-3.6S	3.6	250	7	39.95
MM-5SL	5	250	7	39.95
MM-5S-OV	5	500	7	45.95

NEW "MINI-SQUARE" GENERAL PURPOSE SINGLE OUTPUT POWER SUPPLIES

Model	Output Voltage	Current (MA)	Case (FIG)	Price
MM-10S	10	120	7	27.95
MM-12S	12	100	7	27.95
MM-15S	15	100	7	27.95
MM-18S	18	65	7	27.95
MM-20S	20	60	7	27.95
MM-24S	24	50	7	27.95
MM-28S	28	40	7	27.95

NEW "MINI-SQUARE" DUAL OUTPUT OP AMP POWER SUPPLIES

Model	Output Voltage	Current (MA)	Case (FIG)	Price
MD-10S	±10	120	8	54.95
MD-12S	±12	30	8	25.95
MD-12ST	±12	60	8	39.95
MD-12SM	±12	100	8	56.95
MD-15S	±15	30	8	28.95
MD-15ST	±15	65	8	39.95
MD-15SM	±15	100	8	49.95
MD-18S	±18	50	8	39.95

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

MM MINIATURE POWER SUPPLIES

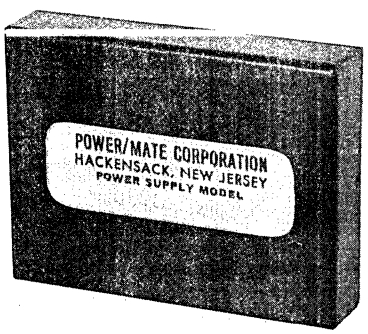
MINI/MATE DC TO DC CONVERTER — DESCRIPTION

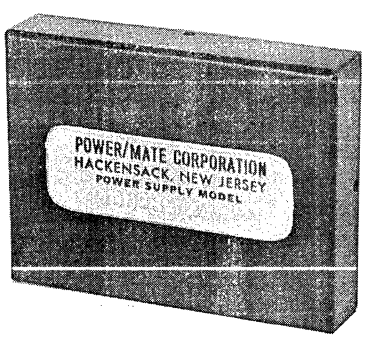
Power/Mate's new DC Series dual output DC to DC converters is the result of Power/Mate's engineering development program to offer the OEM user a full line of high efficiency, low cost DC to DC power supplies.

These new units are designed for use in application that requires precise regulation from a DC source. The DD Series are ideally suited for use with brute force High Current DC power sources such as Power/Mate's FPS Series ferroresonant power supplies. By combining the advantages of a pre-regulated DC input, the DD Series converters provide isolation, high efficiency and excellent point of load regulation.

The mechanical design is compatible with today's PC Board pin spacing for proper mating with standard logic cards and op amps.

DUAL OUTPUT DC TO DC CONVERTERS





MINI/MATE DC TO DC SPECIFICATIONS

INPUT VOLTAGES: 5, 6, 12, and 28VDC.

OUTPUT VOLTAGES: ±12, ±15, ±18, and ±24VDC.

OUTPUT CURRENT: 25mA, 75mA, and 100mA.

REGULATION: Line and Load 0.02% max.

INPUT RIPPLE: Less than 1% P-P of Nominal Input Voltage.

OUTPUT RIPPLE AND NOISE: 1mV RMS max.

OPERATING TEMPERATURE RANGE: −25°C to +71°C.

ISOLATION DIFFERENCE: 1/0 300VDC min.

TEMPERATURE COEFFICIENT: 0.02%/°C.

EFFICIENCY: Nominal line at full load (refer to charts).

Model No.	Input VDC	Outputs VDC	Outputs mA	Eff. %	Case Size	Price
DD5-12A	5	±12	25	50	Fig. 9	$39.00
DD5-12B	5	±12	100	60	Fig. 10	69.00
DD5-15A	5	±15	25	50	Fig. 9	39.00
DD5-15B	5	±15	100	60	Fig. 10	69.00
DD5-18A	5	±18	25	50	Fig. 9	39.00
DD5-18B	5	±18	100	60	Fig. 10	69.00
DD5-24A	5	±24	25	50	Fig. 9	39.00
DD5-24B	5	±24	75	60	Fig. 10	69.00
DD6-12A	6	±12	25	50	Fig. 9	39.00
DD6-12B	6	±12	100	60	Fig. 10	69.00
DD6-15A	6	±15	25	50	Fig. 9	39.00
DD6-15B	6	±15	100	60	Fig. 10	69.00
DD6-18A	6	±18	25	50	Fig. 9	39.00
DD6-18B	6	±18	100	60	Fig. 10	69.00
DD6-24A	6	±24	25	50	Fig. 9	39.00
DD6-24B	6	±24	75	60	Fig. 10	69.00
DD12-12A	12	±12	25	55	Fig. 9	39.00
DD12-12B	12	±12	100	65	Fig. 10	69.00
DD12-15A	12	±15	25	55	Fig. 9	39.00
DD12-15B	12	±15	100	65	Fig. 10	69.00
DD12-18A	12	±18	25	55	Fig. 9	39.00
DD12-18B	12	±18	100	65	Fig. 10	69.00
DD12-24A	12	±24	25	55	Fig. 9	39.00
DD12-24B	12	±24	75	65	Fig. 10	69.00
DD28-12A	28	±12	25	55	Fig. 9	39.00
DD28-12B	28	±12	100	65	Fig. 10	69.00
DD28-15A	28	±15	25	55	Fig. 9	39.00
DD28-15B	28	±15	100	65	Fig. 10	69.00
DD28-18A	28	±18	25	55	Fig. 9	39.00
DD28-18B	28	±18	100	65	Fig. 10	69.00
DD28-24A	28	±24	25	55	Fig. 9	39.00
DD28-24B	28	±24	75	65	Fig. 10	69.00

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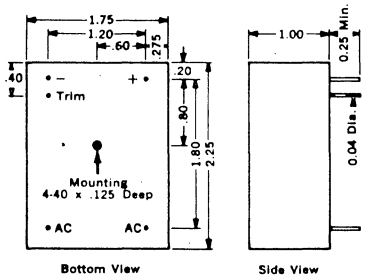
Phone: (201) 343-6294 TWX: (710) 990-5023

MM MINIATURE POWER SUPPLIES



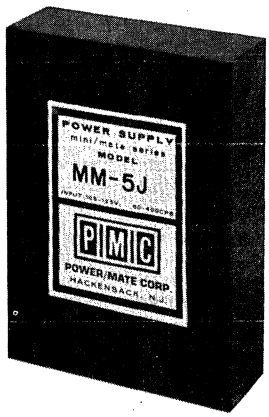
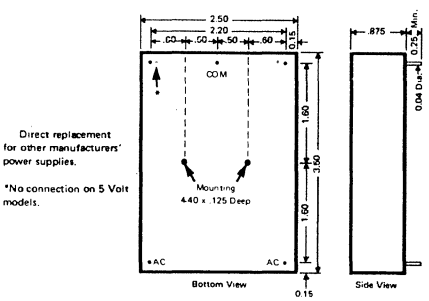
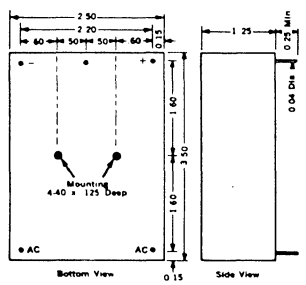


Fig. 1



To reduce spacing on AC input from 2.2" centers to 2.0" centers add suffix "-2" to model nos.

Fig. 2



To reduce spacing on AC input from 2.2" centers to 2.0" centers add suffix "-2" to model nos.

Fig. 3

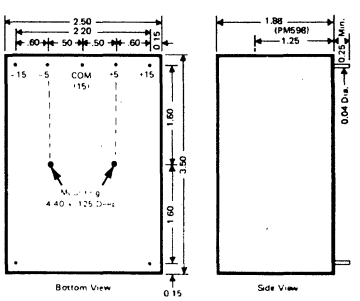
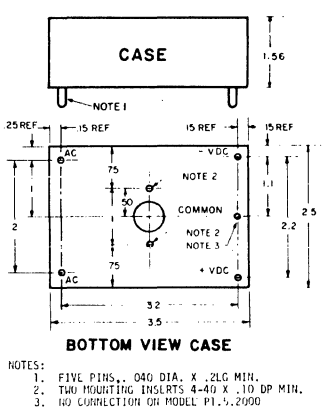


Fig. 4



NOTES:
1. FIVE PINS, .040 DIA. X .2LG MIN.
2. TWO MOUNTING INSERTS 4-40 X .10 DP MIN.
3. NO CONNECTION ON MODEL PM-5-2000

Fig. 5

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

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Phone: (201) 343-6294 TWX: (710) 990-5023

MM MINIATURE POWER SUPPLIES

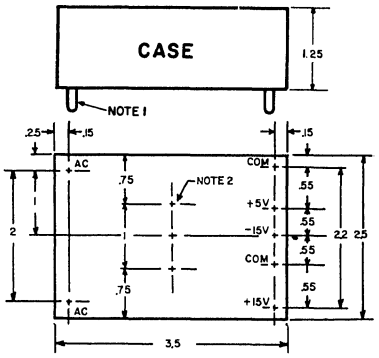

Fig. 6

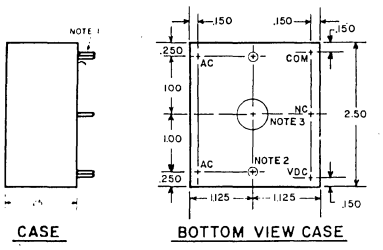

Fig. 7

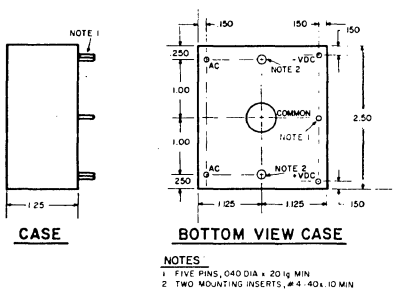

Fig. 8

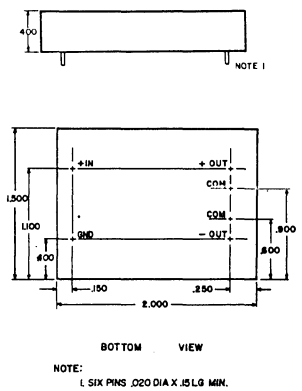

Fig. 9

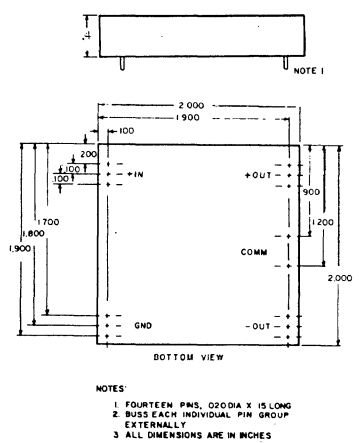

Fig. 10

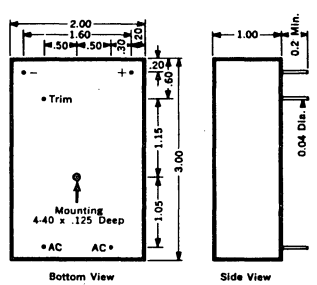

Fig. 11

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
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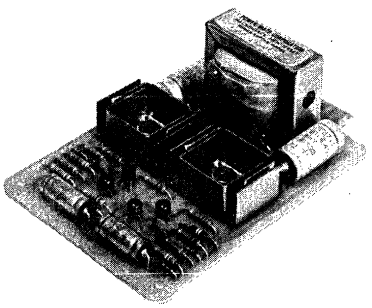
Phone: (201) 343-6294 TWX: (710) 990-5023

CP CARD-PAC SERIES

PRODUCT DIGEST

The new CARD/PAC Series all-silicon P.C. board power supplies are among the most competitively priced power supplies in the industry and provide a compact, low-cost regulated DC voltage source. Using P.C. board construction for economy, these power supplies provide high performance in a unit compatible in packaging and price with the new generation lower cost integrated circuits, operational amplifiers, and digital function devices.

All components are high quality computer-rated for long life. The CARD/PAC Series cannot be damaged by prolonged short circuits or overloads. In addition, the CARD/PAC Series are backed by the same 5-year warranty given all POWER/MATE power supply products.



LINE REGULATION: 0.01% or 1 mV (whichever is greater).
LOAD REGULATION: 0.05%.
RIPPLE: Less than 1 mV RMS max.

SPECIFICATIONS

VOLTAGE INPUT: 105-125 VAC, 50-440 CPS.

CURRENT OUTPUT: Up to 1 amp.

VOLTAGE OUTPUT: 3 to 50 volts.

LINE REGULATION: 0.01% or 1 mV (whichever is greater).

LOAD REGULATION: 0.05%.

RIPPLE: Less than 1 mV RMS max.

TEMPERATURE COEFFICIENT: Better than 0.02%/°C (typical).

OVERLOAD PROTECTION: Power supply cannot be damaged by current overloads.

POLARITY: May be either positive , negative or floating.

AMBIENT OPERATING TEMPERATURE: Continuous duty from −25°C to +71°C ambient.

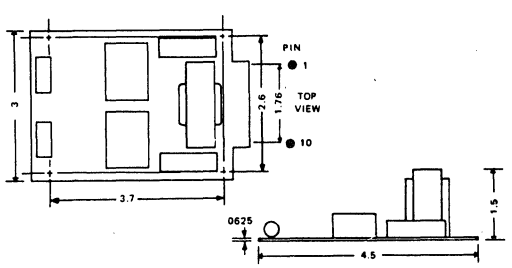
STORAGE TEMPERATURE: −25°C to +85°C.

OUTPUT CURRENT VS. TEMPERATURE: Rated for full current output at temperatures between −25°C to +71°C.

REMOTE OR LOCAL SENSING: Provision included for remote sensing of output voltage directly at the load, for improved overall regulation. Also may be connected for local sensing.

MECHANICAL DATA

CARD/PAC "A": 3"W x 4.5"L x 2"H
CARD/PAC "B": 3"W x 4.5"L x 1.5"H



AVAILABLE OPTIONS

1. A durable baked enamel steel laboratory bench case is available at $25 per case. Add suffix C to model number (Example: CP-5JC).
2. Improved regulation, 0.01%, available at $5 per unit. Add suffix R to model number (Example: CP-9MR).
3. Ten-pin P.C. card connector. Order separately as CARD/PAC CONN at $3.00 ea.

CARD/PAC CONNECTIONS

FOR CARD/PAC "B" (9 VDC TO 15 VDC)

PIN 1 No. Conn.	PIN 6 −VDC out
2 No. Conn.	7 −Sense
3 AC in	8 AC in
4 No. Conn.	9 +VDC out
5 No. Conn.	10 +Sense

Connect Pin 6 with Pin 7, Connect Pin 9 with Pin 10, take output between Pins 6 and 9

TO OPERATE WITH REMOTE SENSING:

a. Connect Pin 9 to positive side of load.
b. Bring out a separate lead from Pin 10 to positive side of load.
c. Connect Pin 6 to negative side of load.
d. Bring out a separate lead from Pin 7 to negative side of load.

FOR CARD/PAC "B" (GREATER THAN 15 VDC OUTPUT)

PIN 1 −Sense	PIN 6 No Conn.
2 −VDC out	7 No Conn.
3 AC in	8 AC in
4 No Conn.	9 +VDC out
5 No Conn.	10 +Sense

Connect Pin 1 with Pin 2, Connect Pin 9 with Pin 10, take output between Pins 2 and 9

CARD/PAC A CONNECTIONS (LESS THAN 9VDC OUTPUT)

PIN 1 Positive Sense—Connect Pin 1 to Pin 2	8 AC Line
2 Positive VDC	9 Negative VDC—Connect Pin 9 to Pin 10
3 AC Line	10 Negative Sense
4, 5, 6 and 7—No Connections	

TO OPERATE WITH REMOTE SENSING:

a. Connect Pin 2 to positive side of load.
b. Bring out a separate lead from Pin 1 to positive side of load.
c. Connect Pin 9 to negative side of load.
d. Bring out a separate lead from Pin 10 to negative side of load.

CARD/PAC B CONNECTIONS (DUAL)

PIN 1 Negative Sense	6 Output Common
2 Negative VDC	7 Positive Sense—Common
3 AC Line	8 AC Lne
4 Negative Sense-Common	9 Positive VDC
5 Output Common	10 Positive Sense

NOTES:
A. Connect Pin 1 with Pin 2
B. Connect Pins 4, 5, 6, and 7 together
C. Connect Pin 9 with Pin 10

TO OPERATE WITH REMOTE SENSING:

a. Connect Pin 2 to negative side of load.
b. Bring out a separate lead from Pin 1 to negative side of load.
c. Connect Pin 5 or 6 to common point of load.
d. Bring out separate leads from Pins 4 and 7 to common point of load.
e. Connect Pin 9 to positive side of load.
f. Bring out a separate lead from Pin 10 to positive side of load.

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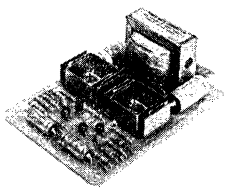
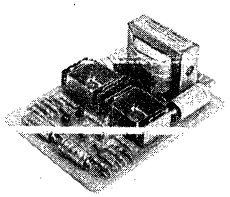
CP CARD-PAC SERIES

CARD/PAC "DUAL" SERIES 50



Model	DC Volts	Current (mA)	PAK Size	Price
DCP-6G	±6	50	B	$39.00
DCP-7G	±7	50	B	39.00
DCP-9G	±9	50	B	39.00
DCP-10G	±10	50	B	39.00
DCP-12G	±12	50	B	39.00
DCP-15G	±15	50	B	39.00
DCP-16G	±16	50	B	39.00
DCP-18G	±18	50	B	39.00
DCP-20G	±20	50	B	39.00
DCP-22G	±22	50	B	39.00
DCP-24G	±24	50	B	39.00
DCP-25G	±25	50	B	39.00
DCP-26G	±25	50	B	39.00
DCP-28G	±28	50	B	39.00
DCP-30G	±30	50	B	39.00

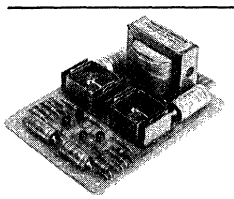
CARD/PAC "DUAL" SERIES 100



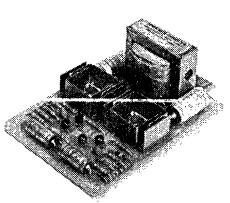
Model	DC Volts	Current (mA)	PAK Size	Price
DCP-6J	±6	100	B	$49.00
DCP-7J	±7	100	B	49.00
DCP-9K	±9	100	B	49.00
DCP-10K	±10	100	B	49.00
DCP-12K	±12	100	B	49.00
DCP-15K	±15	100	B	49.00
DCP-18H	±18	100	B	59.00
DCP-20H	±20	100	B	59.00
DCP-22H	±22	100	B	59.00
DCP-24H	±24	100	B	59.00
DCP-25H	±25	100	B	59.00
DCP-26H	±26	100	B	59.00
DCP-27H	±27	100	B	59.00
DCP-28H	±28	100	B	59.00
DCP-30H	±30	100	B	59.00

CARD/PAC "DUAL" SERIES 200

Model	DC Volts	Current (mA)	PAK Size	Price
DCP-6L	±6	200	B	$59.00
DCP-12M	±12	200	B	59.00
DCP-15M	±15	200	B	59.00



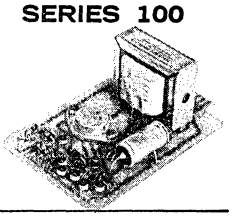
CARD/PAC "SINGLES" SERIES 50



Model	DC Volts	Current (mA)	PAK Size	Price
CP-31G	31	50	B	$44.00
CP-32G	32	50	B	44.00
CP-33G	33	50	B	44.00
CP-34G	34	50	B	44.00
CP-35G	35	50	B	44.00
CP-36G	36	50	B	44.00
CP-37G	37	50	B	44.00
CP-38G	38	50	B	44.00
CP-39G	39	50	B	44.00
CP-40G	40	50	B	44.00
CP-41G	41	50	B	44.00
CP-42G	42	50	B	44.00
CP-43G	43	50	B	44.00
CP-44G	44	50	B	44.00
CP-45G	45	50	B	44.00
CP-46G	46	50	B	44.00
CP-47G	47	50	B	44.00
CP-48G	48	50	B	44.00
CP-49G	49	50	B	44.00
CP-50G	50	50	B	44.00

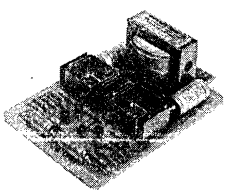
Model	DC Volts	Current (mA)	PAK Size	Price
CP-4J	4	100	A	$38.00
CP-5J	5	100	A	38.00
CP-6J	6	100	A	38.00
CP-7J	7	100	A	38.00
CP-8J	8	100	A	38.00
CP-9K	9	100	B	38.00
CP-10K	10	100	B	38.00
CP-11K	11	100	B	38.00
CP-12K	12	100	B	38.00
CP-13K	13	100	B	38.00
CP-14K	14	100	B	38.00
CP-15K	15	100	B	38.00

CARD/PAC "SINGLES" SERIES 100



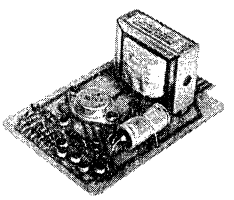
Model	DC Volts	Current (mA)	PAK Size	Price
CP-4L	4	200	A	$49.00
CP-5L	5	200	A	49.00
CP-6L	6	200	A	49.00
CP-7L	7	200	A	49.00
CP-8L	8	200	A	49.00
CP-9M	9	200	B	49.00
CP-10M	10	200	B	49.00
CP-11M	11	200	B	49.00
CP-12M	12	200	B	49.00
CP-13M	13	200	B	49.00
CP-14M	14	200	B	49.00
CP-15M	15	200	B	49.00

CARD/PAC "SINGLES" SERIES 200



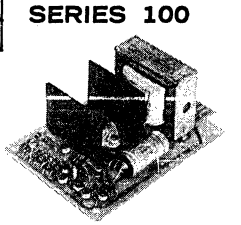
Model	DC Volts	Current (mA)	PAK Size	Price
CP-16H	16	100	B	$49.00
CP-17H	17	100	B	49.00
CP-18H	18	100	B	49.00
CP-19H	19	100	B	49.00
CP-20H	20	100	B	49.00
CP-21H	21	100	B	49.00
CP-22H	22	100	B	49.00
CP-23H	23	100	B	49.00
CP-24H	24	100	B	49.00
CP-25H	25	100	B	49.00
CP-26H	26	100	B	49.00
CP-27H	27	100	B	49.00
CP-28H	28	100	B	49.00
CP-28H	29	100	B	49.00
CP-30H	30	100	B	49.00
CP-31H	31	100	B	49.00
CP-32H	32	100	B	49.00

CARD/PAC "SINGLES" SERIES 300



Model	DC Volts	Current (mA)	PAK Size	Price
CP-3.6X	3.6	1000	A	$49.00
CP-5X	5	1000	A	49.00

CARD/PAC "SINGLES" SERIES 100



SAME DAY SHIPMENT

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

RA/RB POWER MODULES

PRODUCT DIGEST

All Silicon Semiconductors Throughout
All Units Rated for Continuous Duty at −20° to +71°C Ambient
Short Circuit Proof — May be Shorted Indefinitely without Damage
Automatic Overload and Short Circuit Recovery
No External Heat Sink or Cooling Required up to +71°C
MTBI — Over 100,000 Hours
All Components Accessible and Replaceable for Maintenance
Top Quality Components and Rugged Construction
All Power Supplies Subjected to Rigorous QC Inspections

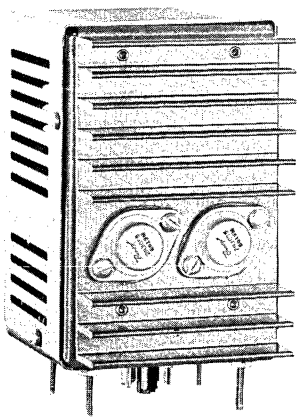
The RA and RB Series of modular power supplies provide regulated voltage outputs between 0 and 400 volts at output currents up to 25 amperes, at regulations of 0.05 or 0.5%, according to the model selected.

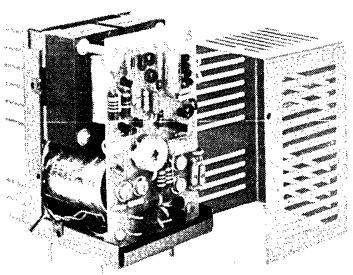
Silicon semiconductors are used exclusively in the power supply circuitry. This together with the internal heat sinking provided in the supply enables full load operation of the unit at ambient temperatures of 71°C without any additional cooling, heat sinking, and without derating.

The RA and RB Series power supplies are completely short circuit proof. The output may be short circuited indefinitely without damage. A unique circuit reduces the output current and voltage if the full load rating of the supply is exceeded. This not only protects the power supply, but serves to protect the load against further damage due to excessive current flow. The power supply automatically restores itself to normal operation after the short or overload is removed.

All components are accessible and replaceable in the field if required. All components are conservatively rated and are of the highest quality. For example, the electrolytic capacitors are 85°C types and the transformers are MIL-T-27 quality.

Connections at the connector permit either internal or remote adjustment of the output voltages. External connections also permit the remote sensing of the voltage directly at the load for improved overall load regulation on the RA Series.





REGULATION: ±0.05% or 2 MV (whichever is greater) vs line and load for RA Series; ±0.5% vs line and load for RB Series.

RIPPLE: Less than 0.002%, or 1 MV RMS (whichever is greater) for RA Series; 0.01% for 5 MV RMS for RB Series.

SPECIFICATIONS

INPUT: 105-125 VAC, 47-420 CPS.

OUTPUT: See Specific Model Listed.

REGULATION: ±0.05% or 2 MV (whichever is greater) vs line and load for RA Series; ±0.5% vs line and load for RB Series.

RIPPLE: Less than 0.002%, or 1 MV RMS (whichever is greater) for RA Series; 0.01% for 5 MV RMS for RB Series.

RESPONSE TIME: 50 Microseconds.

OPERATING AMBIENT TEMPERATURE: −20° to +71°C.

TEMPERATURE COEFFICIENT: 0.015%/C or 1.8 MV, whichever is greater.

OUTPUT ADJUSTMENT: Either internal or external as desired.

COOLING: None required at specified ambients.

POLARITY: May be either positive, negative, or floating (up to 300 volts).

OVERLOAD PROTECTION: Solid state short circuit and overload protected, instantaneous recovery and automatic reset.

MEAN TIME BETWEEN FAILURES: 100,000 hours typical, calculated according to MIL Handbook 217A.

MILITARY SPECIFICATIONS: Designed to meet the environmental requirements of MIL-E-5272, and RFI requirements of MIL-I-6181.

OPTIONS

OVER-VOLTAGE PROTECTION: Additional charge 20% ($35.00 min.).
Solid-state crow-bar protection for voltage sensitive loads is available for all RA and RB models. Trip point of crow-bar is adjustable. The addition of crow-bar circuitry generally requires next larger case size for N & R case supplies. Larger units can generally accommodate crow-bar circuitry. Consult factory for confirmation of case size when ordering. Add suffix V to model number when ordering.

CLOSE REGULATION: Additional charge $10.00.
Regulation accuracies of ±0.01% for line and ±0.025% for load are possible for the RA Series. When ordering add suffix A to model number.

208 or 230 VOLT INPUT: Additional charge 10% ($15.00 min.).
All modules can be modified to accept inputs of 208 or 230 volts, ±10%. Add the suffix L for 208 volts, and LL for 230 volt operation.

SOLDER TERMINALS: Additional charge $5.00.
A solder header is available for any model normally supplied with an octal plug.

ACCESSORIES

PANEL & CHASSIS MOUNTING ADAPTER: This adapter permits any standard **POWER/MATE** module to be surface mounted to either a chassis or panel. Includes socket. Order part no. A200- (—). Follow model no. with module case size with which adapter would be used. Cost — ANY TYPE $4.75.

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PIMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

RA/RB POWER MODULES

OUTPUT VOLTAGE ADJUST RANGE	OUTPUT CURRENT (AMPS)	CASE SIZE	0.5% REGULATION PRICE	0.5% REGULATION MODEL NO.	0.5% REGULATION PRICE	0.5% REGULATION MODEL NO.
0-3	0.375	R	$130	RA2- 0.375	$125	RB2- 0.375
	0.750	R	135	RA2- 0.750	125	RB2- 0.750
	1.5	R	165	RA2- 1.5	155	RB2- 1.5
	3.0	RH	205	RA2- 3.0	190	RB2- 3.0
	6.0	TH	255	RA2- 6.0	245	RB2- 6.0
	12.0	2TH	350	RA2-12.0	340	RB2-12.0
	25.0	4TH	450	RA2-25.0	440	RB2-25.0
3-5	0.375	R	85	RA4- 0.375	75	RB4- 0.375
	0.750	R	100	RA4- 0.750	90	RB4- 0.750
	1.5	R	120	RA4- 1.5	110	RB4- 1.5
	3.0	RH	150	RA4- 3.0	140	RB4- 3.0
	6.0	TH	195	RA4- 6.0	180	RB4- 6.0
	12.0	2TH	280	RA4-12.0	265	RB4-12.0
	25.0	4TH	385	RA4-25.0	370	RB4-25.0
5-7	0.375	R	85	RA6- 0.375	75	RB6- 0.375
	0.750	R	100	RA6- 0.750	90	RB6- 0.750
	1.5	R	120	RA6- 1.5	110	RB6- 1.5
	3.0	RH	150	RA6- 3.0	140	RB6- 3.0
	6.0	TH	195	RA6- 6.0	180	RB6- 6.0
	12.0	2TH	300	RA6-12.0	285	RB6-12.0
	25.0	4TH	430	RA6-25.0	415	RB6-25.0
7-9	0.200	R	80	RA8- 0.200	75	RB8- 0.200
	0.375	R	95	RA8- 0.375	85	RB8- 0.375
	0.750	R	110	RA8- 0.750	100	RB8- 0.750
	1.5	R	120	RA8- 1.5	110	RB8- 1.5
	3.0	RH	150	RA8- 3.0	140	RB8- 3.0
	6.0	TH	205	RA8- 6.0	190	RB8- 6.0
	12.0	2TH	305	RA8-12.0	290	RB8-12.0
	25.0	4TH	440	RA8-25.0	425	RB8-25.0
9-11	0.200	R	80	RA10- 0.200	75	RB10- 0.200
	0.375	R	95	RA10- 0.375	85	RB10- 0.375
	0.750	R	110	RA10- 0.750	100	RB10- 0.750
	1.5	R	120	RA10- 1.5	110	RB10- 1.5
	3.0	RH	150	RA10- 3.0	140	RB10- 3.0
	6.0	TH	210	RA10- 6.0	195	RB10- 6.0
	12.0	2TH	315	RA10-12.0	300	RB10-12.0
	25.0	4TH	450	RA10-25.0	435	RB10-25.0
11-13	0.200	N	80	RA12- 0.200	75	RB12- 0.200
	0.375	N	100	RA12- 0.375	90	RB12- 0.375
	0.750	R	110	RA12- 0.750	100	RB12- 0.750
	1.5	R	130	RA12- 1.5	120	RB12- 1.5
	3.0	RH	150	RA12- 3.0	140	RB12- 3.0
	6.0	TH	225	RA12- 6.0	205	RB12- 6.0
	12.0	2TH	315	RA12-12.0	300	RB12-12.0
	25.0	4TH	465	RA12-25.0	450	RB12-25.0
13-15	0.100	N	80	RA14- 0.100	75	RB14- 0.100
	0.200	N	90	RA14- 0.200	80	RB14- 0.200
	0.375	N	100	RA14- 0.375	90	RB14- 0.375
	0.750	R	115	RA14- 0.750	105	RB14- 0.750
	1.5	R	140	RA14- 1.5	130	RB14- 1.5
	3.0	TH	180	RA14- 3.0	170	RB14- 3.0
	6.0	2TH	235	RA14- 6.0	210	RB14- 6.0
	12.0	3TH	320	RA14-12.0	305	RB14-12.0
	25.0	4TH	480	RA14-25.0	465	RB14-25.0
14-16	0.100	N	80	RA15- 0.100	75	RB15- 0.100
	0.200	N	90	RA15- 0.200	80	RB15- 0.200
	0.375	N	100	RA15- 0.375	90	RB15- 0.375
	0.750	R	115	RA15- 0.750	105	RB15- 0.750
	1.5	R	140	RA15- 1.5	130	RB15- 1.5
	3.0	TH	180	RA15- 3.0	160	RB15- 3.0
	6.0	2TH	235	RA15- 6.0	205	RB15- 6.0
	12.0	3TH	335	RA15-12.0	315	RB15-12.0
	25.0	5TH	480	RA15-25.0	465	RB15-25.0
15-17	0.100	N	80	RA16- 0.100	75	RB16- 0.100
	0.200	N	90	RA16- 0.200	80	RB16- 0.200
	0.375	N	100	RA16- 0.375	90	RB16- 0.375
	0.750	R	120	RA16- 0.750	110	RB16- 0.750
	1.5	R	140	RA16- 1.5	130	RB16- 1.5
	3.0	TH	185	RA16- 3.0	165	RB16- 3.0
	6.0	2TH	240	RA16- 6.0	225	RB16- 6.0
	12.0	3TH	350	RA16-12.0	335	RB16-12.0
	25.0	5TH	485	RA16-25.0	470	RB16-25.0

OUTPUT VOLTAGE ADJUST RANGE	OUTPUT CURRENT (AMPS)	CASE SIZE	0.5% REGULATION PRICE	0.5% REGULATION MODEL NO.	0.5% REGULATION PRICE	0.5% REGULATION MODEL NO.
17-19	0.100	N	$ 80	RA18- 0.100	75	RB18- 0.100
	0.200	N	90	RA18- 0.200	80	RB18- 0.200
	0.375	N	100	RA18- 0.375	90	RB18- 0.375
	0.750	R	120	RA18- 0.750	105	RB18- 0.750
	1.5	R	140	RA18- 1.5	130	RB18- 1.5
	3.0	TH	185	RA18- 3.0	165	RB18- 3.0
	6.0	2TH	255	RA18- 6.0	240	RB18- 6.0
	12.0	3TH	360	RA18-12.0	345	RB18-12.0
	25.0	5TH	485	RA18-25.0	470	RB18-25.0
19-22	0.100	N	80	RA20- 0.100	75	RB20- 0.100
	0.200	N	90	RA20- 0.200	80	RB20- 0.200
	0.375	N	100	RA20- 0.375	90	RB20- 0.375
	0.750	R	120	RA20- 0.750	110	RB20- 0.750
	1.5	R	140	RA20- 1.5	130	RB20- 1.5
	3.0	TH	185	RA20- 3.0	165	RB20- 3.0
	6.0	2TH	260	RA20- 6.0	245	RB20- 6.0
	12.0	3TH	365	RA20-12.0	350	RB20-12.0
	25.0	5TH	490	RA20-25.0	475	RB20-25.0
22-25	0.100	N	80	RA23- 0.100	75	RB23- 0.100
	0.200	N	90	RA23- 0.200	80	RB23- 0.200
	0.375	R	100	RA23- 0.375	90	RB23- 0.375
	0.750	R	125	RA23- 0.750	115	RB23- 0.750
	1.5	RH	145	RA23- 1.5	135	RB23- 1.5
	3.0	TH	190	RA23- 3.0	175	RB23- 3.0
	6.0	2TH	265	RA23- 6.0	250	RB23- 6.0
	12.0	3TH	370	RA23-12.0	355	RB23-12.0
	25.0	5TH	500	RA23-25.0	485	RB23-25.0
25-28	0.100	N	80	RA26- 0.100	75	RB26- 0.100
	0.200	R	90	RA26- 0.200	80	RB26- 0.200
	0.375	R	100	RA26- 0.375	90	RB26- 0.375
	0.750	R	125	RA26- 0.750	115	RB26- 0.750
	1.5	T	155	RA26- 1.5	145	RB26- 1.5
	3.0	TH	195	RA26- 3.0	180	RB26- 3.0
	6.0	2TH	280	RA26- 6.0	265	RB26- 6.0
	12.0	4TH	395	RA26-12.0	380	RB26-12.0
26.5-29.5	0.100	N	80	RA28- 0.100	75	RB28- 0.100
	0.200	R	95	RA28- 0.200	85	RB28- 0.200
	0.375	R	105	RA28- 0.375	95	RB28- 0.375
	0.750	R	130	RA28- 0.750	120	RB28- 0.750
	1.5	T	155	RA28- 1.5	145	RB28- 1.5
	3.0	TH	195	RA28- 3.0	185	RB28- 3.0
	6.0	2TH	280	RA28- 6.0	265	RB28- 6.0
	12.0	4TH	395	RA28-12.0	380	RB28-12.0
28-32	0.050	N	75	RA30- 0.050	75	RB30- 0.050
	0.100	N	85	RA30- 0.100	75	RB30- 0.100
	0.200	R	95	RA30- 0.200	85	RB30- 0.200
	0.375	R	105	RA30- 0.375	95	RB30- 0.375
	0.750	R	130	RA30- 0.750	120	RB30- 0.750
	1.5	T	155	RA30- 1.5	145	RB30- 1.5
	3.0	TH	200	RA30- 3.0	190	RB30- 3.0
	6.0	2TH	290	RA30- 6.0	275	RB30- 6.0
	12.0	4TH	405	RA30-12.0	390	RB30-12.0
32-36	0.050	N	75	RA34- 0.050	75	RB34- 0.050
	0.100	N	85	RA34- 0.100	75	RB34- 0.100
	0.200	R	100	RA34- 0.200	90	RB34- 0.200
	0.375	R	110	RA34- 0.375	100	RB34- 0.375
	0.750	R	130	RA34- 0.750	120	RB34- 0.750
	1.5	T	180	RA34- 1.5	155	RB34- 1.5
	3.0	TH	225	RA34- 3.0	205	RB34- 3.0
	6.0	2TH	310	RA34- 6.0	295	RB34- 6.0
	12.0	4TH	425	RA34-12.0	410	RB34-12.0
36-40	0.050	N	80	RA38- 0.050	75	RB38- 0.050
	0.100	N	90	RA38- 0.100	80	RB38- 0.100
	0.200	R	100	RA38- 0.200	90	RB38- 0.200
	0.375	R	115	RA38- 0.375	105	RB38- 0.375
	0.750	R	130	RA38- 0.750	120	RB38- 0.750
	1.5	T	185	RA38- 1.5	160	RB38- 1.5
	3.0	TH	240	RA38- 3.0	225	RB38- 3.0
	6.0	2TH	335	RA38- 6.0	320	RB38- 6.0
	12.0	4TH	475	RA38-12.0	460	RB38-12.0
40-45	0.050	N	85	RA42- 0.050	75	RB42- 0.050
	0.100	N	95	RA42- 0.100	85	RB42- 0.100
	0.200	R	105	RA42- 0.200	95	RB42- 0.200
	0.375	R	120	RA42- 0.375	110	RB42- 0.375

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RA/RB POWER MODULES

OUTPUT VOLTAGE ADJUST RANGE	OUTPUT CURRENT (AMPS)	CASE SIZE	0.5% REGULATION PRICE	0.5% REGULATION MODEL NO.	0.5% REGULATION PRICE	0.5% REGULATION MODEL NO.
40-45	0.750	T	145	RA42- 0.750	135	RB42- 0.750
	1.5	T	195	RA42- 1.5	185	RB42- 1.5
	3.0	TH	250	RA42- 3.0	245	RB42- 3.0
	6.0	2TH	355	RA42- 6.0	340	RB42- 6.0
	12.0	4TH	495	RA42-12.0	480	RB42-12.0
45-50	0.050	N	95	RA47- 0.050	85	RB47- 0.050
	0.100	N	105	RA47- 0.100	95	RB47- 0.100
	0.200	R	115	RA47- 0.200	105	RB47- 0.200
	0.375	R	130	RA47- 0.375	120	RB47- 0.375
	0.750	T	150	RA47- 0.750	140	RB47- 0.750
	1.5	T	195	RA47- 1.5	185	RB47- 1.5
	3.0	TH	265	RA47- 3.0	250	RB47- 3.0
	6.0	3TH	360	RA47- 6.0	345	RB47- 6.0
	12.0	5TH	505	RA47-12.0	490	RB47-12.0
50-56	0.050	N	105	RA53- 0.050	95	RB53- 0.050
	0.100	N	115	RA53- 0.100	105	RB53- 0.100
	0.200	R	130	RA53- 0.200	120	RB53- 0.200
	0.375	R	140	RA53- 0.375	130	RB53- 0.375
	0.750	T	160	RA53- 0.750	150	RB53- 0.750
	1.5	TH	195	RA53- 1.5	180	RB53- 1.5
	3.0	TH	265	RA53- 3.0	250	RB53- 3.0
	6.0	3TH	365	RA53- 6.0	325	RB53- 6.0
56-62	0.050	N	110	RA59- 0.050	100	RB59- 0.050
	0.100	R	120	RA59- 0.100	110	RB59- 0.100
	0.200	R	135	RA59- 0.200	125	RB59- 0.200
	0.375	R	145	RA59- 0.375	135	RB59- 0.375
	0.750	T	165	RA59- 0.750	155	RB59- 0.750
	1.5	TH	245	RA59- 1.5	230	RB59- 1.5
	3.0	2TH	305	RA59- 3.0	295	RB59- 3.0
	6.0	3TH	425	RA59- 6.0	410	RB59- 6.0
62-69	0.050	R	110	RA65- 0.050	100	RB65- 0.050
	0.100	R	120	RA65- 0.100	110	RB65- 0.100
	0.200	R	135	RA65- 0.200	125	RB65- 0.200
	0.375	R	145	RA65- 0.375	135	RB65- 0.375
	0.750	T	165	RA65- 0.750	155	RB65- 0.750
	1.5	TH	250	RA65- 1.5	235	RB65- 1.5
	3.0	2TH	355	RA65- 3.0	340	RB65- 3.0
	6.0	3TH	460	RA65- 6.0	445	RB65- 6.0
69-76	0.050	R	115	RA72- 0.050	105	RB72- 0.050
	0.100	R	125	RA72- 0.100	115	RB72- 0.100
	0.200	R	140	RA72- 0.200	130	RB72- 0.200
	0.375	T	150	RA72- 0.375	140	RB72- 0.375
	0.750	T	175	RA72- 0.750	165	RB72- 0.750
	1.5	TH	285	RA72- 1.5	270	RB72- 1.5
	3.0	2TH	360	RA72- 3.0	345	RB72- 3.0
	6.0	3TH	460	RA72- 6.0	445	RB72- 6.0
76-84	0.050	R	120	RA80- 0.050	110	RB80- 0.050
	0.100	R	130	RA80- 0.100	120	RB80- 0.100
	0.200	R	145	RA80- 0.200	135	RB80- 0.200
	0.375	T	160	RA80- 0.375	150	RB80- 0.375
	0.750	T	190	RA80- 0.750	175	RB80- 0.750
	1.5	TH	295	RA80- 1.5	270	RB80- 1.5
	3.0	2TH	365	RA80- 3.0	350	RB80- 3.0
	6.0	4TH	480	RA80- 6.0	465	RB80- 6.0
84-93	0.050	R	125	RA88- 0.050	115	RB88- 0.050
	0.100	R	135	RA88- 0.100	125	RB88- 0.100
	0.200	R	155	RA88- 0.200	145	RB88- 0.200
	0.375	T	170	RA88- 0.375	160	RB88- 0.375
	0.750	T	200	RA88- 0.750	190	RB88- 0.750
	1.5	TH	315	RA88- 1.5	300	RB88- 1.5
93-103	0.050	R	130	RA98- 0.050	120	RB98- 0.050
	0.100	R	140	RA98- 0.100	130	RB98- 0.100
	0.200	R	155	RA98- 0.200	145	RB98- 0.200
	0.375	T	185	RA98- 0.375	170	RB98- 0.375
	0.750	T	260	RA98- 0.750	245	RB98- 0.750
	1.5	TH	325	RA98- 1.5	310	RB98- 1.5
103-114	0.050	R	140	RA108- 0.050	130	RB108- 0.050
	0.100	R	150	RA108- 0.100	140	RB108- 0.100

OUTPUT VOLTAGE ADJUST RANGE	OUTPUT CURRENT (AMPS)	CASE SIZE	0.5% REGULATION PRICE	0.5% REGULATION MODEL NO.	0.5% REGULATION PRICE	0.5% REGULATION MODEL NO.
103-114	0.200	R	160	RA108- 0.200	155	RB108- 0.200
	0.375	T	210	RA108- 0.375	185	RB108- 0.375
	0.750	T	300	RA108- 0.750	280	RB108- 0.750
	1.5	2TH	380	RA108- 1.5	365	RB108- 1.5
114-126	0.050	R	140	RA120- 0.050	130	RB120- 0.050
	0.100	R	160	RA120- 0.100	150	RB120- 0.100
	0.200	R	185	RA120- 0.200	170	RB180- 0.200
	0.375	T	225	RA120- 0.375	200	RB120- 0.375
	0.750	T	300	RA120- 0.750	280	RB120- 0.750
	1.5	2TH	380	RA120- 1.5	365	RB120- 1.5
126-139	0.050	R	150	RA132- 0.050	140	RB132- 0.050
	0.100	R	160	RA132- 0.100	160	RB132- 0.100
	0.200	R	185	RA132- 0.200	170	RB132- 0.200
	0.375	T	235	RA132- 0.375	210	RB132- 0.375
	0.750	TH	340	RA132- 0.750	325	RB132- 0.750
139-153	0.050	R	150	RA146- 0.050	140	RB146- 0.050
	0.100	R	170	RA146- 0.100	160	RB146- 0.100
	0.200	R	185	RA146- 0.200	170	RB146- 0.200
	0.375	T	235	RA146- 0.375	225	RB146- 0.375
	0.750	TH	340	RA146- 0.750	325	RB146- 0.750
153-168	0.050	R	155	RA160- 0.050	145	RB160- 0.050
	0.100	R	185	RA160- 0.100	170	RB160- 0.100
	0.200	R	195	RA160- 0.200	185	RB160- 0.200
	0.375	T	235	RA160- 0.375	210	RB160- 0.375
	0.750	TH	340	RA160- 0.750	325	RB160- 0.750
168-185	0.050	R	160	RA176- 0.050	150	RB176- 0.050
	0.100	R	190	RA176- 0.100	180	RB176- 0.100
	0.200	T	240	RA176- 0.200	225	RB176- 0.200
	0.375	T	285	RA176- 0.375	270	RB176- 0.375
	0.750	TH	380	RA176- 0.750	365	RB176- 0.750
185-204	0.050	R	165	RA194- 0.050	155	RB194- 0.050
	0.100	R	200	RA194- 0.100	190	RB194- 0.100
	0.200	T	255	RA194- 0.200	250	RB194- 0.200
	0.375	T	340	RA194- 0.375	340	RB194- 0.375
	0.750	TH	440	RA194- 0.750	425	RB194- 0.750
204-225	0.050	R	165	RA214- 0.050	155	RB214- 0.050
	0.100	R	200	RA214- 0.100	190	RB214- 0.100
	0.200	T	265	RA214- 0.200	250	RB214- 0.200
	0.375	T	350	RA214- 0.375	340	RB214- 0.375
225-250	0.050	R	190	RA236- 0.050	170	RB236- 0.050
	0.100	R	230	RA236- 0.100	210	RB236- 0.100
	0.200	T	300	RA236- 0.200	280	RB236- 0.200
	0.375	TH	390	RA236- 0.375	375	RB236- 0.375
250-275	0.050	R	185	RA262- 0.050	175	RB262- 0.050
	0.100	T	245	RA262- 0.100	230	RB262- 0.100
	0.200	T	315	RA262- 0.200	305	RB262- 0.200
	0.375	TH	400	RA262- 0.375	390	RB262- 0.375
275-315	0.050	T	200	RA295- 0.050	185	RB295- 0.050
	0.100	T	270	RA295- 0.100	255	RB295- 0.100
	0.200	T	355	RA295- 0.200	340	RB295- 0.200
	0.375	TH	430	RA295- 0.375	415	RB295- 0.375
315-340	0.050	T	205	RA327- 0.050	195	RB327- 0.050
	0.100	T	280	RA327- 0.100	265	RB327- 0.100
	0.200	T	370	RA327- 0.200	355	RB327- 0.200
	0.375	TH	450	RA327- 0.375	440	RB327- 0.375
340-370	0.050	T	225	RA355- 0.050	205	RB355- 0.050
	0.100	T	295	RA355- 0.100	275	RB355- 0.100
	0.200	T	380	RA355- 0.200	365	RB355- 0.200
	0.375	TH	465	RA355- 0.375	450	RB355- 0.375
370-400	0.050	T	235	RA385- 0.050	225	RB385- 0.050
	0.100	T	305	RA385- 0.100	285	RB385- 0.100
	0.200	T	390	RA385- 0.200	375	RB385- 0.200
	0.375	TH	475	RA385- 0.375	460	RB385- 0.375

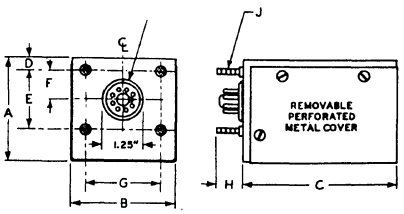
POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

RA/RB POWER MODULES

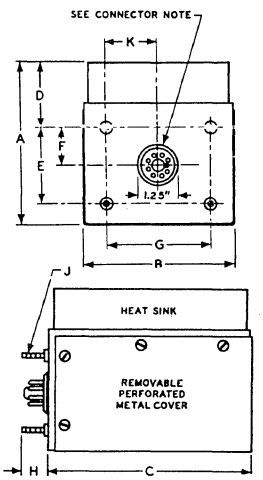
MECHANICAL DATA

CASE STYLES N R T *SEE CONNECTOR NOTE



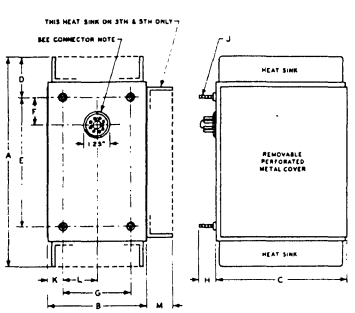
Case Style	A	B	C	D	E	F	G	H	J
N	2.5	3.0	4.25	0.406	1.75	0.875	2.25	0.69	6-32
R	3.25	3.25	5.0	0.350	1.86	0.930	2.296	0.69	6-32
T	4.0	5.0	6.56	0.750	2.75	1.375	3.437	0.625	10-32

CASE STYLES RH TH BRH



Case Style	A	B	C	D	E	F	G	H	J	K
RH	4.125	3.25	5.0	1.22	1.86	0.93	2.296	0.69	6-32	1.148
TH	5.25	5.0	6.56	2.063	2.75	1.375	3.437	0.625	10-32	1.718
BRH	4.125	5.0	5.5	1.25	2.50	1.25	4.156	0.69	6-32	.656

CASE STYLES 2TH 3TH 4TH 5TH



	CASE DIMENSIONS IN INCHES											
Case Style	A	B	C	D	E	F	G	H	J	K	L	M
2TH	10.75	5.0	6.5	2.125	6.5	1.375	3.437	0.625	10-32	0.781	1.719	
3TH	10.75	5.0	6.5	2.125	6.5	1.375	3.437	0.625	10-32	0.781	1.719	1.25
4TH	10.75	10.0	6.5	2.125	6.5	1.375	8.438	0.906	¼-20	0.781	1.719	
5TH	10.75	10.0	6.5	2.125	6.5	1.375	8.438	0.906	¼-20	0.781	1.719	1.25

CONNECTOR NOTE: All modules over six amperes are normally supplied with solder type connector. All modules six amperes and less are normally supplied with an octal plug, except for dual output modules. These are supplied with an 11 pin octal type of plug.

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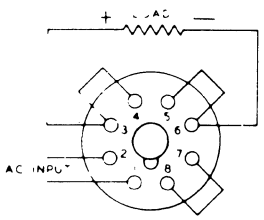
Phone: (201) 343-6294 TWX: (710) 990-5023

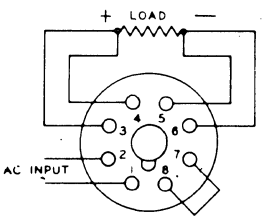
RA/RB POWER MODULES

CONNECTIONS

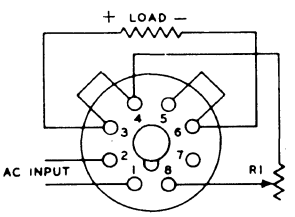
RA SERIES
SEE NOTE



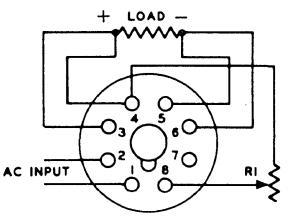
LOCAL SENSING, INTERNAL ADJUST



REMOTE SENSING, INTERNAL ADJUST

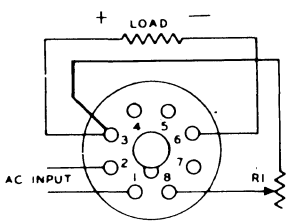


LOCAL SENSING, EXTERNAL ADJUST

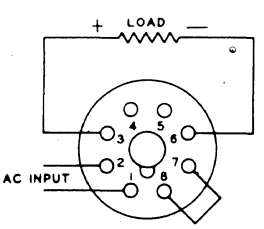


REMOTE SENSING, EXTERNAL ADJUST

RB SERIES
SEE NOTE

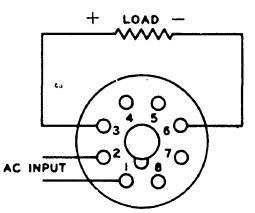


EXTERNAL VOLTAGE ADJUST



INTERNAL VOLTAGE ADJUST

RC/RD SERIES



NOTE: For all models up to and including 6 amps, with octal output plug. Consult factory for 12 and 25 amp models. RI-500 ohm pot for models prefixed RA2 thru RA8, RB2 thru RB8, RA327 thru RA385, RB327 thru RB385. Use 5000 ohm pot for models prefixed RA10 thru RA295.

POWER SUPPLY WEIGHTS

The approximate weight of POWER/MATE power supply modules is primarily determined by the case size as shown below. Consult the factory for the exact weight of any specific model.

For approximate shipping weight, increase the weights shown by one-third.

Case Size	Net Weight (pounds)	Case Size	Net Weight (pounds)
N	2¼	TH	9¼
R	3¾	2TH	16
RH	4¾	3TH	19
BRH	5½	4TH	35¾
T	8¾	5TH	38¾

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

PMC **POWER/MATE CORP.**
514 S. RIVER STREET, HACKENSACK, N. J. 07601
Phone: (201) 343-6294 TWX: (710) 990-5023

RC, RD PLUG IN POWER SUPPLIES

PRODUCT DIGEST

All Silicon Semiconductors Throughout.

All Units Rated for Continuous Duty at —20° to +71°C Ambient

Short Circuit Proof — May be Shorted Indefinitely without Damage.

Automatic Overload and Short Circuit Recovery.

No External Heat Sink or Cooling Required up to +71°C.

MTBF — Over 100,000 Hours.

All Components Accessible and Replaceable for Maintenance.

Top Quality Components and Rugged Construction.

All Power Supplies Subjected to Rigorous QC Inspections.

The RC and RD Series of module power supplies are low cost units that feature the same high quality construction and components used in our other series of power supply modules. The regulation and ripple listed in the specifications are adequate to permit their use in all but the more critical applications. The low cost of these modules is the direct result of the wide acceptance that these modules have found throughout the industry. All of the modules listed are available from stock.

Silicon semiconductors are used exclusively in the power supply circuitry. This together with the internal heat sinking provided in the supply, enables full load operation of the unit at ambient temperatures of 71°C without any additional cooling, heat sinking, and without derating.

...All components in the supply are readily accessible by removing the cover, and are replaceable in the field should it ever be necessary. Components are conservatively rated. Electrolytic capacitors are 85°C types, and the transformers is MIL-T-27 quality.

REGULATION: See specific model rating.

RIPPLE: Less than 4MV (RMS) for RC Series.
Less than 8 MV (RMS) for RD Series.

The RC and RD Series modules are completely short-circuit proof. A solid-state current fold-back circuit makes the unit immune to overloads or short circuits. The unit automatically resets when the overload or short is removed.

All of the RC and Rd Series modules are housed in a rugged 3¼ x 3¼ x 5" (R style case) with a standard octal plug for the input output connections.

SPECIFICATIONS

INPUT: 105-125 VAC, 47-420 CPS.

OUTPUT: See specific model rating.

REGULATION: See specific model rating.

RIPPLE: Less than 4MV (RMS) for RC Series.
Less than 8 MV (RMS) for RD Series.

OPERATING AMBIENT TEMPERATURE: —20° to +71°C.

OUTPUT ADJUSTMENT: Adjusted by means of internal pot.

COOLING: None required within specified ambients.

POLARITY: May be either positive, negative or floating up to 300 volts.

OVERLOAD PROTECTION: Short circuit protected, autoreset.

MECHANICAL DATA:

CONNECTOR NOTE: All modules are normally supplied with an octal plug.

RC SERIES ALL MODELS $65 **RD SERIES ALL MODELS $55**

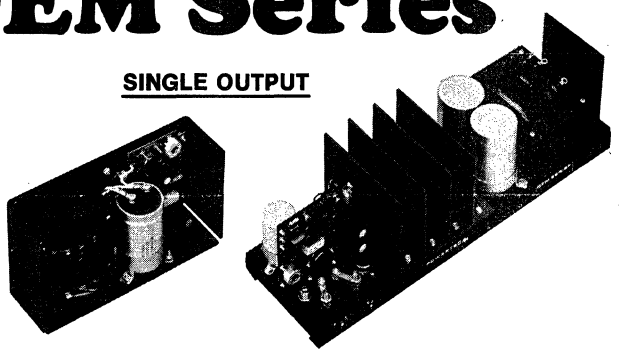
Model No.	Output Volts	Output Amps	Regulation±% Line	Load
RC-5	3-7	1.0	0.3	0.7
RC-9	7-11	1.0	0.1	0.3
RC-12	11-13	1.0	0.075	0.1
RC-15	13-16	0.5	0.075	0.1
RC-19	16-21	0.5	0.075	0.1
RC-24	21-26	0.5	0.075	0.1
RC-28	26-31	0.5	0.06	0.1
RC-34	31-37	0.5	0.05	0.1
RC-40	37-43	0.5	0.05	0.1
RC-48	43-50	0.5	0.05	0.1
RD-5	3-7	1.0	0.6	1.4
RD-9	7-11	1.0	0.2	0.6
RD-12	11-13	1.0	0.15	0.2
RD-15	13-16	0.5	0.15	0.2
RD-19	16-21	0.5	0.15	0.2
RD-24	21-26	0.5	0.15	0.2
RD-28	26-31	0.5	0.12	0.2
RD-34	31-37	0.5	0.1	0.2
RD-40	37-43	0.5	0.1	0.2
RD-48	48-50	0.5	0.1	0.2

POWER/MATE IS THE WORLD'S LARGEST SUPPLIER OF QUALITY POWER SUPPLIES

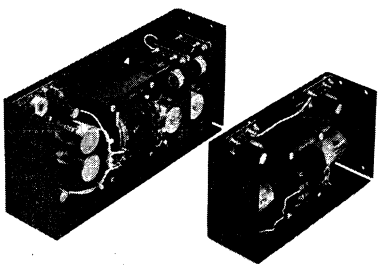
From POWERTEC - Standard Series of DC Power Supplies plus Custom Designs

OEM Series

SINGLE OUTPUT



MULTIPLE OUTPUT



SINGLE OUTPUT MODELS

VERY LOW COST • CURRENT LIMIT/FOLDBACK • OPEN CASE/CHASSIS CONSTRUCTION • RATED TO 40°C, DERATE TO 71°C • SERIES REGULATED DC POWER SUPPLIES

Model Number	Depth	Width	Height	-(5) 5V	-(5) 6V	-(15) 12V	-(15) 15V	-(24) 18V	-(24) 20V	-(24) 24V	Unit** Price
2B-	4.00	4.87	1.62	3A	2.5A	1.5A	1.3A	1.0A	1.0A	1.0A	$29.00
2C-	4.87	5.62	2.50	6A	5A	3.0A	2.8A	2.0A	2.3A	2.3A	$49.00
2D-	4.87	9.00	2.75	12A	10A	6.5A	6.0A	4.5A	5.0A	5.0A	$79.00
2E-	4.87	16.75	4.87	25A	23A	15A	14A	10A	12A	11A	$139.00
2F-	10.00	16.75	4.87	50A	46A	30A	28A	20A	24A	22A	$229.00
2G-	15.38	16.75	4.87	75A	68A	45A	42A	30A	36A	33A	$299.00

- REGULATION: Line ± .1%
  Load ± .1%
- INPUT: 115 VAC ± 10V, 47-63Hz
- RIPPLE: 1mv RMS (5 & 15V), 3mv RMS (24V)
- O.L. PROTECTION: Current limit/foldback
- RESPONSE: 50μsec typical
- TEMPERATURE: 0°C to 40°C derated to 71°C
- OPTIONAL OVP: All Models

•ALL MODELS ARE U.L. RECOGNIZED

MULTIPLE OUTPUT MODELS

PROVEN RELIABLE DESIGN • FULLY ISOLATED OUTPUTS • BEST POWER/COST RATIOS

		MODEL NUMBER	OUTPUT POWER OUTPUT #1	OUTPUT #2	OUTPUT #3	UNIT** PRICE
2K DUAL OUTPUT	Depth: 2.50 Width: 7.87 Height: 4.00	2K15D-1.3	+12V, 1.5A or +15V, 1.3A	−12V, 1.5A or −15V, 1.3A	NA	$49.00
		* 2K5D-3.0	5V, 3.0A or 6V, 2.5A	5V, 3.0A or 6V, 2.5A	NA	
		* 2K5, 15D	5V, 3.0A or 6V, 2.5A	12V, 1.5A or 15V, 1.3A	NA	
		* 2K5,24D	5V, 3.0A or 6V, 2.5A	18V, 1.0A or 20V, 1.0A or 24V, 1.0A	NA	
2L DUAL OUTPUT	Depth: 2.75 Width: 9.38 Height: 4.88	2L15D-2.8	+12V, 3.0A or + 15V, 2.8A	−12V, 3.0A or −15V, 2.8A	NA	$79.00
		* 2L5D-6.0	5V, 6.0A or 6V, 5.0A	5V, 6.0A or 6V, 5.0A	NA	
		* 2L5, 15D	5V, 6.0A or 6V, 5.0A	12V, 3.0A or 15V, 2.8A	NA	
		* 2L5, 24D	5V, 6.0A or 6V, 5.0A	18V, 2.0A or 20V, 2.3A or 24V, 2.3A	NA	
2R TRIPLE OUTPUT	Depth: 2.87 Width: 11.00 Height: 4.88	2R-70T	+12V, 1.5A or +15V, 1.3A	−12V, 1.5A or −15V, 1.3A	5V, 6.0A or 6V, 5.0A	$89.00
		* 2R-72T	5V, 3.0A or 6V, 2.5A	12V, 1.5A or 15V, 1.3A	5V, 6.0A or 6V, 5.0A	
		* 2R-74T	5V, 3.0A or 6V, 2.5A	18V, 1.0A or 20V, 1.0A or 24V, 1.0A	5V, 6.0A or 6V, 5.0A	
		* 2R-76T	12V, 1.5A or 15V, 1.3A	18V, 1.0A or 20V, 1.0A or 24V, 1.0A	5V, 6.0A or 6V, 5.0A	
2S TRIPLE OUTPUT	Depth: 4.00 Width: 15.00 Height: 4.88	2S-140T	+12V, 3.0A or +15V, 2.8A	−12V, 3.0A or −15V, 2.8A	5V, 12A or 6V, 8.0A	$149.00
		* 2S-142T	5V, 6.0A or 6V, 5.0A	12V, 3.0A or 15V, 2.8A	5V, 12A or 6V, 8.0A	
		* 2S-144T	5V, 6.0A or 6V, 5.0A	18V, 2.0A or 20V, 2.3A or 24V, 2.3A	5V, 12A or 6V, 8.0A	
		* 2S-146T	12V, 3.0A or 15V, 2.8A	18V, 2.0A or 20V, 2.3A or 24V, 2.3A	5V, 12A or 6V, 8.0A	

All outputs can be connected in any common configuration. Other voltages and currents available, consult factory for price and delivery.
* Non-stocked. ** Contact factory for quantity discounts at 25, 50, 100 units and others.

POWERTEC

POWERTEC, INC.
an Airtronics Subsidiary
9168 DeSoto Ave., Chatsworth, Calif. 91311
(213) 882-0004 • TWX (910) 494-2092

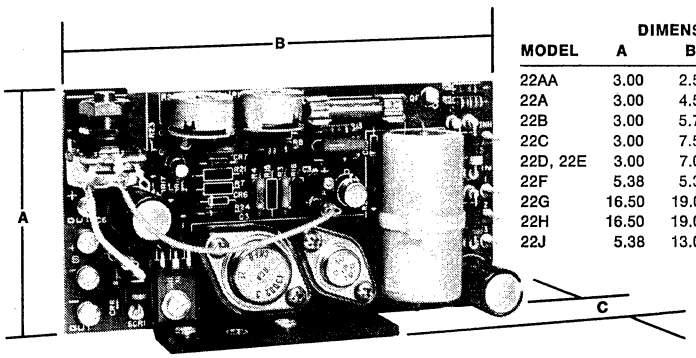
FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

From POWERTEC-4 New DC Power Supply Series

SM Series

SUB-MODULAR DC POWER SUPPLIES

FOR IN-HOUSE NEEDS AND CUSTOM DESIGNS.
● RECTIFICATION ● FILTERING ● REGULATION
● PROTECTION ... BUILT-IN. 50 MODELS ... 10 POWER PACKAGES ● UP TO 30 VOLTS ● UP TO 75 AMPS.



MODEL	DIMENSIONS A	B	C
22AA	3.00	2.50	0.98
22A	3.00	4.50	1.06
22B	3.00	5.75	1.18
22C	3.00	7.50	1.18
22D, 22E	3.00	7.00	3.30
22F	5.38	5.38	3.88
22G	16.50	19.00	3.47
22H	16.50	19.00	5.22
22J	5.38	13.00	3.88

SM SERIES VOLTAGE, CURRENT RATINGS AND PRICES

Model	—100 *5V to 6V		—200 *8V to 10V		—300 *12V to 20V		—400 *18V to 28V		—500 *24V to 28V		PRICES** UNIT	100
22AA	.40A	.35A	.29A	.25A	.23A	.20A	.19A	.18A	.17A	.16A	$15.00	$10.00
22A	1.0A	.875A	.725A	.625A	.575A	.500A	.475A	.450A	.425A	.400A	23.00	15.00
22B	3.0A	2.5A	2.2A	1.9A	1.7A	1.5A	1.4A	1.3A	1.2A	1.1A	30.00	20.00
22C	6.0A	5.2A	4.4A	3.8A	3.4A	3.0A	2.8A	2.6A	2.5A	2.3A	45.00	30.00
22D	12.0A	10.4A	8.8A	7.6A	6.8A	6.0A	5.6A	5.2A	5.0A	4.7A	60.00	40.00
22E	18.0A	15.6A	13.2A	11.4A	10.2A	9.0A	8.4A	7.8A	7.5A	7.1A	75.00	50.00
22F	24.0A	21A	17.25A	15A	13.7A	12.2A	11.2A	10.7A	10.0A	9.4A	105.00	70.00
22G	36.0A	31.5A	26.0A	22.5A	20.6A	18.2A	16.8A	16.0A	15.0A	14.1A	145.00	95.00
22H	50.0A	43.8A	35.9A	31.3A	28.5A	25.3A	23.3A	22.3A	20.8A	19.6A	190.00	125.00
22J	75.0A	65.6A	33.9A	46.9A	42.8A	38.0A	35.0A	33.4A	31.3A	29.5A	265.00	175.00

* See specifications for Voltage Adjustment Range. Typical ordering information for 5V, 1.0A, Model 22A-100; and 12V, 6.8A, Model 22D-300, etc. ** Consult factory for prices at other quantities.

SPECIFICATIONS: 22 SERIES "SM" MODULES

OUTPUT RATINGS:

OUTPUT VOLTAGE: **−100,** 4.75 to 7.0V; **−200,** 7.0V to 10.5V; **−300,** 10.5V to 15.75V; **−400,** 15.75V to 22.0V; **−500,** 22.0V to 30.0V

OUTPUT CURRENT: See Voltage/Current Rating Chart

REGULATION:
LINE: ±.075% for ±10% input voltage change.
LOAD: ±.075% for 0-100% load change.

OUTPUT RIPPLE: 1 MV RMS, 3 MV PK-PK typical. 5 MV PK-PK maximum.

OVERLOAD PROTECTION: Fully adjustable, fold-back type current limiting standard.

LOGIC INHIBIT FUNCTION: A T^2L compatible signal between 2.4V and 5V will inhibit dc output.

OVERVOLTAGE PROTECTION: SCR crowbar type. Trigger level fully adjustable.

TRANSIENT RESPONSE: <50 usec for a 50% load change.

TEMPERATURE COEFFICIENT: .007%/°C typical.

STABILITY: ±0.1% for 8 hours after warmup.

OPERATING AMBIENT TEMPERATURE: 0 to 40°C, derate to 71°C.

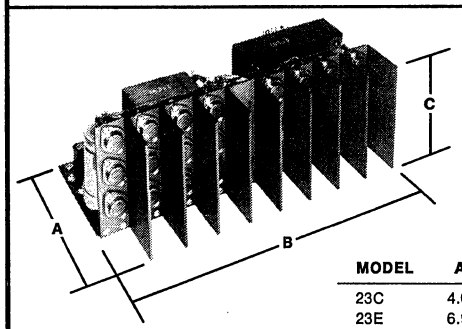
DELIVERY: All models deliverable from stock in 24 hours.

U.L. RECOGNIZED

SMI Series

DC-AC INVERTERS

3 POWER PACKAGES ● 9 DIFFERENT MODELS
● WIDE INPUT RANGE ● SINGLE OR MULTIPLE OUTPUTS
● CUSTOM OUTPUTS AT LOWEST COSTS
● BEST COST/PERFORMANCE RATIO



MODEL	DIMENSIONS A	B	C
23C	4.06	6.50	3.10
23E	6.97	10.50	2.97
23G	7.37	13.50	4.82

OUTPUT RATING CHART AND PRICES

MODEL NUMBER	NOMINAL INPUT VDC	*MAX. AC OUTPUT WATTS	CASE SIZE	EFFICIENCY %	WGT. (LBS.)	UNIT** PRICE
23C-24	24	150	C	65	8	$175.00
23C-48	48	150	C	70	8	175.00
23C-120	120	150	C	70	8	175.00
23E-24	24	300	E	65	14	245.00
23E-48	48	300	E	70	14	245.00
23E-120	120	300	E	70	14	245.00
23G-24	24	600	G	65	20	325.00
23G-48	48	600	G	70	20	325.00
23G-120	120	600	G	70	20	325.00

**Consult factory for quantity discount prices

* **HOW TO SPECIFY:** User can specify any combination of up to 6 AC outputs within maximum output power rating of individual model. Specify voltage and current of each output. Maximum AC output is 500v.
EXAMPLE: For a 300 watt, 3 output Inverter with 24vdc input, order Model 23E-24 and specify V_1, I_1, V_2, I_2, V_3, I_3, such that $P_t \leq 300w$.
DELIVERY — 2 WEEKS

SPECIFICATIONS:

DC INPUT: 20-30v, nominal 24v; 40-60v, nominal 48v; 100-150v, nominal 120v. See rating chart for individual models.
INPUT TRANSIENT: 1000v for 2 μsec.
AC OUTPUTS: See rating chart for outputs of individual models
OUTPUT REGULATION: Line, ±5%; Load, ±5% (no load to full load)
OUTPUT FREQUENCY: Nominal 500 Hz square wave
OVERLOAD PROTECTION: Thermal and Electrical.
COOLING: Convection Cooled.

POWERTEC

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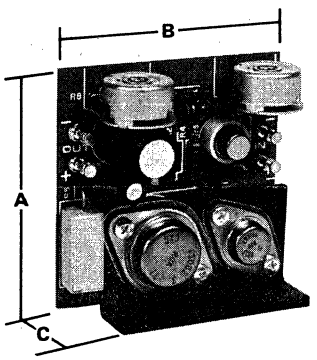
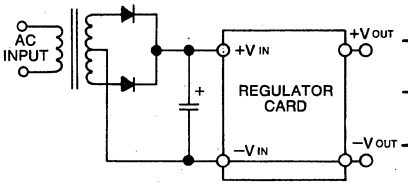
DCR Series

- POWER REGULATOR
- VARIABLE OUTPUTS
- 90/180 WATT RATING
- SIX MODELS – IN ONE SMALL SIZE





Typical Use in Regulated Power Supply

UNIT PRICE	MODEL NUMBER	WATTS DISS.	DC OUTPUT VOLTS	DC OUTPUT AMPS
$15.00	1B5-6	90	4.5-6.5	6.0
$15.00	1B15-6	90	11.5-15.5	6.0
$15.00	1B24-4.5	90	17.5-24.5	4.5
$22.00	1C5-12	180	4.5-6.5	12.0
$22.00	1C15-12	180	11.5-15.5	12.0
$22.00	1C24-8	180	17.5-24.5	8.0

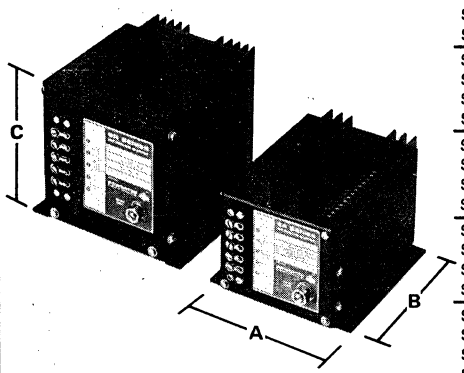
SPECIFICATIONS INPUT: 40 VDC (Max) • OUTPUT: Adjustable, See chart.• INPUT-OUTPUT DIFFERENTIAL (MIN): 4.5 VDC • REGULATION: Line ±.075%; Load ±.075% • RIPPLE: 3MV P-P (with 2.0 V P-P Input Ripple) • RESPONSE: 25 μsec (50% Load Change) • TEMPERATURE: -5°C to 75°C. DIMENSIONS: 2-7/8 H x 2-3/4 W x 1-3/16 D • WEIGHT: 3 OZ

DELIVERY All models deliverable from stock in 24 hours.

SR Series

MODULAR DC POWER SUPPLIES

- HIGH QUALITY
- INTERNAL OVP
- SMALL SIZE
- 55°C RATING



PRICE (INCL. OVP)	MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE	REGULATION LOAD	DIMENSIONS A	DIMENSIONS B	DIMENSIONS C	WEIGHT LBS
$108.00	3E5-5	5.0	5.0	±.05%	±0.3%	4.13	6.50	3.63	5.30
$138.00	3F5-10	5.0	10.0	±.05%	±0.3%	4.88	6.20	5.00	7.50
$191.00	3G5-20	5.0	20.0	±.05%	±0.3%	4.88	11.30	5.00	13.50
$279.00	3H5-35	5.0	35.0	±.05%	±0.3%	14.50	8.00	5.00	22.00
$108.00	3E6-4.6	6.0	4.6	±.05%	±0.3%	4.13	6.50	3.63	5.30
$138.00	3F6-9.0	6.0	9.0	±.05%	±0.3%	4.88	6.20	5.00	7.50
$191.00	3G6-18	6.0	18.0	±.05%	±0.3%	4.88	11.30	5.00	13.50
$279.00	3H6-35	6.0	35.0	±.05%	±0.3%	14.50	8.00	5.00	22.00
$108.00	3E10-3.0	10.0	3.0	±.05%	±0.1%	4.13	6.50	3.63	5.30
$138.00	3F10-6.0	10.0	6.0	±.05%	±0.1%	4.88	6.20	5.00	7.50
$191.00	3G10-12	10.0	12.0	±.05%	±0.1%	4.88	11.30	5.00	13.50
$279.00	3H10-24	10.0	24.0	±.05%	±0.1%	14.50	8.00	5.00	22.00
$108.00	3E12-2.5	12.0	2.5	±.05%	±.05%	4.13	6.50	3.63	5.30
$138.00	3F12-5.0	12.0	5.0	±.05%	±.05%	4.88	6.20	5.00	7.50
$191.00	3G12-10.0	12.0	10.0	±.05%	±.05%	4.88	11.30	5.00	13.50
$279.00	3H12-20.0	12.0	20.0	±.05%	±.05%	14.50	8.00	5.00	22.00
$108.00	3E15-2.2	15.0	2.2	±.05%	±.05%	4.13	6.50	3.63	5.30
$138.00	3F15-4.4	15.0	4.4	±.05%	±.05%	4.88	6.20	5.00	7.50
$191.00	3G15-8.8	15.0	8.8	±.05%	±.05%	4.88	11.30	5.00	13.50
$279.00	3H15-17.6	15.0	17.6	±.05%	±.05%	14.50	8.00	5.00	22.00
$108.00	3E18-2.0	18.0	2.0	±.05%	±.05%	4.13	6.50	3.63	5.30
$138.00	3F18-4.0	18.0	4.0	±.05%	±.05%	4.88	6.20	5.00	7.50
$191.00	3G18-8.0	18.0	8.0	±.05%	±.05%	4.88	11.30	5.00	13.50
$279.00	3H18-16.0	18.0	16.0	±.05%	±.05%	14.50	8.00	5.00	22.00
$108.00	3E24-1.5	24.0	1.5	±.05%	±.05%	4.13	6.50	3.63	5.30
$138.00	3F24-3.0	24.0	3.0	±.05%	±.05%	4.88	6.20	5.00	7.50
$191.00	3G24-6.0	24.0	6.0	±.05%	±.05%	4.88	11.30	5.00	13.50
$279.00	3H24-12.0	24.0	12.0	±.05%	±.05%	14.50	8.00	5.00	22.00
$108.00	3E28-1.4	28.0	1.4	±.05%	±.05%	4.13	6.50	3.63	5.30
$138.00	3F28-2.8	28.0	2.8	±.05%	±.05%	4.88	6.20	5.00	7.50
$191.00	3G28-5.6	28.0	5.6	±.05%	±.05%	4.88	11.30	5.00	13.50
$279.00	3H28-11.2	28.0	11.2	±.05%	±.05%	14.50	8.00	5.00	22.00

SPECIFICATIONS INPUT: 115 VAC ±10%; 57-440 Hz derate 10% 47 Hz • OUTPUT: See chart. Voltage Adjustable ±3% • REGULATION: See chart, 50% load 10% line • RIPPLE: Typical 1 MV RMS, 3 MV P-P; MAX. 5 MV P-P • RESPONSE: 20 - 50 μsec typical for half load to full load • TEMPERATURE: Full load 0°C to +55°C. Derate 50% @ 71°C. Storage -55°C to +85°C • T.C.: ±0.01%°C Max • STABILITY: ±0.1% for 8 hours after warmup • O.V. PROTECTION: Optional @ 120% ±5% • O.L. PROTECTION: Current limit foldback • REMOTE SENSE: G and H case sizes.

DELIVERY All models deliverable from stock in 24 hours.

POWERTEC

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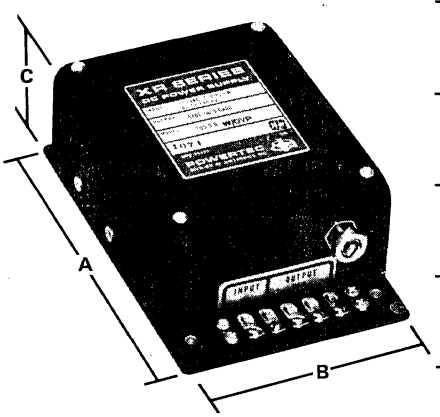
XR Series

MODULAR DC POWER SUPPLIES

- HIGH QUALITY
- INTERNAL OVP
- SMALL SIZE
- 71°C RATING



PRICE (INCL. OVP)	MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE/LOAD	DIMENSIONS A	DIMENSIONS B	DIMENSIONS C	WGT LBS
SINGLE OUTPUT UNITS WITH OVP.								
$41.50	3B5-.35	5.0	.35	±0.3%	3.50	2.50	1.56	.75
$52.00	3C5-1.2	5.0	1.2	±0.3%	5.88	3.25	1.90	1.5
$59.00	3D5-3.0	5.0	3.0	±0.3%	6.25	4.00	2.25	2.5
$41.50	3B6-.35	6.0	.35	±0.3%	3.50	2.50	1.56	.75
$52.00	3C6-1.0	6.0	1.0	±0.3%	5.88	3.25	1.90	1.5
$59.00	3D6-2.5	6.0	2.5	±0.3%	6.25	4.00	2.25	2.5
$41.50	3B10-.2	10.0	.2	±0.1%	3.50	2.50	1.56	.75
$52.00	3C10-.7	10.0	.7	±0.1%	5.88	3.25	1.90	1.5
$59.00	3D10-1.5	10.0	1.5	±0.1%	6.25	4.00	2.25	2.5
$41.50	3B12-.2	12.0	.2	±0.075%	3.50	2.50	1.56	.75
$52.00	3C12-.6	12.0	.6	±0.075%	5.88	3.25	1.90	1.5
$59.00	3D12-1.5	12.0	1.5	±0.075%	6.25	4.00	2.25	2.5
$41.50	3B15-.2	15.0	.2	±0.075%	3.50	2.50	1.56	.75
$52.00	3C15-.5	15.0	.5	±0.075%	5.88	3.25	1.90	1.5
$59.00	3D15-1.2	15.0	1.2	±0.075%	6.25	4.00	2.25	2.5
$41.50	3B18-.15	18.0	.15	±0.075%	3.50	2.50	1.56	.75
$52.00	3C18-.5	18.0	.5	±0.075%	5.88	3.25	1.90	1.5
$59.00	3D18-1.0	18.0	1.0	±0.075%	6.25	4.00	2.25	2.5
$41.50	3B24-.1	24.0	.1	±0.075%	3.50	2.50	1.56	.75
$52.00	3C24-.35	24.0	.35	±0.075%	5.88	3.25	1.90	1.5
$59.00	3D24-.7	24.0	.7	±0.075%	6.25	4.00	2.25	2.5
$41.50	3B28-.1	28.0	.1	±0.075%	3.50	2.50	1.56	.75
$52.00	3C28-.35	28.0	.35	±0.075%	5.88	3.25	1.90	1.5
$59.00	3D28-.7	28.0	.7	±0.075%	6.25	4.00	2.25	2.5
DUAL OUTPUT UNITS WITH OVP								
$76.00	*3C10D-.3	10.0	.30	±0.075%	5.88	3.25	1.90	1.5
$84.00	*3D10D-.6	10.0	.60	±0.075%	6.25	4.00	2.25	2.5
$76.00	3C12D-.3	12.0	.30	±0.075%	5.88	3.25	1.90	1.5
$84.00	3D12D-.6	12.0	.60	±0.075%	6.25	4.00	2.25	2.5
$76.00	3C15D-.25	15.0	.25	±0.075%	5.88	3.25	1.90	1.5
$84.00	3D15D-.5	15.0	.50	±0.075%	6.25	4.00	2.25	2.5
FULLY ADJUSTABLE UNITS (†OVP NOT AVAILABLE)								
$47.00†	*3C18-.25-V	0-18	.25	±0.075+5MV	5.88	3.25	1.90	1.5
$57.00†	*3D18-.5-V	0-18	.50	±0.075+5MV	6.25	4.00	2.25	2.5
$47.00†	*3C36-.13-V	0-36	.13	±0.075+5MV	5.88	3.25	1.90	1.5
$57.00†	*3D36-.25-V	0-36	.25	±0.075+5MV	6.25	4.00	2.25	2.5
NIXIE POWER SUPPLIES (NOT ADJUSTABLE, †OVP NOT AVAILABLE)								
$41.50†	*3B180-.01	180	.01	±3%	3.50	2.50	1.56	.75
$52.00†	*3C180-.02	180	.02	±3%	5.88	3.25	1.90	1.5
$59.00†	*3D180-.04	180	.04	±3%	6.25	4.00	2.25	2.5

* NON-STOCKED. ON NON-STOCKED ITEMS THERE IS A HANDLING CHARGE OF $25.00 FOR THE FIRST UNIT AND $10.00 FOR EACH ADDITIONAL UNIT OF A GIVEN MODEL TYPE.

SPECIFICATIONS INPUT: 115 VAC ±10%; 57-440 Hz derate 10% 57-47 Hz • OUTPUT: See chart, Voltage Adjustable ±3% • REGULATION: See chart, 50% load, 10% line • RIPPLE: Typical 1 MV RMS, 3MV P-P; MAXIMUM 5MV P-P • RESPONSE: 20-50 μsec typical 1/2-FL • TEMPERATURE: Full load 0°C to +71°C. Storage -55°C to +85°C. • T.C.: ±0.01%/°C Max • STABILITY: ±0.1% for 8 hours after warmup • O.V. PROTECTION: SET AT 120% ±5% • O.L. PROTECTION: Current Limit foldback.

DELIVERY All models deliverable from stock in 24 hours.

POWERTEC

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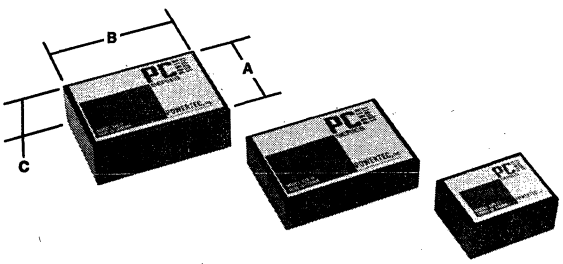
PC Series

SINGLE OR DUAL OUTPUT MODELS
- **SPACE SAVING SINGLE OUTPUT MODELS**
- **OUTPUT RATINGS FROM 5 TO 28 VDC**
- **CURRENT RATINGS FROM 25 mA TO 1000 mA**



DIMENSIONS

MODEL	A	B	C
A	1.75	2.25	1.00
B	2.50	3.50	.87
C	2.50	3.50	1.25

MOUNTING SOCKETS

CASE	MODEL NO.	UNIT PRICE
A	32M-A	$5.00
B	32M-B	$5.00
C	32M-C	$5.00

OUTPUT RATING CHART AND PRICES

MODEL NUMBER	DC OUTPUT VOLTAGE	DC OUTPUT CURRENT	CASE SIZE	REGULATION LINE (MAX.)	REGULATION LOAD (MAX.)	RIPPLE & NOISE	*UNIT PRICE
SINGLE OUTPUT MODELS							
32C5	5v	1000mA	C	±0.02%	±0.04%	1.0mV RMS	$65.00
32B5X	5v	500mA	B	±0.02%	±0.04%	1.0mV RMS	45.00
32B5	5v	250mA	B	±0.02%	±0.04%	1.0mV RMS	38.00
32A10	10v	120mA	A	±0.02%	±0.02%	0.5mV RMS	25.00
32A12	12v	100mA	A	±0.02%	±0.02%	0.5mV RMS	25.00
32A15	15v	100mA	A	±0.02%	±0.02%	0.5mV RMS	25.00
32A18	18v	65mA	A	±0.02%	±0.02%	1.0mV RMS	25.00
32A24	24v	50mA	A	±0.02%	±0.02%	1.0mV RMS	25.00
DUAL OUTPUT MODELS							
32C12D	±12v	240mA	C	±0.02%	±0.02%	0.5mV RMS	65.00
32B12D	±12v	120mA	B	±0.02%	±0.02%	0.5mV RMS	45.00
32C15D	±15v	200mA	C	±0.02%	±0.02%	0.5mV RMS	65.00
32B15D	±15v	100mA	B	±0.02%	±0.02%	0.5mV RMS	45.00

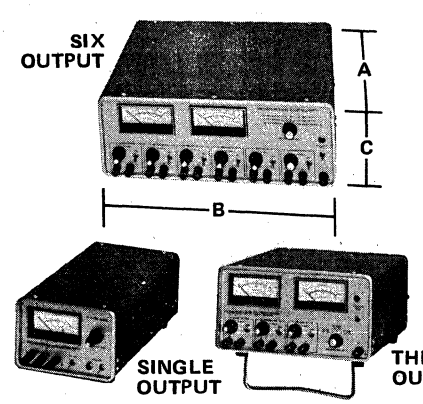
*Consult factory for quantity discounts

DELIVERY — ALL MODELS DELIVERABLE FROM STOCK
Prices and specifications subject to change without notice.

SPECIFICATIONS:
INPUT VOLTAGE: 115 ± 10 vac
OPERATING TEMPERATURE: −25°C to 71°C
FREQUENCY: 50 to 400 Hz
TEMPERATURE COEFFICIENT: 0.02% / °C
INPUT ISOLATION: 50 Megohms
OUTPUT IMPEDANCE @ 10 KHz: 200 Milliohms
STORAGE TEMPERATURE: −25°C to 85°C

LAB Series

LABORATORY DC POWER SUPPLIES
- SMALL SIZE & WEIGHT • LOW COST
- SINGLE & MULTI-OUTPUTS • R&D PRECISION



UNIT PRICE	MODEL NUMBER	VDC	AMPS	REGULATION LINE/LOAD	RIPPLE	DIMENSIONS (IN.) A	B	C	WGT LBS
SINGLE OUTPUT LAB SUPPLY									
$235.00	6B1000	0-6V	15A	±0.01%	1MVRMS	9.38	5.75	4.45	9.5
$235.00	6B1001	0-18V	6A	±0.01%	1MVRMS	9.38	5.75	4.45	9.5
$235.00	6B1002	0-36V	3A	±0.01%	1MVRMS	9.38	5.75	4.45	9.5
THREE OUTPUT LAB POWER SUPPLY									
$350.00	6C3000	0-6V	5A	±0.15%	1MVRMS	10.25	9.00	4.70	15.0
		0-36V	1A	±0.05%	1MVRMS	10.25	9.00	4.70	15.0
		0-36V	1A	±0.05%	1MVRMS	10.25	9.00	4.70	15.0
SIX OUTPUT LAB POWER SUPPLY									
$495.00	6D6000	0-6V	5A	±0.15%	1MVRMS	13.87	12.80	4.70	22.5
		0-18V	2A	±0.05%	1MVRMS	13.87	12.80	4.70	22.5
		0-18V	2A	±0.05%	1MVRMS	13.87	12.80	4.70	22.5
		0-36V	1A	±0.05%	1MVRMS	13.87	12.80	4.70	22.5
		0-36V	1A	±0.05%	1MVRMS	13.87	12.80	4.70	22.5
		0-200V	.040A	±0.05%	5MVRMS	13.87	12.80	4.70	22.5

SPECIFICATIONS INPUT: 6B; 115 VAC ±10%, 57-63 Hz. 6C, 6D: 115/230 VAC ±10%, 57-63 Hz • RESOLUTION: <3 mV, 200 VDC output 50 mV • TEMPERATURE: Full power rating 0-40°C • T.C. ±.01%/°C • O.L.: Current limit at 120% • METERING: Voltage and current switch on one knob.

DELIVERY All models deliverable from stock in 24 hours.

POWERTEC

POWERTEC, INC.
an Airtronics Subsidiary
9168 DeSoto Ave., Chatsworth, Calif. 91311
(213) 882-0004 • TWX (910) 494-2092

FOR CURRENT SOURCE DATA CALL TOLL-FREE 800-645-9200 (IN N. Y. STATE CALL COLLECT (516) 294-0990)

HOW TO USE eem

electronic engineers master

1973-74

Need directory information?

EEM contains four complete directories which provide the most up-to-date information available. These directories are listed and described at the right. They appear in all three volumes, with the exception of the Trade Mark Directory which appears only in Volume 1. Directory references to Volume 4 indicate the 1973 edition, which you received in January. That copy of Volume 4 should be retained to complete the 4-volume set.

Add Volume 4/1973 to your copies of Volumes 1, 2 and 3 to make a complete set of **EEM** for 1973-74.

Included in this volume are:

The Product Index and Directory

The Product Index and Directory (green section, page 9) lists more than 6,000 types of electronic products alphabetically, by product. Under each product heading is a complete, alphabetical listing of manufacturers who make that product. **Bold face** listings indicate which manufacturers have provided catalog data on that product in the white pages.

The Manufacturers and Sales Office Directory

The Manufacturers and Sales Office Directory (starts yellow section of each volume) lists more than 3,000 manufacturers of electronic components, materials, instruments, assemblies, systems, and key services. Provided are complete addresses, phone numbers, sales managers' names, names of application engineers, TWX numbers where applicable, selected distributors. **Bold face** listings indicate that manufacturers have provided catalog data in the white pages and that sales offices are listed.

The Distributor Directory

The Distributor Directory (yellow section, page 1594, with black edge marking) lists more than 1,000 electronic distributors and branch locations, alphabetically by distributor's name, geographically by state and city.

Need catalog information?

For complete catalog information on any product, refer to the Product Index and Directory (green section, page 9, all volumes) which provides a complete listing of all the manufacturers who supply a particular product. Those manufacturers listed in bold face with page and volume number references have provided catalog data on this product in the catalog section (white pages) where you can find the information you need. References to Volume 4 indicate the Volume 4 you received in January and which should be retained to complete your 4-volume set of EEM.

Need additional information in a hurry?

Two special telephone services are being maintained for EEM users to provide extra information you need. If you need to determine a local source of supply, just **D.I.A.L. EEM.** This toll-free service (**D**istributor **I**nformation **A**nd **L**istings), provides you with the name of a sales office or distributor in your area who can provide a needed product.
For up-to-the-minute listings of manufacturers who provide certain IC functions, **call the IC UPDATE HOTLINE.** Listings of IC functions are updated daily by manufacturers throughout the country. For information in a hurry, **just D.I.A.L. EEM** — call toll-free 800-645-9200 (in N. Y. State call collect (516) 294-0990). Or **call The IC UPDATE HOTLINE,** Dial toll-free 800-645-9201.

Need additional assistance?

Contact the EEM editorial staff, at United Technical Publications, Inc., 645 Stewart Avenue, Garden City, N. Y. 11530, or phone (516) 248-9700.

UNITED TECHNICAL PUBLICATIONS

Thin Line P.C. Card Power Supplies

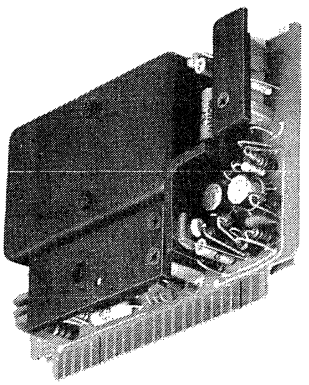
"Smallest size for 7.5 Watt Output"

Series

P C

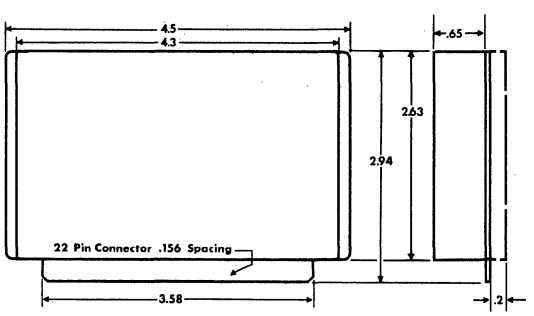
FEATURES

- Repairable
- 5 VDC to ±15 VDC
- Up to 1 amp.
- 0.65" Above P.C. Board
- Excellent Performance Specs
- Fully Protected
- Low Cost
- Adjustable Voltage Included
- Plug In Compatability With More Expensive Units



DESCRIPTION

The RO Associates P.C. series is designed for powering small systems with convenient plug in flexibility. The extremely low profile allows a minimum number of card slots to be sacrificed for a power supply. The small size is available due to utilization of advanced switching techniques. RFI is completely filtered out. Connector is standard 22 pin with 0.156" spacing.



COMMON SPECIFICATIONS

Input

105 to 125 VAC, 50Hz to 1KHz

Temperature Range

0-50°C ambient

Temperature Coefficient

±0.03% / °C

Model	Volts	Current	Regulation		Ripple & Noise	Price	
			±10% Line	O-F.L		1-24	25 & up
PCD-15-250	±15*	±250 ma	±.01%	0.03%	±.03%	$119.00	$109.00
PC-5-1	5	1000 ma	±.01%	0.1%	±0.1%	99.00	89.00

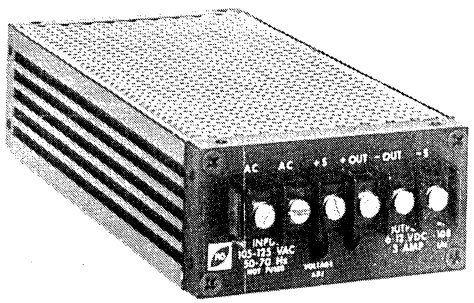
*±15 adj. to ±12 @ 200 ma

RO ASSOCIATES
3705 HAVEN AVE.
MENLO PARK
CALIFORNIA · 94025

Low Profile-Low Cost High Efficiency System Power Supplies Series 100

FEATURES

- Up to 5 Amps Out
- 1¾" Panel mount
- Short and Overload Proof
- Crow Bar Included
- Excellent Transient response
- Low Cost



DESCRIPTION

The RO series 100 combines high efficiency switching techniques to realize small size and high volume production techniques for low cost. The 100 series are high quality, high reliability units with excellent operating specifications. All of the quality features and specification of higher priced units are contained in this series. Form factor allows for mounting on a 1¾" or 3½" rack panels. No additional heat sinking is required to obtain full output.

COMMON SPECIFICATIONS

INPUT
105 to 125 VAC, 50 to 70 Hz

Power Supply Protection
Current limit provides continuous short circuit and overload protection

Load Protection
Crowbar set at 6.8 ±0.2V on model 105 and at 18 ±0.5V on models 107 and 108.
No crowbar on 106 or 115.

Transient Response
No turn on or off overshoot.
20 mv max. change for 40% load change, recovery in 20 microseconds.

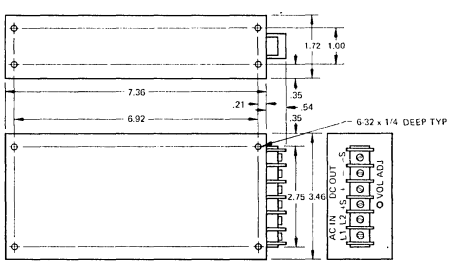
Operating Temperature
—20°C to +75°C (see above cooling spec.)

Weight
4½ lbs.

Temperature Stability
Better than .03%/°C

Remote Sensing
Remote sensing connection standard

Cooling
Max. mounting base temperature for full output is 75°C.
For no (air conduction) cooling, max. ambient temperature is 25°C for full output. Derate linearly to 60% of current @ 60°C and no cooling.



SINGLE

Model	Volts	Amps	P-P Ripple	Regulation ±10% Line	Regulation O-F.L	Price 1-24	Price 25-99	Price 100 & up
105	1.5 to 6 VDC adj.	5A	2 mv	±1 mv	2 mv	$89.00	$79.00	$76.00
106	6 to 30 VDC adj.	1.5A	2 mv	±1 mv	2 mv	99.00	89.00	85.00
107	12 to 15 VDC adj.	2.5A	2 mv	±1 mv	2 mv	99.00	89.00	85.00
108	6 to 12 VDC adj.	3.0A	2 mv	±1 mv	2 mv	99.00	89.00	85.00

DUAL

115	±12 to ±15 adj.	0.75A	2 mv	±3 mv	3 mv	99.00	89.00	85.00

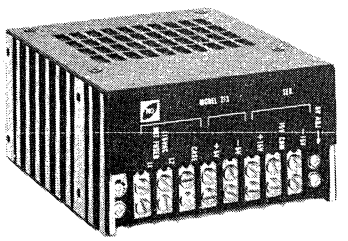
RO ASSOCIATES
3705 HAVEN AVE.
MENLO PARK
CALIFORNIA 94025

Miniature Power Converters for Digital I.C. and Analog Circuits and D.C. to D.C. Converters See Model 2105

Model 200

FEATURES

- 55 Watts in 45 Cubic Inches
- 5 1/16" x 4" x 2 1/4", weighs 2.5 lbs.
- Multiple Outputs
- High Efficiency
- Fully Protected
- 20 KHz operation, no audible noise
- RFI Filtered
- 110VAC Input
- 48 VDC Input on Model 2105



COMMON SPECIFICATIONS

Input
105 to 130 VAC. 50 to 1000 Hz or 160 VDC ±10%

Protection
All outputs current limited, continuous overload and short circuit proof. 5 volts outputs have self recovering overvoltage protection set at 6.8 to 7 volts.

Temperature Stability
Better than 0.01% / °C

Cooling
Maximum mounting base temperature for full output is 85°C. For no (air or conductive) cooling, max. ambient temperature of 30°C for full output. Derate linearly to 60% power at 60°C ambient and no cooling.

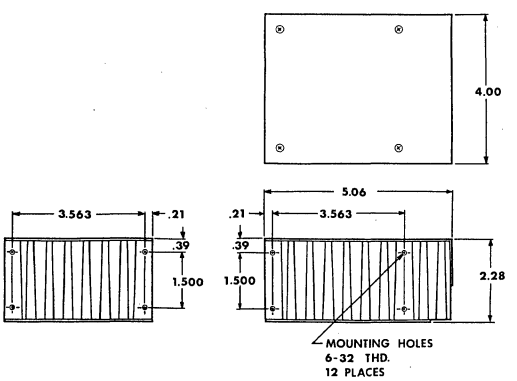
Operating Temperature
—20°C to +85°C

Remote Sensing
On most outputs.

Size
5 1/16" x 4" x 2 1/4", 45 cubic inches

Weight
Approx. 2.5 pounds

Mounting
Mounting available on 3 sides by 4, 6-32 tapped inserts



Model	DC Out - Volts, DC	Amps	Regulation		Ripple & Noise	Price 1-99
			Load*	Line ±10%		
210	3.5 to 5.5 adj.	10A	0.1% or 5 mv	±0.1%	25 mv p-p	$245.00
211	(A) 4.5 to 5.5 adj. (B) 24	5A 1A	0.2% 0.2%	±0.1% ±0.05%	25 mv p-p 25 mv p-p	275.00
213	(A) 4.5 to 5.5 adj. (B) ±15	5A 400 ma each side	0.2% 0.1%	±0.1% ±0.05%	25 mv p-p 20 mv p-p	345.00
250	12 to 15 adj.	4A	0.2%	±0.05%	50 mv p-p	260.00
251	24 to 28 adj.	2A	0.2%	±0.05%	50 mv p-p	260.00
2105	4.5 to 5.5	10A	0.1%	±0.1%	20 mv p-p	395.00

Model 2105 has 48 VDC −6 +12 VDC input.

*LOAD REGULATION is from 0.5 A to F.L. on all 5 volt outputs, 0 to F.L. on all other outputs, from 0 to 0.5A on 5 volt output regulation is better than 1%.

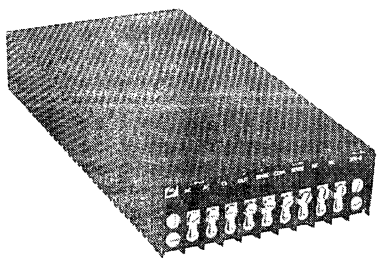
RO ASSOCIATES
3705 HAVEN AVE.
MENLO PARK
CALIFORNIA 94025

Miniature Power Converter for Analog and Memory Applications

Model 301

FEATURES

- 90 Watts in 94 Cubic Inches
- Dual Outputs
- High Efficiency Circuit
- Fast Transient Response
- Current Limited, Short Circuit Proof
- Multiple Output Choices
- Completely RFI Filtered
- 115 VAC Input



DESCRIPTION

The RO 300 series is designed specifically for analog and memory circuit application. In this single unit, there is a large choice of output voltages, dual and single, at full output power. This amazing flexibility is coupled with RO's high efficiency circuitry utilizing 20 KHz techniques, resulting in extremely small size. These units supplement the RO 200 series for digital applications.

SPECIFICATIONS

DC Outputs

*A. ±12 to ±15 VDC @ 3A each side or B. 12 to 15 VDC @ 6A or C. 24 to 30 VDC @ 3A

*All outputs available by choice of connection. When using both plus and minus outputs at same time, any combination of 6 amps can be taken from both polarities.

Input

105 to 130 VAC, 50 to 1000 Hz (Also 115 to 170 VDC)

Efficiency

65% typical at ±15 VDC at ±3 amps output

Regulation

±0.01% for ±10% change in line 0.1% zero to full load, + and — tracking

Ripple and noise

Less than 500 microvolts RMS Less than .10 millivolts peak to peak

Transient response

For no load to full load switching, recovery is less than 20 microseconds, and peak excursions are less than 200 mv typical

Protection

Power supply is protected against continuous overload and short circuit conditions, by electronic current limit circuitry.

Temperature Stability

Better than .015% / °C

Cooling

Unit will provide full output with **no** (air or conductive) cooling up to an ambient of 30°C.

Full output is obtainable if base plate is maintained at 75°C. Over temp T/S built in.

Operating Temperature

—20° to +75°C (see above cooling spec.)

Size

5.26" x 10.6" x 1.69" (94 cubic inches)

Mounting

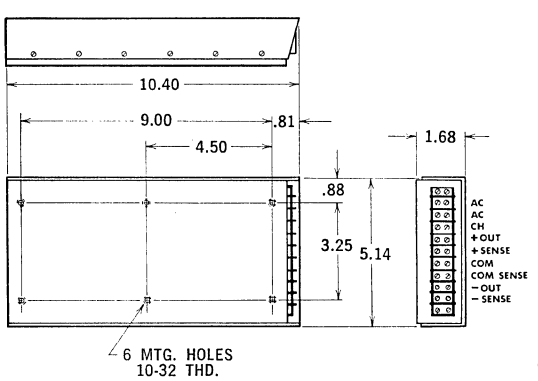
Mounting on 5" x 10" surface with 6 threaded inserts, size 10-32

Weight

3.5 lbs.

Price: $495.00

Other multiple outputs to your requirements will be quoted, contact factory or local representative.



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MENLO PARK
CALIFORNIA 94025

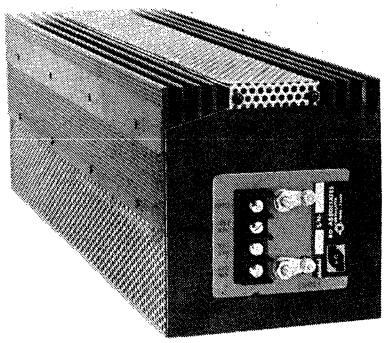
High Efficiency Switching Power Converter 5 VDC @ 50A AC to DC and DC to DC

Applicable to Uninterruptable Power Systems

Series 400

FEATURES

- **May be operated from 12V DC battery. Ideal for uninterruptable power supply system. (UPS)**
- **4.5-5.5 volts adj. at 50 Amp output (2.0 to 8V available).**
- **High efficiency, typically 65% at 5V, 50A output.**
- **Units are parallelable up to thousands of Amps without control interconnections.**
- **Logic turn-on/turn-off capability (T^2L compatible).**
- **20 kHz operation, no audible noise, RFI shielded.**
- **Output has crow bar overvoltage, adjustable current limit protection, and overtemperature protection.**
- **Remote sensing.**
- **Conservative Electrical Design. 422 cubic inches, 5.01″ x 5.01″ x 16.85″ overall.**



DESCRIPTION

The RO Series 400 is a high efficiency, 20 kHz switching supply that has tremendous versatility in that it has small size, UPS capability, simple parallel operation, 12 VDC input connections, heat sinkability, no derating if case temperature is maintained by any technique, wide output voltage range at no extra cost, system inputs for sequencing, full load and power supply protection, and very conservative electrical design. Multiple outputs totaling up to 400 watts available soon.

SPECIFICATIONS

Input Specifications

Power

105 to 125 VAC, 50 to 500 Hz or 12 VDC +8 --2.

Signal

Logic turn-on/turn-off, T^2L compatible. "O" state will hold supply off.

No connection is required to allow the supply to go on and off. External synch, input, 20 kHz. T^2L compatible. "1" pulse width −3 ±0.5 μseconds.

Rapid shutdown — 10 μseconds at no load, maximum of 2.5 μseconds at full load. Apply at 8 ±0.5V pulse or DC level (referenced to supply output ground) to C/B test terminal.

Output specifications (based on 5 ±0.1 Volt Output)

Load Regulation

0.2%, 0 to 50 Amps

Line Regulation

±0.1%, for ±10% input

Ripple and Noise

50 mV p-p, DC to 20 MHz

Temperature Stability

.02%/°C

On/Off Times

(Logic controlled, 50A load, 12 VDC Input)

On — 20 msec. max. (0-4.5 VDC)

Off — 15 msec. max.

Storage Time

(50 Amp load, switching input voltage from 12 VDC to open circuit)

Greater than 10 milliseconds

Transient Response

(30 Amp load and 12 VDC input)

For a load change of ±20 Amps the output will vary less than ±300 mv and will recover in less than 1 millisecond

Operating Temperature

Full output at max case temp of 70°C, or still ambient of −20°C to +30°C. Unit is heatsinkable. Recommended orientation in still air is fins up or vertical.

Mounting

Mounting to extrusion by 6, #10-32 either side.

Weight

14 lbs.

Size

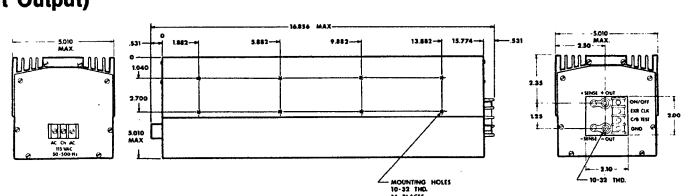
5.01″ x 5.01″ x 16.85″ overall max.

Price

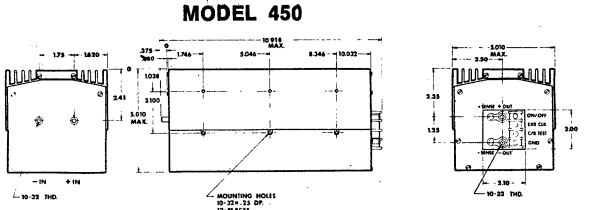
Model 450*	$550.00
Model 460**	$450.00

* 2.0 to 8 volts available at no extra charge on both 450 and 460. Model 450 has internal connections for 12 VDC battery plus isolating diode for UPS operation.

** Model 460 has identical specifications to Model 450 except input is limited to 12 VDC +8 −2 input. It has an efficiency of 75% at 5V out and is not isolated from input to output.



MODEL 450



MODEL 460

RO ASSOCIATES
3705 HAVEN AVE.
MENLO PARK
CALIFORNIA 94025

New Low Cost Quality OEM Plug In Modules Series 500

DESCRIPTION

These units contain high quality features such as

- All Teflon Lead Wire
- G-10 Board Material
- M-6 Magnetic Material
- Computer Grade Semi Conductors and Capacitors
- Epoxy Impregnated Transformers

COMMON SPECIFICATIONS

Input

105-125 VAC, 50 to 400 Hz

Temperature

0 to 55°C; Derate to 70% Power @ 70°C

P.S. Protection

Current Limited, Short Circuit Proof

Load Protection

Crowbar Included for Model 517, Available on Models 518 and 519 for $8.00 additional

Controls

Voltage adjust pots included, duals have single adjust for both + and — output

Tracking

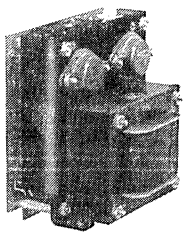
All duals are tracking units

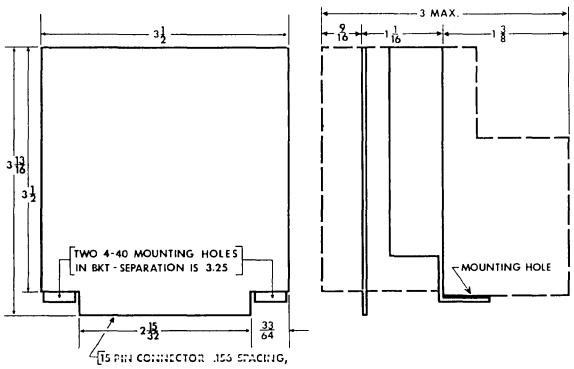
Connector

Standard 15 pin, 0.156′ spacing P.C. connector, single sided

FEATURES

- Single & Dual Outputs
- Current Limit Protection
- Overvoltage on 5 Volt Units
- All System Voltages
- Adjust Pots Included
- Plug In Flexibility





SINGLES

517*	5±0.5	2.5 A	< 5 mv	0.03%	0.2%	0.03%	2.8	59.00
518	12 to 15	1.0 A	< 5 mv	0.02%	0.1%	0.03%	2.8	59.00
519	24 to 28	0.5 A	<10 mv	0.02%	0.2%	0.03%	2.8	59.00

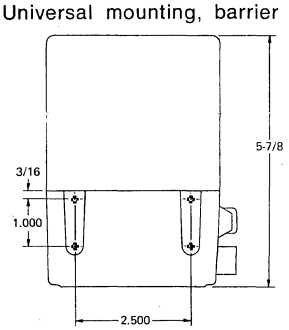
*Includes overvoltage crowbar

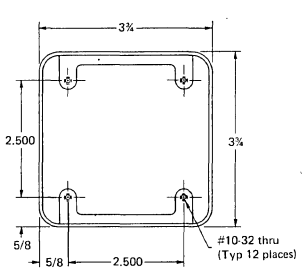
DUALS

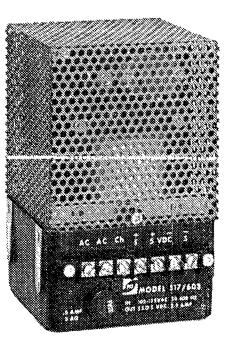
Model	Volts	Current	Ripple p-p	Regulation		Stability %/°C & 24 hours	Wt. lbs.	Price
				Line ±10%	Load 0 - FL			
506	±12 to ±24	150 ma	< 2 mv	0.03%	0.15%	0.02%	2.0	$95.00
513	±21 to ±28	300 ma	<10 mv	0.1%	0.3%	0.03%	2.8	76.00
514	±12 to ±15	500 ma	< 1 mv	0.02%	0.02%	0.01%	2.8	89.00
515	±24	60 ma	<10 mv	0.2%	0.2%	0.2%	1.8	49.00

ORDER ABOVE UNITS 506 THROUGH 519 WITH CASE, ILLUSTRATED BELOW, $25.00 ADDITIONAL.

OPTIONAL MOUNTING AVAILABLE FOR ALL UNITS
Universal mounting, barrier strip output, input fuse included.







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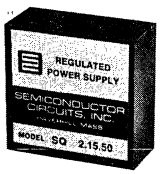
The Most Complete Line Of Miniature Encapsulated

COMPONENT ORIENTED — IN PACKAGING PRICE PERFORMANCE
OF IC'S, FUNCTION MODULES, D-A CONVERTERS,

SQ SERIES The Real Square Deal...



A TRULY LOW COST MINIATURE (2" x 2" x $\frac{7}{8}$") WITH BETTER THAN AVERAGE REGULATION

MODEL	OUTPUT VOLTAGE (±1% FIXED)	OUTPUT CURRENT	REGULATION LINE AND LOAD *	PRICE (1-9)
SQ1.5.250	5VDC	250mA	0.2%	$19.95
SQ2.12.30	±12VDC	±30mA	0.1%	19.95
SQ2.12.50	±12VDC	±50mA	0.1%	28.95
SQ2.15.30	±15VDC	±30mA	0.1%	19.95
SQ2.15.50	±15VDC	±50mA	0.1%	28.95

From $19.95 (1-9)

SPECIFICATIONS:

INPUT VOLTAGE:
105-125 VAC 50-440 Hz

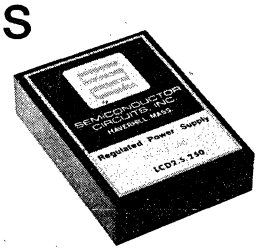
RIPPLE AND NOISE:
1mV RMS

TEMPERATURE COEFFICIENT:
0.02%/°C typical

OPERATING TEMPERATURE RANGE:
- 25°C to +71°C

LCD SERIES For General Purpose Applications

MODEL	OUTPUT VOLTAGE (± FIXED 1%)	OUTPUT CURRENT	CASE STYLE	PRICE (1-9)
LCD2.15.25	±15VDC	±25mA	A	$19.95
LCD2.15.50	±15VDC	±50mA	A	35.00
LCD2.15.100	±15VDC	±100mA	A	45.00
LCD2.15.200	±15VDC	±200mA	B	59.95
LCD2.5.250	±5VDC	±250mA	A	59.00
LCD2.5.500	±5VDC	±250mA	B	69.00



MANY OTHER MODELS AVAILABLE

Dimensions: (A) 2.5" x 3.5" x .875"
(B) 2.5" x 3.5" x 1.25"

From $19.95 (1-9)

SPECIFICATIONS:

INPUT VOLTAGE:
105-125 VAC—50 to 440 Hz

REGULATION:
0.20%, line and load

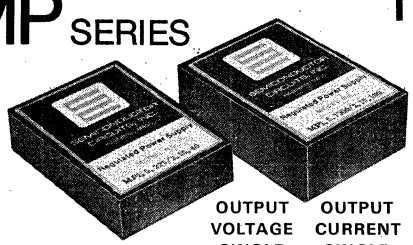
RIPPLE AND NOISE:
1mV, RMS

TEMPERATURE COEFFICIENT:
0.02%/°C typical

OPERATING TEMPERATURE RANGE:
–25°C to +71°C

MP SERIES Triple Regulated Outputs

IN ONE SMALL PACKAGE



MODEL	OUTPUT VOLTAGE SINGLE (Vdc)	OUTPUT CURRENT SINGLE (mA)	OUTPUT VOLTAGE DUAL (Vdc)*	OUTPUT CURRENT DUAL (mA)	CASE STYLE	PRICE (1-9)
MP1.5.225/2.15.40	5	225	±15	±40	E	$49.95
MP1.5.300/2.15.150	5	300	±15	±150	F	$67.00
MP1.5.500/2.15.100	5	500	±15	±100	F	$73.00
MP1.5.750/2.15.150	5	750	±15	±150	G	$93.00
MP1.5.1000/2.15.100	5	1000	±15	±100	G	$96.00

*Available with dual 12 Vdc outputs and up to 6 outputs for OEM applications.

Dimensions: (E) 2.5" x 3.5" x .875"
(F) 2.5" x 3.5" x 1.25"
(G) 2.5" x 3.5" x 1.56"

From $49.95 (1-9)

SPECIFICATIONS:

INPUT VOLTAGE:
105-125 VAC– 50-440 Hz

OUTPUT VOLTAGE:
(±1% Fixed)

REGULATION (Max.):
LINE (105-125 VAC) 0.01%
LOAD (NL-FL) 0.05%

TEMPERATURE COEFFICIENT:
0.02%/°C Typical

RIPPLE AND NOISE:
1mV RMS (Max.)

OPERATING TEMPERATURE:
-25°C to +71°C (Ambient)

Our NEW 32 page catalog describes our full line of component module, PC card, open-frame cased, and laboratory power supplies, DC/DC converters, DC/AC inverters, DC/DC isolators, switching regulators, and power kits.

Power Supplies For Digital And Linear Applications

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OP-AMPS, DPM'S, ETC.

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(IN N.Y. STATE CALL COLLECT (516) 294-0990)

P SERIES High Performance High Reliability

THE STANDARD FOR THE INDUSTRY

SINGLE OUTPUT MODELS	OUTPUT VOLTAGE (Vdc)	OUTPUT CURRENT (mA)	CASE STYLE	PRICE (1-9)
P1.5.500	5	500	A	$43.00
P1.5.1000	5	1000	B	62.00
P1.5.2000	5	2000	C	89.00
DUAL OUTPUT MODELS				
P2.15.25	±15	±25	A	$22.95
P2.15.60	±15	±60	A	39.00
P2.15.100	±15	±100	A	49.00
P2.15.200	±15	±200	B	69.00
P2.15.300	±15	±300	C	98.00
P2.5.250/12.100	±5, -12	±250, -100	A	59.00
P2.5.500/12.200	±5, -12	±500, -200	B	69.00

Many other models available from 3.6 Vdc to 200 Vdc and from 25mA to 2 Amp.

Dimensions: (A) 2.5" x 3.5" x .875"
(B) 2.5" x 3.5" x 1.25"
(C) 2.5" x 3.5" x 1.56"

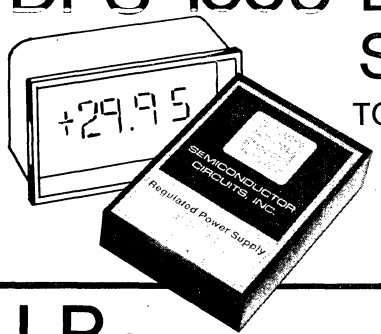
SPECIFICATIONS FOR STANDARD AND 'J' SERIES MODELS

INPUT VOLTAGE:
105 to 125 VAC
INPUT FREQUENCY:
50 to 440 Hz
OUTPUT VOLTAGE:
±1% Fixed
REGULATION (MAX.):
LINE (105-125 VAC) 0.01%
LOAD (NL-FL) 0.05%
RIPPLE AND NOISE (MAX.):
1mV RMS
TEMPERATURE COEFFICIENT:
0.02%/°C
OPERATING TEMPERATURE:
-25°C to +71°C
STORAGE TEMPERATURE:
-25°C to +85°C

HIGH ISOLATION VERSIONS
Add: Suffix "J" Price $5.00

ISOLATION:
100,000 MΩ (MIN.)
LEAKAGE CURRENT:
5μA (MAX.)
BREAKDOWN VOLTAGE (I/O):
Tested for 2000 VDC

DPS 1000 Low Cost 5V-1 AMP Supply **Only $29.95 (1-9)**



TO POWER LOGIC CIRCUITRY, DPM'S A/D AND D/A CONVERTERS

Many other models including DC/DC isolators, battery to DC switching regulators and DC to AC inverters also available.

SPECIFICATIONS

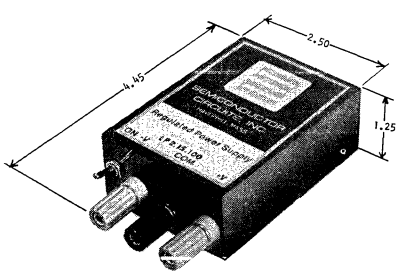
INPUT VOLTAGE:
105-125 VAC @ 50-440 Hz
OUTPUT VOLTAGE:
(±1%) 5 VDC
OUTPUT CURRENT:
1000 mA
REGULATION:
0.5%
OPERATING TEMP.:
-25° C to +71° C
SHORT CIRCUIT PROTECTION

LP SERIES Pocket Size Lab Supplies

LP SERIES FEATURES:

- NEVER REQUIRES CALIBRATION.
- HAVE CURRENT LIMITING SHORT CIRCUIT PROTECTION INDEFINITELY.
- NO DERATING UP THRU 71° C.

MODEL	OUTPUT VOLTAGE (±1% FIXED)	OUTPUT CURRENT	PRICE (1-9)
LP1.5.500	5VDC	500mA	$49.00
LP1.5.1000	5VDC	1000mA	69.00
LP2.15.100	±15VDC	±100mA	49.00
LP2.15.200	±15VDC	±200mA	69.00



SPECIFICATIONS:

INPUT VOLTAGE:
105 to 125 VAC, 50 to 440 Hz.
REGULATION (MAX):
LINE (105-125 VAC) 0.05%
LOAD (NL-FL) 0.01%
RIPPLE AND NOISE (MAX.):
1mV RMS

OPTION:
Voltage variable output (4.5 to 6 or ±13.5 to ±16.5 Vdc) Add suffix "V" to Model Number and $15.00 additional to price.

We build power supplies with the customer in mind. Special configurations and liberal OEM quantity discounts.

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(617) 373-9104

New standards of value and performance in standard off-the-shelf DC power supplies.

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STANDARD POWER SUPPLIES

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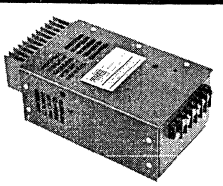
A new generation of economical DC power supplies featuring advanced designs of today . . . for better performance tomorrow . . . at yesterday's prices! All models are stocked at strategic distributor locations nationwide for fast delivery from stock . . . at prices that set new standards for OEM power supply value. Buy them for their top quality . . . not only for their low price. Write or call Standard for our new full-line catalog, today!

OPEN-FRAME "BLUE LINE" DC SUPPLIES. New standards for design and value.

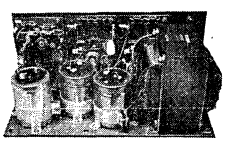
5 Vdc (4.5-5.5 Vdc)		12 Vdc (10.8-13.4 Vdc)		15 Vdc (13.5-16.5 Vdc)		24/28 Vdc (22-30 Vdc)		48 Vdc (44-52 Vdc)		Distributor Prices		
Amp	Model	Amp	Model	Amp	Model	Amp	Model	Amp	Model	1-9	10-24	25-49
1.5	SPS15-5	0.8	SPS15-12	0.7	SPS15-15	0.5	SPS15-24/28			$23.95	$22.75	$21.55
3	SPS30-5	1.8	SPS30-12	1.6	SPS30-15	1.2	SPS30-24/28	0.6	SPS30-48	28.50	27.10	25.65
5	SPS40-5	3.5	SPS40-12	3.0	SPS40-15	1.8	SPS40-24/28			48.00	45.60	43.20
6	SPS60-5	5.0	SPS60-12	4.0	SPS60-15	2.5	SPS60-24/28	1.2	SPS60-48	57.50	54.65	51.75
12	SPS120-5	10	SPS120-12	8.0	SPS120-15	6.0	SPS120-24/28	3.0	SPS120-48	89.50	85.00	80.55
25	SPS250-5	20	SPS250-12	18	SPS250-15	10	SPS250-24/28			160.00	152.00	144.00

COVERED "BLUE LINE" DC SUPPLIES. Top performers in rugged environments.



5 Vdc (4.5 to 6)		12 Vdc (10.8 to 13.4)		15 Vdc (13.5 to 16.5)		24/28 Vdc (22 to 30)		Distributor Prices		
Amp	Model	Amp	Model	Amp	Model	Amp	Model	1-9	10-24	25-49
1.5	CPS15-5	0.8	CPS15-12	0.7	CPS15-15	0.5	CPS15-24/28	$39.00	$37.00	$35.00
3.0	CPS30-5	1.8	CPS30-12	1.6	CPS30-15	1.2	CPS30-24/28	44.00	41.80	39.60
6.0	CPS60-5	5.0	CPS60-12	4.0	CPS60-15	2.5	CPS60-24/28	80.00	76.00	72.00
12	CPS120-5	10	CPS120-12	8.0	CPS120-15	6.0	CPS120-24/28	120.00	114.00	108.00
25	CPS250-5	20	CPS250-12	18	CPS250-15	10	CPS250-24/28	180.00	171.00	162.00
50	CPS500-5	40	CPS500-12	33	CPS500-15	20	CPS500-24/28	345.00	327.75	310.50

MULTIPLE OUTPUT DC SUPPLIES. Space savers for multiple voltage functions.

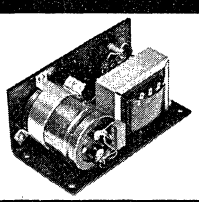


Dual Output	Output Power			Distributor Prices (Dual)		
Model Number	±12 to 15 V	10 V	5 V	1-9	10-24	25-49
SPS30D–5/12	.6 A		2A	$44.00	$41.80	$39.60
SPS30D–12/15	.7 A			44.00	41.80	39.60
SPS40D–5/5			2A	55.00	52.25	49.50
SPS40D–5/10		1 A	2A	55.00	52.25	49.50
SPS40D–12/15	1.2 A			55.00	52.25	49.50
SPS60D–5/10		1.8A	3A	80.00	76.00	72.00
SPS60D–12/15	1.8 A			80.00	76.00	72.00

Triple Output	Output Power		
Model Number	±12 V or 15 V		5 V
SPS30T–5/12/15	.25A	.25A	2 A
SPS60T–5/12/15	.7A	.7A	3 A
SPS90T–5/12/15	1.5A	1.3A	6 A
SPS120T–5/12/15	2.0A	1.8A	12A

Other dual output and triple output combinations are available by special order from the factory.

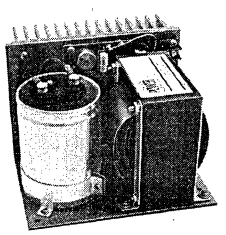
"BLACK LINE" UNREGULATED DC SUPPLIES. Just plain power—at low cost!



5 Vdc Upstream 7.5-8.5 nom. @ F.L.		12 Vdc (nom. @ F.L.)		24 Vdc (nom. @ F.L.)		48 Vdc (nom. @ F.L.)		Distributor Prices		
Full Load Amperes	Model	Full Load Amperes	Model	Full Load Amperes	Model	Full Load Amperes	Model	1-9	10-24	25-49
1.8	15B7	1.2	15B12	0.6	15B24	0.3	15B48	$14.00	$13.30	$12.60
3.0	30B7	2.4	30B12	1.2	30B24	0.6	30B48	18.00	17.10	16.20
10	100B7	7.0	100B12	3.5	100B24	1.8	100B48	33.00	31.35	29.70
20	200B7	15	200B12	7.5	200B24	4.0	200B48	45.00	42.75	40.50

CURRENT REGULATING DC SUPPLIES. Closely regulated for current . . . and cost.

NEW!



Model Number	Output Current (Amps)	Compliance Voltage	Distributor Prices 1-9	10-24	25-49
SCC 30-1 SCC 30-2	.1–1 .1–2	30 15	$ 55.00	$ 52.25	$ 49.50
SCC 60-2 SCC 60-4	.1–2 .1–4	30* 15	84.00	79.80	75.60
SCC 120-4 SCC 120-8 SCC 120-12	.1–4 .1–6 .1–10	30** 15 8	125.00	118.75	112.50
SCC 250-8 SCC 250-15 SCC 250-25	.1–8 .1–15 .1–25	30 15 8	225.00	213.75	202.50

*Above 30 watts dissipation requires 50 CFM air. **Above 80 watts dissipation requires 50 CFM air.

STANDARD POWER, INCORPORATED Call: (714) 558-8512 • TWX: 960-595-1760
General Offices and Plant: 1400 So. Village Way, Santa Ana, Calif. 92705

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DIVISION OF SOLA BASIC INDUSTRIES

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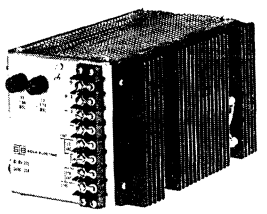
ALL NEW. THE STATE-OF-THE-ART IN MODULAR POWER SUPPLIES: TOTALLY INTERCHANGEABLE, ZERO MAINTENANCE, LONG LIFE, FAIL-SAFE PERFORMANCE, LOW COST.

NEW PREMIUM MODULAR POWER SUPPLIES—I-C regulated

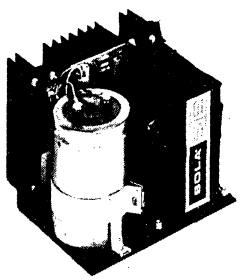
- ☐ Regulation—0.01% + line or load
- ☐ PARD—0.01% RMS
- ☐ Integrated circuit for increased stability
- ☐ Convection cooled
- ☐ Remote sensing
- ☐ Completely protected—short circuit proof, automatic current limiting
- ☐ Overvoltage protection
- ☐ Overtemperature shutdown
- ☐ Complete serviceability



Model No.	Output Voltage Adjustment	Output Current	Price (1-9 Pcs.)
82-05-315	4.8-5.5V	15A	$139.00
82-12-270	11.5-12.5V	7A	$139.00
82-15-258	14.5-15.5V	5.8A	$139.00
82-24-240	23-25V	4A	$139.00
82-05-325	4.8-5.5V	25A	$189.00
82-12-312	11.5-12.5V	12A	$189.00
82-15-296	14.5-15.5V	9.6A	$189.00
82-24-260	23-25V	6A	$189.00
82-48-230	46-50V	3A	$189.00

NEW OEM MODULAR POWER SUPPLIES—Series regulated

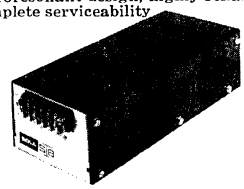
- ☐ Regulation—0.05% + 1mV line or load
- ☐ PARD—0.01% RMS
- ☐ Convection cooled
- ☐ Constant voltage
- ☐ Remote sensing
- ☐ Completely protected—short circuit proof, automatic current limiting
- ☐ Complete serviceability
- ☐ Designed for both bench or rack



Model No.	Output Voltage Adjustment	Output Current	Price (1-9 Pcs.)
83-05-260	4.8-5.5V	6A	$69.50
83-12-250	11.5-12.5V	5A	$69.50
83-15-240	14.5-15.5V	4A	$69.50
83-24-225	23-25V	2.5A	$69.50
83-05-312	4.8-5.5V	12A	$99.50
83-12-310	11.5-12.5V	10A	$99.50
83-15-280	14.5-15.5V	8A	$99.50
83-24-260	23-25V	6A	$99.50
83-48-230	46-50V	3A	$99.50

NEW MODULAR POWER SUPPLIES—CVDC

- ☐ Regulation—1% line, 4% to 10% load
- ☐ PARD—3% RMS
- ☐ Convection cooled
- ☐ Completely protected—short circuit proof
- ☐ Ferroresonant design, highly reliable
- ☐ Complete serviceability

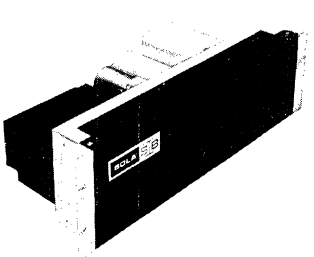


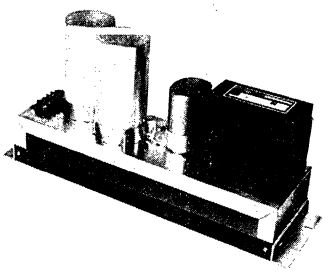
Sola Cat. #	D.C. Output Volts	Amps	VA	Replaces KEPCO Model #	Load Regulation Volts ½ L—FL	¼ L—FL	Chassis Style	Ship Wt.	Max. Ripple rms	User Net
28-04-315	12.3	15	60	Not Available	0.5	0.8	A	14	.4	$109.00
28-05-315	5.2	15	78	PRM 5-15	0.5	0.8	A	14	.4	109.00
28-06-315	6.3	15	95	PRM 6-15	0.5	0.8	A	14	.4	109.00
28-10-312	10	12	120	Not Available	0.6	1.0	A	14	.4	109.00
28-12-310	12	10	120	PRM 12-10	0.6	1.0	A	14	.4	109.00
28-15-280	15	8	120	Not Available	0.8	1.3	A	14	.3	109.00
28-18-267	18	6.7	120	PRM 18-7.6	0.8	1.3	A	14	.3	109.00
28-24-250	24	5	120	PRM 24-5	1.0	1.7	A	14	.3	109.00
28-28-243	28	4.3	120	PRM 28-4.3	1.2	2.0	A	14	.3	109.00
28-48-225	48	2.5	120	PRM 18-2.5	2.0	3.4	A	14	.4	109.00
28-04-325	4	25	100	Not Available	0.5	0.8	B	19	.4	129.00
28-05-325	5.2	25	130	PRM 5-25	0.5	0.8	B	19	.4	129.00
28-06-325	6.3	25	155	PRM 6-25	0.5	0.8	B	19	.4	129.00
28-10-318	10	18	180	Not Available	0.6	1.0	B	19	.4	129.00
28-12-315	12	15	180	PRM 12-15	0.6	1.0	B	19	.4	129.00
28-15-312	15	12	180	Not Available	0.6	1.0	B	19	.3	129.00
28-18-310	18	10	180	PRM 18-10	0.6	1.0	B	19	.3	129.00
28-24-280	24	8	192	PRM 24-8	0.7	1.2	B	19	.3	129.00
28-28-270	28	7	196	PRM 28-7	0.7	1.2	B	19	.3	129.00
28-48-240	48	4.0	196	PRM 48-4	1.0	1.7	B	19	.3	129.00

SOLA CVDC POWER SUPPLIES

SOLA offers a wide range of CVDC type power supplies. These standard designs, available in any quantity, are the result of SOLA custom engineering efforts.

Highly reliable, the CVDC supplies are ruggedly built and use simple circuitry. Fast, dependable regulation, current limiting, and high efficiency are provided by the heart of the supply: the famous SOLA Constant Voltage Transformer.





CHARACTERISTICS

- Fast, dependable line-voltage regulation: within ±1% for fluctuations of ±15%; voltage will return to regulation envelope in approximately 50 milliseconds.
- Load regulation: from ½% to 8%, one half to full load.
- Automatic current limiting: short circuit protection; withstands load faults; high overloads cannot damage power supply of equipment components.
- High efficiency: upwards of 75%; low input-power requirements.
- Simplified operation: no adjustments or maintenance; continuous duty.
- Convection cooling.
- Ripple: 1% rms maximum.
- Ambient operating temperature: 50° C maximum.
- Constant-voltage Sola transformer provides ±1% regulation for line voltage variations as great as ±15%, serves as the heart of CVDC power supplies for voltage-sensitive equipment.

STANDARD CVDC MODELS

(fixed output for pulse, variable, intermittent and fixed loads —inputs 100-130 volts, 60Hz)

Catalog No.	Output Ratings Volts	Amps	VA	Panel Ht.	Wt. Lbs.	Price 1-4
281513-2	6	10	60	3-1/2	27	$132.50
282123-1	6	15	90	5-1/4	38	136.00
281514-2	12	5	60	3-1/2	18	127.50
282124-1	12	10	120	5-1/2	31	133.00
281845-2	12	15	180	5-1/4	45	145.50
281515-2	18	5	90	3-1/2	20	136.00
282125-1	18	10	180	5-1/2	45	146.00
281024-1	24	6	144	5-1/4	30	137.00
282126-1	24	10	240	5-1/4	48	149.00
281203-2	24	15	360	8-3/4	64	155.00
282127-1	24	25	600	7	72	199.00
28626-2	28	8	224	5-1/4	42	142.50
282128-1	28	15	420	7	55	165.00
281048	48	4	192	5-1/4	32	141.25
281561-2	48	10	480	5-1/2	48	198.00
282129-1	48	20	960	8-3/4	95	235.00
281125-1	125	2	250	5-1/4	44	140.00
281150-1	150	2	300	5-1/4	48	144.50
281200	200	1	200	5-1/4	39	131.50
281250	250	1	250	5-1/4	45	131.50

ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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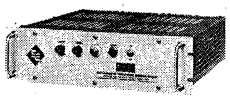
STABILINE® *automatic VOLTAGE REGULATORS*



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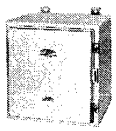

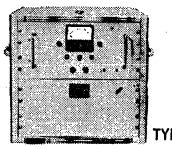

TYPE EMT10228

TYPE EMT4115B

Deliver a constant output voltage regardless of variations in input voltage or changes in line current. Types available from 0.25 to 275 kva. Submit specifications for ratings desired but not given in the charts. Input voltage ranges shown are at nominal output voltage; input range shifts with output voltage setting.

EMT SERIES – Electro Mechanical Transistorized types with virtually zero waveform distortion, 47-63 hertz frequency range, very low internal impedance, negligible phase shift and efficiency approximately 99%. Rated accuracy ±.75% for all line voltage or load current variations within unit stated range. Insensitive to load magnitude and power factor; no effect on system power factor.

EMS SERIES – Electro Mechanical Transistorized types for heavier load requirements. Same operating characteristics as EMT Series. Units with letter I before first digit in type number have individual control for each line-to-neutral voltage.

EMK SERIES – Electro Mechanical Transistorized types providing faster correction times than other electromechanical models.

IES SERIES – Instantaneous Electronic Solid-State types having extremely fast correction, no moving parts. Will maintain output voltage within a 100 millivolt rms band for any combination of rated input voltage and/or load from 1.0 to 0 power factor lagging. Efficiency to 95%. All units have provision for remote sensing and have plug-in solid-state circuit boards.

MILITARIZED – Meet requirements of applicable military specifications. Type EMTH41007MH is 3½ x 6 x 4½"; type EM4108MCR fits standard 19" relay rack. Accuracy ±1.0%.

STABILINE®

Full Range REGULATOR CONTROLLERS

Designed for use with any motor-driven POWERSTAT Variable Transformer to provide full range regulation of a-c voltage, a-c current or d-c voltage. Output voltage will remain within a 2-volt band when used with 120 volt units and a 4-volt band when used with 240 volt models. Output current can be maintained within ±1% of maximum current setting with user supplied current transformer and Superior Electric transformer T6340. Type FR501DC and user supplied d-c power will provide regulated d-c voltage.

EMT SERIES

NOMINAL OUTPUT VOLTAGE	OUTPUT VOLTAGE (ADJUSTABLE)	INPUT VOLTAGE RANGE‡‡	MAXIMUM OUTPUT AMPERES	RATED OUTPUT KVA	CORRECTION RATE AT 60 HERTZ (SECONDS/VOLT)	TYPE
50/60 HERTZ, SINGLE PHASE OPERATION						
115	110-120	95-135	20	2.3	0.075	EMT4102B†
			57	6.6	0.075	EMT4106C§
		90-115	52	6.0	0.12	EMT10228
		105-125	114	13.0	0.15	EMT4112B§*
		95-135	144	16.6	0.125	EMT4115B
120¶	110-120	108-137	35	4.2	0.10	EMT4104B††
230‡	220-240	195-255	36	8.3	0.083	EMT4207B
			93	21.4	0.083	EMT4220
		205-250	130	29.9	0.111	EMT4228C
240‡¶	220-240	228-256	35	8.4	0.10	EMT4104B††
460	440-480	400-520	20	9.2	0.041	EMT4407B
			45	20.7	0.041	EMT4418B
50/60 HERTZ, THREE PHASE OPERATION						
230‡	220-240	195-255	33	13.1	0.083	EMT6210YB
			48	19.1	0.083	EMT6215YB
			63	25.1	0.083	EMT6220YB
			145	57.8	0.25	EMT6245YB
			188	74.9	0.25	EMT6270DB
460	440-480	400-520	18	14.3	0.041	EMT6412YB
			24	19.1	0.041	EMT6417YB
			35	27.9	0.041	EMT6425YB
			75	59.8	0.125	EMT6450YB
			100	75.0	0.125	EMT6475YB
		420-500	148	118	0.188	EMT64100YB

EMS SERIES

60 HERTZ, SINGLE PHASE, 2-WIRE						
115	110-120	103.5-126.5	833	100	0.65	EMS41100
230‡	220-240	218.5-241.5	435	100	0.22	EMS42100‡
50/60 HERTZ, SINGLE PHASE, 3-WIRE, INDIVIDUAL LINE CONTROL						
240/120	230-250/115-125	204-276/102-138	104	25.0	.03/.06	EMSI4225
			250	60.0	.03/.06	EMSI4260
	220-240/110-120	228-252/114-126	417	100	.10/.21	EMSI42100
50/60 HERTZ, THREE PHASE, SINGLE CONTROL						
230‡	220-240	203-257	339	135	0.28	EMS62135Y‡
460	440-480	445-495	230	180	0.30	EMS64180Y
			347	275	0.30	EMS64275Y
50/60 CYCLE, THREE PHASE, INDIVIDUAL LINE CONTROL						
208/120	191-217/115-125	177-239/102-138	250	90.0	.08/.14	EMSI6290Y
		165-233/95-135	525	190	.37/.22	EMSI62190Y

EMK SERIES

50/60 CYCLE, SINGLE PHASE						
115	110-120	95-135	23	2.6	0.02	EMK4105†
		105-125	46	5.3	0.04	

IES SERIES

50 OR 60 CYCLE ±10%, SINGLE PHASE						
115	110-120	95-135**	4.4	0.5	—	IES91005
			8.7	1.0	—	IES9101
			26.1	3.0	—	IES9103
			52.2	6.0	—	IES9106
			130	15.0	—	IES9115
230	220-240	195-255**	13	3.0	—	IES9203
			26.1	6.0	—	IES9206
			65	15.0	—	IES9215

MILITARIZED TYPES

45-66 HERTZ, SINGLE PHASE						
120	115-125	105-135	66.6	8.0	0.10	EM4108MCR
380-420 HERTZ, SINGLE PHASE						
115	115	103.5-126.5	6	0.69	0.13▲	EMTH41007MH

▲At 400 Hertz

†Also available as rack model (suffix R when ordering).

¶For 60 Hertz operation only.

*Can also be operated on an input range of 95 to 135 volts with a rating of 57 amperes, 6.6 kva and a correction rate of 0.075 seconds per volt.

§Also available as rack (suffix R when ordering) or wall mounted (suffix W when ordering) models.

‡Unit can be converted for 208 volt operation by simple tap changes. Input and output voltage ranges change proportionally.

**At nominal output. Shifts with output voltage setting but not proportionally.

††Also available in open construction (suffix U) and with screened and enclosed (suffix UT) construction.

‡‡At nominal output. Shifts proportionally with output voltage setting.

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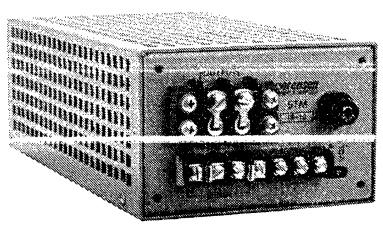
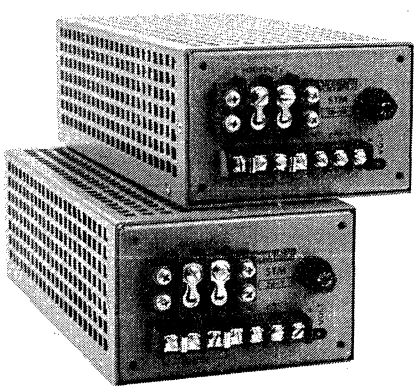
NEW STM SERIES

Modular power supplies utilizing advanced switching techniques to achieve high power outputs from small volume. Favorably priced. Excellent performance: low temperature coefficient, drift and ripple, fine regulation. Computer optimized input/output filtering for RFI performance closely approximating MIL-STD 461A. Package size: 3⅝" x 5⅛" x 9½". Weight: 6.5 lbs. Module IIIA configuration. Package size: 3⅝" x 5⅛" x 14". Weight: 9 lbs.



STANDARD SORENSEN MODULE III

Model††	Output Power: Voltage (Vdc) Sat. Range Min.	Max.	Current (Adc)* 40°C	50°C	60°C	71°C	Voltage Regulation (Combined line and load)	Ripple RMS	P-P**	Input Power: AC — 1φ Volts	Amps @ 115 Vac	Freq.	DC Volts	Amps @ 150 Vdc	List Price†
STM3.5-24	3.0	4.5	24	19.4	14.9	9.6	0.05%	10 mV	50 mV	105-132	1.8	50-440	150 ± 15%	1.5	$250
STM5-24	4.5	6.0	24	19.4	14.9	9.6		10 mV			2.3			1.5	$250
STM9-12	6.0	10	12	9.7	7.5	4.8		3 mV			2.1			1.5	$250
STM12-12	9.5	13.5	12	9.7	7.5	4.8		3 mV			2.9			1.5	$250
STM15-10	13	17	10	8.1	6.2	4.0		3 mV			2.7			1.8	$240
STM18-10	16	20	10	8.1	6.2	4.0		3 mV			3.2			1.8	$250
STM24-8.5	19	25	8.5	6.8	5.3	3.4		3 mV			3.3			1.9	$250
STM28-7	24	30	7.0	5.6	4.3	2.8		3 mV			3.2			1.9	$250
STM36-4	29	43	4.0	3.2	2.5	1.6		3 mV			4.0			1.9	$260
STM48-4	42	56	4.0	3.2	2.5	1.6		3 mV			4.0			1.9	$270



STANDARD SORENSEN MODULE III A

Model	Output Power: Voltage (Vdc) Set Range Min.	Max.	Current (Adc)* 40°C	50°C	60°C	71°C	Voltage Regulation (combined line and load	Ripple RMS	P-P**	Input Power: AC - 1φ Volts	Amps @ 115 Vac	Freq. (Hz)	DC Volts	Amps @ 150 Vdc	List Price
STM3.5-36	3.0	4.5	36	29.1	22.3	14.4	0.05%	10mV	50 mV	105-132	3.8	50-440	150 ± 15%	2.2	$330
STM5-36	4.5	6.0	36	29.1	22.3	14.4		10mV			4.2			2.5	$330
STM9-20	6.0	10	20	16.2	12.4	8.0		3 mV			3.8			2.2	$300
STM12-20	9.5	13.5	20	16.2	12.4	8.0		3 mV			4.8			2.8	$300
STM15-15	13	17	15	12.1	9.3	6.0		3 mV			4.3			2.6	$300
STM18-15	16	20	15	12.1	9.3	6.0		3 mV			5.0			3.0	$300
STM24-13	19	25	13	10.5	8.0	5.2		3 mV			5.5			3.2	$310
STM28-11	24	30	11	8.9	6.8	4.4		3 mV			5.5			3.2	$310
STM36-6	29	43	6.0	4.8	3.7	2.4		3 mV			4.5			2.6	$330
STM48-6	42	56	6.0	4.8	3.7	2.4		3 mV			5.5			3.2	$330

COMMON DATA — ALL UNITS

Stability: 0.05% for 24 hours after warm-up. **Temperature Coefficient:** 0.01%/°C. **RFI:** Minimized through computer-optimized input/output filtering. Meets most portions of MIL-STD 461A for both narrowband and broadband interference. Surpasses performance of conventional regulators. Contact factory or our local representative (yellow pages) for copies of performance test data. **Transient Response:** 1 millisecond for half load change and return to 1% band. **Resolution:** 0.05% Eo max. **Adjustable Built-in Overvoltage Protection:** Standard — all models. **Automatic Current Limiting:** Adjustable from 0 to 125% rated full-load current. **Remote Sensing:** Maximum permissible drop per load lead is one-half difference between output voltage and maximum rated output voltage. **Temperature Range:** Operating — 0° to 71°C; Storage — 55° to 85°C. **Programmable:** Resistance — 1000 Ω/V; Signal — 1 V/V. **Series Operation:** To 200 Vdc. **Turn on/off Overshoots:** None. No Audible Noise. **Isolation:** 1300 Vdc, Input to chassis, 500 Vdc, Output to chassis. **Fall Out:** Will provide full output at regulated voltage for 15 milliseconds following removal of nominal input power, half output for 30 milliseconds.

NOTES:

*Free — air rating — no external heatsink.
**Worst case. Typically less than 30 mV.
†U.S.A. price.
††20 more models available.

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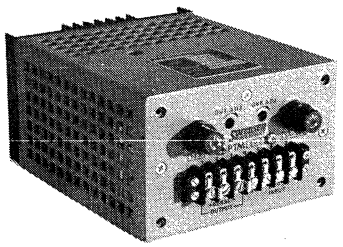
PTM SERIES

Excellent space saving over competitive models is offered with the PTM series-pass regulated DC power supplies. These rugged units are designed to deliver outstanding power per cubic inch at surprisingly modest cost. Quality components and material are used in each PTM, including computer-grade capacitors; ceramic, hermetically sealed plug-in IC's; plug-in power transistors; grain-oriented steel transformer laminations; bridge rectifier package. Convection cooling allows complete mounting flexibility. All models feature as standard built-in over-voltage protection.



Model	Output Power: Voltage (Vdc) Min.	Voltage (Vdc) Max.	Current (Amps) 40°C	50°C	60°C	71°C	Input Power @ 1φ, 50-440 Hz: Vac*	Aac (max.)	Power Factor (% typ.)	List Price ***
PTM PACKAGE SIZE II — 3 5/16 x 5 1/8 x 6 1/2 — 7.5 lbs.										
PTM3-7	2.8	3.5	7	6.3	4.9	2.8	105-125 200-240* 210-250*	1.3	82	$119
PTM5-7	4.8	5.5	7	6.3	4.9	2.8		1.3	81	$119
PTM12-4.4	11.4	12.6	4.4	4.0	3.1	1.8		1.3	80	$119
PTM15-3.5	14.25	15.75	3.5	3.1	2.5	1.6		1.3	83	$119
PTM24-2.3	23	25	2.3	2.1	1.7	1.1		1.3	79	$119
PTM28-2	27	29	2	1.8	1.5	1.0		1.3	78	$119
PTM PACKAGE SIZE III — 3 5/16 x 5 1/8 x 9 1/2 — 11.0 lbs.										
PTM3-11	2.8	3.5	11	9.6	7.8	4.4	105-125 200-240* 210-250*	2.4	82	$139
PTM5-11	4.8	5.5	11	9.6	7.8	4.4		2.4	80	$139
PTM12-6.5	11.4	12.6	6.5	5.7	4.6	2.7		2.4	82	$139
PTM15-5.5	14.25	15.75	5.5	4.9	3.9	2.5		2.4	83	$139
PTM24-4	23	25	4	3.6	2.9	1.9		2.4	78	$139
PTM28-3.5	27	29	3.5	3.1	2.6	1.8		2.4	79	$139

COMMON DATA — PTM SERIES

Voltage Regulation (line and load comb.): 0.05% +5 mV. **Voltage Ripple (PARD**):** 1 mV rms, 5 mV peak-to-peak. **Temperature Coefficient:** 0.01%/°C or 1 mV/°C whichever is greater. **Transient Response Time:** 50 μsec (for changes in load between 10-100% and 100-10% to recover to ±20 mV band). **Drift (24 hours):** 0.1% after 1 hour warm-up. **Remote Sensing:** 250 mV max. drop in each leg. **Current Limiting:** Automatic, adjustable; 50-130% of rated power (min. range); factory set to 125% of rated (40°C) output current. **Overvoltage Protection:** Automatic, adjustable crowbar action; response time 100 μsec typ. to avoid nuisance tripping. **Operating Temperature:** 0°C to 71°C. **Cooling:** Convection.

NOTES:

*Nominal 115 Vac standard. Alternate nominal 220 or 230 Vac input available.

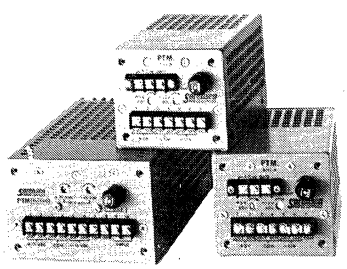
**PARD — The "Periodic and Random Deviation" of the output power from its average value, with all external operational and environmental parameters maintained constant.

***U.S.A. price.

TEL: (603) 668-4500 • TWX: 710-220-1339

PTM DUAL SERIES

Ideal for applications requiring compact, dual-output DC power supplies. Designed for space-savings; more compact than competitive series-pass units. Nine models, all with common AC voltage inputs and two regulated DC voltage outputs — one positive and one negative with respect to common terminal. Outputs are individually adjustable, dual tracking with the negative output acting as the master. Units designed for installation flexibility: front panel positioning vertical or horizontal; side, base or cantilever mounting. Components used in the PTM Dual units are highest quality, include ceramic, hermetically sealed integrated circuits, plug-in power transistors and computer-grade capacitors.



Model No.	Adjustment Range (Vdc) Min.	Max.	Current (Adc) @ 40°C	50°C	60°C	71°C	Output Adjust. Resolution (typ.)	Input Power @ 1φ, 50-440 MHz: Vac	Aac (max.) (rms)	Power Factor (typ.)	List Prices**
PTM DUALS PACKAGE SIZE I — 3 5/16" x 3 7/8" x 6 1/2" — 5.25 lbs.											
PTM-12-1D	11 11	13 13	1 1	.9 .9	.7 .7	.4 .4	25 mV 25 mV	105-125† 200-240 210-250	.6 .35 .3	80%	$130
PTM-15-.8D	14 14	16 16	.8 .8	.72 .72	.56 .56	.32 .32	25 mV 25 mV			80%	$125
PTM-5/12D1	4.75 11	5.5 13	2 .5	1.8 .45	1.4 .35	.8 .2	10 mV 25 mV			80%	$135
PTM DUALS PACKAGE SIZE II — 3 5/16" x 5 1/8" x 6 1/2" — 7.5 lbs.											
PTM-12-1.6D	11 11	13 13	1.6 1.6	1.44 1.44	1.12 1.12	.64 .64	25 mV 25 mV	105-125† 200-240 210-250	.9 .45 .4	80%	$155
PTM15-1.5D	14 14	16 16	1.5 1.5	1.35 1.35	1.05 1.05	.6 .6	25 mV 25 mV			80%	$150
PTM-5/12D11	4.75 11	5.5 13	3.5 1	3.15 .9	2.45 .7	1.4 .4	10 mV 25 mV			80%	$160
PTM DUALS PACKAGE SIZE III — 3 5/16" x 5 1/8" x 9 1/2" — 11.0 lbs.											
PTM12-3D	11 11	13 13	3 3	2.7 2.7	2.1 2.1	1.2 1.2	25 mV 25 mV	105-125† 200-240 210-250	1.8 .9 .85	80%	$180
PTM15-2.8D	14 14	16 16	2.8 2.8	2.52 2.52	1.96 1.96	1.12 1.12	25 mV 25 mV			80%	$175
PTM-5/12D111	4.75 11	5.5 13	6 1.5	5.4 1.35	4.2 1.05	2.4 .6	10 mV 25 mV			80%	$185

COMMON DATA — PTM DUALS

Voltage Regulation (line and load comb.): 0.02%; **Voltage Ripple (PARD*):** 1 mV rms, 5 mV peak-to-peak. **Temperature Coefficient:** 0.01%/°C or 1 mV/°C whichever is greater. **Transient Response Time:** 50 μsec (for changes in load between 10-100% and 100-10% to recover 20 mV band. **Tracking Accuracy:** Adjustable to .2%. **Remote Programming:** 500 ohms/volt. **Remote Sensing:** 250 mV max. drop in each leg. **Output Turn-on/Turn-off Overshoot:** None. **Operating Temperature:** 0°C to 71°C. **Storage Temperature:** −65°C to +85°C. **Cooling:** Convection. **Current Limiting:** Automatic, fixed, foldback, factory set. **Over-voltage Protection:** DC outputs protected by internally adjusable circuit. Outputs are sensed separately; over-voltage condition in either causes both to be shorted by internal SCR wihin 50 μsec-positive shorted to negative. With built-in reverse polarity diodes on each output keeps outputs within 2.5 v of common after OVP trip.

NOTES:

†132 VAC at 20% reduced rating, reduce linearly from 125 VAC.

*PARD — The "Periodic and Random Deviation" of the output power from its average value, with all external operational and environmental parameters maintained constant.

**U.S.A. price.

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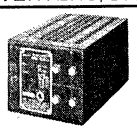
QSA SERIES



Modular, wide range power supplies designed for OEM users. U.L. listed, the QSA's feature excellent regulation, ripple and response-time characteristics. Convection cooling permits complete mounting flexibility. A complete line of accessories including metered panels, rack adapters, chassis slides, filler panels and overvoltage protectors are available for all models. Remote sensing and remote programming by resistance and voltage are featured.

Model	Output Power: Voltage Range (Vdc)	Output Power: Current (Adc) 40°C	50°C	60°C	71°C	Constant Voltage Regulation	Temperature Coefficient	Transient Response Time (Typ.)	Input Power @ 1φ, 47-440 Hz: Voltage (Vac)	Input Power @ 1φ, 47-440 Hz: Current Max. (Aac)	Power Factor (Typ.)	List Price*
PACKAGE SIZE I — 3⅝ x 3⅞ x 6½												
QSA10-1.4	0-10	0-1.5	0-1.4	0-1.2	0-0.9	±0.005% or ±0.2 mV	0.01%/°C or 0.5 mV/°C	20 μs		0.6	.84	$89
QSA12-1.3	8-14	0-1.4	0-1.3	0-1.1	0-0.9	±0.005%	0.01%/°C	20 μs		0.6	.85	$89
QSA18-1.1	14-22	0-1.2	0-1.1	0-0.9	0-0.7	±0.005%	0.01%/°C	20 μs		0.8	.83	$89
QSA28-.7	22-35	0-0.77	0-0.7	0-0.6	0-0.5	±0.005%	0.01%/°C	20 μs		0.7	.86	$89
QSA48-.4	35-60	0-0.44	0-0.4	0-0.34	0-0.27	±0.005%	0.015%/°C	20 μs		0.7	.83	$96
PACKAGE SIZE II — 3⅝ x 5⅛ x 6½												
QSA10-2.2	0-10	0-2.4	0-2.2	0-1.9	0-1.5	±0.005% or ±0.2 mV	0.01%/°C or 0.5 mV/°C	20 μs		0.8	.83	$109
QSA12-2.1	8-14	0-2.3	0-2.1	0-1.8	0-1.4	±0.005%	0.01%/°C	20 μs		1.0	.83	$109
QSA18-1.9	14-22	0-2.1	0-1.9	0-1.6	0-1.3	±0.005%	0.01%/°C	20 μs		1.3	.83	$109
QSA28-1.3	22-35	0-1.4	0-1.3	0-1.1	0-0.9	±0.005%	0.01%/°C	20 μs		1.3	.81	$109
QSA48-.8	35-60	0-0.88	0-0.8	0-0.68	0-0.53	±0.005%	0.015%/°C	20 μs		1.3	.79	$127
QSA75-.5	60-90	0-0.55	0-0.5	0-0.42	0-0.33	±0.005%	0.015%/°C	20 μs		1.2	.78	$129
PACKAGE SIZE III — 3⅝ x 5⅛ x 9½												
QSA5-6.4	3-7	0-7	0-6.4	0-5.4	0-3.1	±0.1%	0.015%/°C	20 μs		1.6	.84	$149
QSA10-3.7	0-10	0-4	0-3.7	0-3.1	0-2.5	±0.005% or ±0.2 mV	0.01%/°C or 0.5 mV/°C	20 μs		1.4	.83	$129
QSA12-3.8	8-14	0-4.2	0-3.8	0-3.2	0-2.5	±0.005%	0.01%/°C	20 μs		1.6	.83	$129
QSA18-3.0	14-22	0-3.3	0-3	0-2.5	0-2	±0.005%	0.01%/°C	20 μs		1.8	.82	$129
QSA28-2.0	22-35	0-2.2	0-2	0-1.7	0-1.3	±0.005%	0.01%/°C	20 μs	105-125	1.8	.80	$129
QSA48-1.2	35-60	0-1.3	0-1.2	0-1	0-0.8	±0.005%	0.015%/°C	20 μs	200-240	1.8	.79	$139
QSA75-.8	60-90	0-0.88	0-0.8	0-0.68	0-0.53	±0.005%	0.015%/°C	20 μs	210-250	1.7	.79	$149
QSA120-.5	90-150	0-0.55	0-0.5	0-0.42	0-0.33	±0.01%	0.015%/°C	20 μs		1.8	.79	$159
QSA175-.25	150-200	0-0.28	0-0.25	0-0.21	0-0.17	±0.01%	0.015%/°C	20 μs		1.2	.75	$170
QSA265-.15	200-330	0-0.17	0-0.15	0-0.13	0-0.1	±0.01%	0.015%/°C	20 μs		1.3	.72	$185
PACKAGE SIZE IV — 4⅛ x 7½ x 9⅜												
QSA5-14.6	3-4.5 4.5-6.5**	0-17.6 0-16.1	0-16 0-14.6	0-13 0-12.4	0-8 0-6	±0.01%	0.015%/°C	35 μs		3.4	.80	$209
QSA12-9.3	8-11 11-14**	0-11 0-10.2	0-10 0-9.3	0-8.5 0-7.9	0-6.7 0-5.3	±0.005%	0.015%/°C	35 μs		3.8	.79	$199
QSA18-6.8	14-18 18-22**	0-7.9 0-7.4	0-7.2 0-6.8	0-6.1 0-5.8	0-4.8 0-3.3	±0.005%	0.015%/°C	35 μs		4.0	.77	$199
QSA28-6.0	22-26 26-30**	0-6.8 0-6.6	0-6.2 0-6	0-5.3 0-5.1	0-4.1 0-3.4	±0.005%	0.015%/°C	35 μs		4.4	.78	$209
PACKAGE SIZE V — 4⅛ x 7½ x 11⅞												
QSA5-18.2	3-4.5 4.5-6.5**	0-20.5 0-20	0-18.6 0-18.2	0-15.8 0-15.5	0-12.5 0-12.2	±0.01%	0.015%/°C	35 μs		4.6	.83	$249
QSA12-13	8-11 11-14**	0-15.4 0-14.3	0-14 0-13	0-11.9 0-11	0-9.4 0-8.7	±0.005%	0.015%/°C	35 μs		5.2	.80	$249
QSA18-10.1	14-18 18-22**	0-12.1 0-11.1	0-11 0-10.1	0-9.4 0-8.6	0-7.4 0-5.8	±0.005%	0.015%/°C	35 μs		5.6	.80	$249
QSA28-8.8	22-26 26-30**	0-10.2 0-9.8	0-9.3 0-8.8	0-7.9 0-7.5	0-6.2 0-5	±0.005%	0.015%/°C	35 μs		6.0	.80	$249

COMMON DATA — ALL UNITS

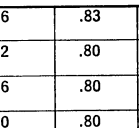
Voltage Ripple (PARD*):** 300 μV rms, 3 mV peak-to-peak. **Drift:** 0.025%/8 hrs. after 30-minute warm-up with constant line, load and ambient temperature. **Remote Sensing:** 1.5 volts drop maximum per load lead. **Overload/Short Circuit Protection:** Current foldback (current limiting for 5 and 10 volt models). **Operating Temperature:** −20 to +71°C. **Cooling:** Convection. **Isolation Voltage:** 1,000 Vdc input, 700 Vdc output. **Overvoltage Protection:** Optional, available for all models.

NOTES:

*U.S.A. price. **Dual-range unit — factory-set for high range output; lower range may be field selected. ***PARD — the "Periodic and Random Deviation" of the output power from its average value, with all external operational and environmental parameters maintained constant.

TEL: (603) 668-4500 • TWX: 710-220-1339

MMT, MMS AND MMD SERIES



Compact, ultra-reliable units specifically designed to provide excellent regulation at a modest cost. Typical applications include drivers for displays, linear IC's, reed relays, dynamic and static shift registers, ROM's, RAM's, plus D/A and A/D converters. All units are fully warranted for a 24-month period.

Model	Output Power: Voltage (Vdc)	Output Power: Current (mA)	Regulation: Load (NL-FL)	Regulation: Line (±10 Vac)	Ripple & Noise (mV RMS)	Temperature Coefficient (%/°C)	Derate mA/°C above 55°C	Package Size (Inches)	List Price**
MMT SERIES									
MMT5/15E	±15 5	100 500	±0.05% ±0.05%	±0.05% ±0.05%	1.0 mV 1.0 mV	0.02 0.02	5.0 mA[1] 9.0 mA[1]	2½ x 3½ x 1.88	$90
MMD SERIES									
MMD15-.025	±15	25	±0.2%	±0.2%	2.0 mV	0.02	1.0 mA	2½ x 3½ x ⅞	$23
MMD15-.065	±15	65	±0.02%	±0.02%	0.5 mV	0.02	1.0 mA[1]	2½ x 3½ x ⅞	$42
MMD15-.100	±15	100	±0.02%	±0.02%	0.5 mV	0.02	5.0 mA[1]	2½ x 3½ x ⅞	$48
MMD15-.200	±15	200	±0.05%	±0.01%	1.0 mV	0.02	8.0 mA[2]	2½ x 3½ x 1¼	$65
MMD15-.300	±15	300	±0.025%	±0.05%	1.0 mV	0.02	8.0 mA[1]	2½ x 3½ x 1.56	$98
MMD12-.120	±12	120	±0.02%	±0.02%	0.5 mV	0.02	8.0 mA[1]	2½ x 3½ x ⅞	$48
MMD12-.240	±12	240	±0.05%	±0.01%	1.0 mV	0.02	9.0 mA[2]	2½ x 3½ x 1¼	$65
MMS SERIES									
MMS5-.250	5	250	±0.05%	±0.05%	0.5 mV	0.05	9.0 mA[1]	2½ x 3½ x ⅞	$35
MMS5-.500*	5	500	±0.1%	±0.05%	1.0 mV	0.02	9.0 mA[2]	2½ x 3½ x ⅞	$44
MMS5-1.00*	5	1000	±0.1%	±0.05%	1.0 mV	0.02	9.0 mA[2]	2½ x 3½ x 1¼	$65
MMS5-2.00	5	2000	±0.025%	±0.05%	1.0 mV	0.02	6.0 mA	2½ x 3½ x 1.56	$89
MMS10-.120	10	120	±0.02%	±0.02%	0.5 mV	0.02	6.0 mA	1¾ x 2¼ x 1	$24
MMS12-.100	12	100	±0.02%	±0.02%	0.5 mV	0.02	5.0 mA	1¾ x 2¼ x 1	$24
MMS15-.100	15	100	±0.02%	±0.02%	0.5 mV	0.02	5.0 mA	1¾ x 2¼ x 1	$24
MMS24-.050	24	50	±0.02%	±0.02%	1.0 mV	0.02	2.5 mA	1¾ x 2¼ x 1	$24
MMS28-.040	28	40	±0.02%	±0.02%	1.0 mV	0.02	2.0 mA	1¾ x 2¼ x 1	$24

COMMON DATA — ALL UNITS

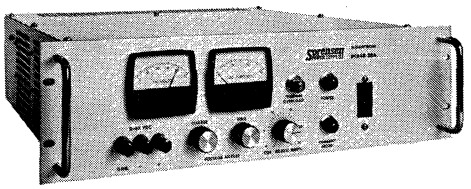
Short Circuit Protection: Internal current limiting. **Overvoltage Protection:** Standard on Model MMS5-1.00 and MMS5-.500 — Should the output voltage exceed 6.8 volts, crowbar operates to reduce the output voltage. **Operating Temperature:** −25° to + 71°C. **Storage Temperature:** −25 to +85°C.

NOTES:

*220/230 Vac available at extra cost. **Does not require derating until 60°C. ***Derating begins at 50°C. †U.S.A. price.

TEL: (603) 668-4500 • TWX: 710-220-1339

LAB/SYSTEMS AC & DC POWER SUPPLIES



DCR SERIES Best dollars-per-watt ratio in industry. Wide range. Completely programmable over output range by resistance or signal voltage in voltage and current modes. Remote sensing with large allowable lead drop. Voltage and current mode operations. 37 models. Overvoltage protectors available. Includes 7 regulated high voltage models.

Model	Output Power: Voltage (Vdc)	Output Power: Current (Adc) Max. 30°C	55°C	71°C	Voltage Regulation Line & Load (Comb.)	Voltage Ripple (rms) PARD*	Current Regulation Line & Load (Comb.)	Drift (8 hrs.)	Temp. Coeff. (mV/°C)	Transient Response Time	Input Voltage (Vac)	Input Current (Amps)	Input Freq.[4] (Hz)	Input Phase	Cabinet Size (Inch.) Width	Height	Depth	list Price
DCR20-125A	0-20	144	125	82.5	±0.075% or ±8 mV	0.4%Eo +20 mV	±125 mA	0.05%	3	30 ms	187-229X 207-253	29	47-63	1φ	19	10½	20	$1150
DCR20-250A	0-20	275	250	165	±0.010% or ±8 mV	0.8%Eo +60 mV or 160 mV	±500 mA	.10%	8	40 ms	187-229[3]X 207-253	37	47-63	3φ	19	17½	22	$1875
DCR20-1000A	0-20	1100	1000	660	±0.010% or ±8 mV	0.8%Eo +60 mV or 160 mV	±2000 mA	0.10%	8	40 ms	414-506[4]	60	57-63[4]	3φ	25	42½	23	$4700
DCR40-10A	0-40	11.5	10	6.6	±0.075% or ±15 mV	0.4%Eo +40 mV	±20 mA	0.05%	6	30 ms	105-125	8	47-63	1φ	19	5¼	15	$360
DCR40-20A	0-40	23	20	13	±0.075% or ±15 mV	0.4%Eo +40 mV	±25 mA	0.05%	6	30 ms	105-125	16	47-63	1φ	19	5¼	18	$500
DCR40-35A	0-40	40	35	25	±0.075% or ±15 mV	0.4%Eo +40 mV	±35 mA	0.05%	6	30 ms	105-125	27	47-63	1φ	19	7	18	$750
DCR40-60A	0-40	69	60	39.6	±0.075% or ±15 mV	0.4%Eo +40 mV	±60 mA	0.05%	6	30 ms	187-229X 207-253	25	47-63	1φ	19	7	20	$925
DCR40-125A	0-40	138	125	82.5	±0.10% or ±15 mV	0.4%Eo +60 mV or 160 mV	±250 mA	0.10%	16	40 ms	187-229[3]X 207-253	35	47-63	3φ	19	17½	22	$1750
DCR40-250A	0-40	275	250	165	±0.10% or ±15 mV	0.4%Eo +60 mV or 160 mV	±500 mA	0.10%	16	40 ms	414-506[4]	60 27	57-63[4]	3φ	19	22¾	24	$2475
DCR40-500A	0-40	550	500	330	±0.10% or ±15 mV	0.4%Eo +60 mV	±1000 mA	0.10%	16	40 ms	414-506[4]	60	57-63[4]	3φ	25	42½	23	$4200
DCR60-13A	0-60	15	13	8.6	±0.075% or ±15 mV	0.4%Eo +60 mV	±20 mA	0.05%	9	30 ms	105-125	16	47-63	1φ	19	5¼	18	$500
DCR60-25A	0-60	28.8	25	16.5	±0.075% or ±15 mV	0.4%Eo +60 mV	±25 mA	0.05%	9	30 ms	105-125	30	47-63	1φ	19	7	18	$925
DCR60-40A	0-60	45	40	26.4	±0.075% or ±15 mV	0.4%Eo +60 mV	±40 mA	0.05%	9	30 ms	187-229X 207-253	23	47-63	1φ	19	7	20	$1050
DCR80-5A	0-80	5.75	5	3.3	±0.075% or ±20 mV	0.4%Eo +80 mV	±15 mA	0.05%	12	30 ms	105-125	8	47-63	1φ	19	5¼	15	$425
DCR80-10A	0-80	11.5	10	6.6	±0.075% or ±20 mV	0.4%Eo +80 mV	±20 mA	0.05%	12	30 ms	105-125	16	47-63	1φ	19	5¼	18	$650
DCR80-18A	0-80	20.7	18	11.9	±0.075% or ±20 mV	0.4%Eo +80 mV	±25 mA	0.05%	12	30 ms	105-125	28	47-63	1φ	19	7	18	$925
DCR80-30A	0-80	34.5	30	19.8	±0.075% or ±20 mV	0.4%Eo +80 mV	±30 mA	0.05%	12	30 ms	187-229X 207-253	23	47-63	1φ	19	7	20	$1050
DCR150-2.5A	0-150	2.88	2.5	1.65	±0.075% or ±30 mV	0.4%Eo +150 mV	±15 mA	0.05%	23	30 ms	105-125	8	47-63	1φ	19	5¼	15	$360
DCR150-5A	0-150	5.75	5	3.3	±0.075% or ±30 mV	0.4%Eo +150 mV	±15 mA	0.05%	23	30 ms	105-125	16	47-63	1φ	19	5¼	18	$650
DCR150-10A	0-150	11.5	10	6.6	±0.075% or ±30 mV	0.4%Eo +150 mV	±20 mA	0.05%	23	30 ms	105-125	28	47-63	1φ	19	7	18	$925
DCR150-15A	0-150	17.3	15	9.9	±0.075% or ±30 mV	0.4%Eo +150 mV	±25 mA	0.05%	23	30 ms	187-229X 207-253	22	47-63	1φ	19	7	18	$1050
DCR150-35A	0-150	38.5	35	23	±0.10% or ±30 mV	0.4%Eo +200 mV or 500 mV	±70 mA	0.10%	60	40 ms	187-229[3]X 207-253	35	47-63	3φ	19	17½	22	$1750
DCR150-70A	0-150	77	70	47	±0.10% or ±30 mV	0.4%Eo +200 mV or 500 mV	±140 mA	0.10%	60	40 ms	414-506[4]	60 27	57-63[4]	3φ	19	22¾	24	$2695
DCR300-1.25A	0-300	1.44	1.25	.83	±0.075% or ±60 mV	0.4%Eo +300 mV	±15 mA	0.05%	45	30 ms	105-125	8	47-63	1φ	19	5¼	15	$450
DCR300-2.5A	0-300	2.88	2.5	1.65	±0.075% or ±60 mV	0.4%Eo +300 mV	±15 mA	0.05%	45	30 ms	105-125	14	47-63	1φ	19	5¼	18	$650
DCR300-5A	0-300	5.75	5	3.3	±0.075% or ±60 mV	0.4%Eo +300 mV	±15 mA	0.05%	45	30 ms	105-125	25	47-63	1φ	19	7	18	$925
DCR300-8A	0-300	9.2	8	5.3	±0.075% or ±60 mV	0.4%Eo +300 mV	±20 mA	0.05%	45	30 ms	187-229X 207-253	22	47-63	1φ	19	7	18	$1050
DCR300-18A	0-300	19.8	18	12	±0.10% or ±60 mV	0.4%Eo +400 mV or 1 V	±36 mA	0.10%	120	40 ms	187-229[3]X 207-253	35	47-63	3φ	19	17¼	22	$1750
DCR300-35A	0-300	38.5	35	23	±0.10% or ±60 mV	0.4%Eo +400 mV or 1 V	±70 mA	0.10%	120	40 ms	414-506[4]	60 27	57-63[4]	3φ	19	22¾	24	$2695
DCR600-2.5A	6-600	2.87	2.5	1.65	±0.075% or ±120 mV	0.4%Eo +600 mV	±7 mA	0.05%	90	30 ms	105-125	25	47-63	1φ	19	10½	18	$875
DCR600-18A	6-600	19.8	18	12	±0.10% or ±120 mV	0.4%Eo +800 mV or 2 V	±36 mA	0.10%	240	40 ms	414-506[4]	60 27	57-63[4]	3φ	19	22¾	24	$2695
DCR1500-1A	15-1500	1.15	1.0	0.66	±0.075% or ±300 mV	0.4%Eo +1.5 V	±4.5 mA	0.05%	225	30 ms	105-125	25	47-63	1φ	19	12¼	18	$1075
DCR3000-.5A	30-3000	0.575	0.5	0.33	±0.075% or ±600 mV	0.4%Eo +3 V	±3.8 mA	0.05%	450	30 ms	105-125	27	47-63	1φ	19	12¼	18	$1295
DCR6000-.25A	60-6000	0.287	0.25	0.165	±0.075% or ±1.2 V	0.4%Eo +6 V	±3.4 mA	0.05%	900	30 ms	105-125	27	47-63	1φ	19	12¼	18	$1550
DCR12000-.125A	120-12000	0.125	0.125	—	±0.075% or ±3 V	0.3%Eo	±.5 mA	0.05%	.015% of Eo Max.	30 ms	105-125	32	47-63	1φ	19	26¼	21¾	$2250
DCR20000-.075A	200-20000	0.075	0.075	—	±0.075% or ±5 V	0.3%Eo	±.4 mA	0.05%		30 ms	105-125	32	47-63	1φ	19	26¼	21¾	$2500
DCR30000-.05A	300-30000	0.050	0.050	—	±0.075% or ±7.5 V	0.3%Eo	±.35 mA	0.05%		30 ms	105-125	32	47-63	1φ	19	26¼	21¾	$2750

COMMON DATA — ALL UNITS

1. All models are programmable both in voltage and current modes, by resistance and voltage signal. **2. Ripple** and transient specifications apply at 60 Hz and will vary by a factor of $(60/f)^2$ where "f" is the input frequency. **3.** Optional auxiliary chassis permits operation from 342-418, 390-440, or 414-506 Vac input: ST101. **4.** Models factory-wired for a nominal 460 V input, but may be field or factory modified to accept alternate inputs.

Alternate inputs (with voltage derating, if applicable) for DCR40-250A, DCR150-70A, DCR300-35A, DCR600-18A are: 187-229 Vac, 57-63 Hz, 100% Eo Max. 207-253 Vac, 57-63 Hz, 100% Eo Max. 342-418 Vac, 47-63 Hz, 90% Eo Max. 390-440 Vac, 47-63 Hz, 100% Eo Max.

Alternate inputs (with voltage derating, if applicable) for DCR20-1,000A and DCR40-500A are: 342-418 Vac, 47-63 Hz, 75% Eo Max. 390-440 Vac, 47-63 Hz, 92% Eo Max.

5. Overvoltage protection available as standard or optional feature. Contact local representative or factory for details.

NOTES:

*PARD — "The 'Periodic and Random Deviation' of the output voltage, current or power from its average value, with all external operational and environmental parameters maintained constant."

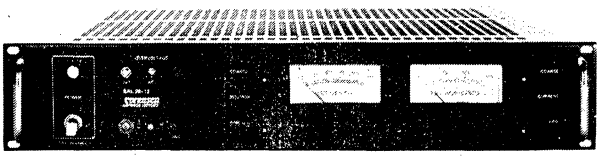
**U.S.A. price.

xModels factory-wired to accept 208 V input. If 220 V is desired, contact factory for price and delivery.

Tel: (603) 668-4500 • TWX: 710-220-1339

SRL SERIES

SRL's feature built-in overvoltage protection that can be set and checked without removing the load from the supply. The SRL's are low voltage, well regulated dc units ideal for system/lab applications. These medium power units offer very fast response time over the full load range; constant voltage/current operation with automatic crossover; remote programming in both current and voltage modes; remote sensing; master-slave paralleling. Programming feature permits gain selection for control with small signal and high resolution with coefficient alteration.



Model	Output Power: Voltage (Vdc)	Output Power: Current (Adc) 55°C	60°C	71°C	Voltage Line & Load Regulation (Comb.)	Voltage Ripple (PARD*): rms (μV)	p-p (mV)	Current Regulation Line & Load (Comb.)	Current Ripple PARD* (rms)	Transient Response Time	Input Power @ 1φ, 47-53 Hz: Voltage (Vac)	Current (Aac)	Cabinet Size (Inches): Width	Height	Depth	List Price**
SRL10-25	0-10	25	22	16.7		350	20	0.02% +4 mA	10 mA	150 μs	105-125	7.5	19	5¼	17¾	$550
SRL10-50	0-10	50	44	33.5		300	10	0.02% +4 mA	20 mA	150 μs	105-125	14.7	19	5¼	21	$750
SRL10-100	0-10	100	88	67		300	20	0.02% +6 mA	30 mA	150 μs	105-125	32.5	19	7	23	$950
SRL20-12	0-20	12	10.5	8		200	20	0.02% +4 mA	3 mA	70 μs	105-125	7.8	19	3½	17¾	$500
SRL20-25	0-20	25	22	16.7		300	20	0.02% +4 mA	10 mA	150 μs	105-125	13.6	19	5¼	17¾	$600
SRL20-50	0-20	50	44	33.5		500	40	0.02% +4 mA	10 mA	150 μs	105-125	28.0	19	7	21	$850
SRL40-6	0-40	6	5.3	4	0.01% or	200	20	0.02% +1 mA	0.5 mA	70 μs	105-125	6.3	19	3½	17¾	$500
SRL40-12	0-40	12	10.5	8	2 mV	300	20	0.02% +4 mA	1 mA	150 μs	105-125	13.2	19	5¼	17¾	$600
SRL40-25	0-40	25	22	16.7		500	10	0.02% +4 mA	10 mA	150 μs	105-125	22.0	19	5¼	21	$750
SRL40-50	0-40	50	44	33.5		700	40	0.02% +4 mA	10 mA	150 μs	190-230	25.0	19	7	21	$950
SRL60-4	0-60	4	3.5	2.68		300	20	0.02% +1 mA	0.5 mA	70 μs	105-125	6.0	19	3½	17¾	$525
SRL60-8	0-60	8	7	5.36		300	20	0.02% +1 mA	1 mA	70 μs	105-125	12.5	19	5¼	17¾	$625
SRL60-17	0-60	17	14.9	11.4		500	10	0.02% +4 mA	3 mA	150 μs	105-125	22.0	19	5¼	21	$750
SRL60-35	0-60	35	31	23.4		700	10	0.02% +4 mA	10 mA	150 μs	190-230	26.0	19	7	21	$1025

COMMON DATA — ALL UNITS

Drift: 0.25% +500 μV/8 hours. **Temperature Coefficient:** 0.01% +200 μV/°C. **Input Power:** 105-125 Vac standard; on all models except SRL 40-25 and SRL 60-35; order optional M1 suffix for 190-230 Vac input, M2 suffix for 210-250 Vac input. Add $30.00 for M1 or M2 option.

NOTES:

*PARD — "The 'Periodic and Random Deviation' of the output power from its average value, with all external operational and environmental parameters maintained constant."

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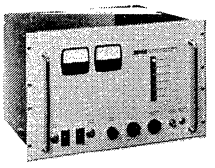
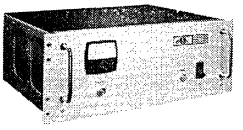


DCR-HV Series



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DC POWER SUPPLIES — Regulated

QRD Series

General laboratory instruments featuring excellent voltage and current regulation, low noise and ripple, and high-speed programmability. Seven models from 30 to 90 watts, 15 to 60 volts, full range. Accessories include overvoltage protectors, rack adapters and calibrated ten-turn voltage and current controls.

QSB Series

Highly regulated, extremely low ripple, slot-type half and full rack sources. Excellent value with attractive pennies per watt ratio. Twelve models, 5 to 36 volts, up to 315 watts. Accessories include overvoltage protectors and rack adapters.

HIGH VOLTAGE DC POWER SUPPLIES — Regulated & Unregulated

DCR-HV Series

High voltage, regulated, fully solid state. All models feature voltage and current mode operation with automatic crossover, remote programmability, and full personnel and equipment safeguards, including overvoltage and overload protection, zero-start operation, and mechanical interlocks. Seven models: 600, 1,500, 3,000, 6,000, 12,000, 20,000 and 30,000 volts; 1,500 watts.

5000 Series

High-voltage regulated supplies. Regulation to ±0.03% for line and load combined, polarity reversible. Two models, voltages to 30 kV, currents to 8 mA.

200, 1000 & 2000 Series

High-voltage, unregulated supplies, featuring simplicity in design, ease of operation and complete personnel and equipment safeguards. Sixteen models, 3 kV to 150 kV, currents to 1000 mA. The 200 series is completely portable. Line regulators and dc filters available for the 1000 and 2000 series.

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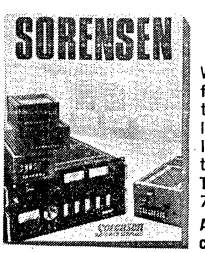
ACR Series

All solid-state, high efficiency ac line regulators designed to protect voltage sensitive loads against the effects of line voltage swings and "brownouts." Features include automatic current limiting, remote sensing and remote programmability. Eight models, regulated 115 volts output, 500 to 15,000 volt-amperes.



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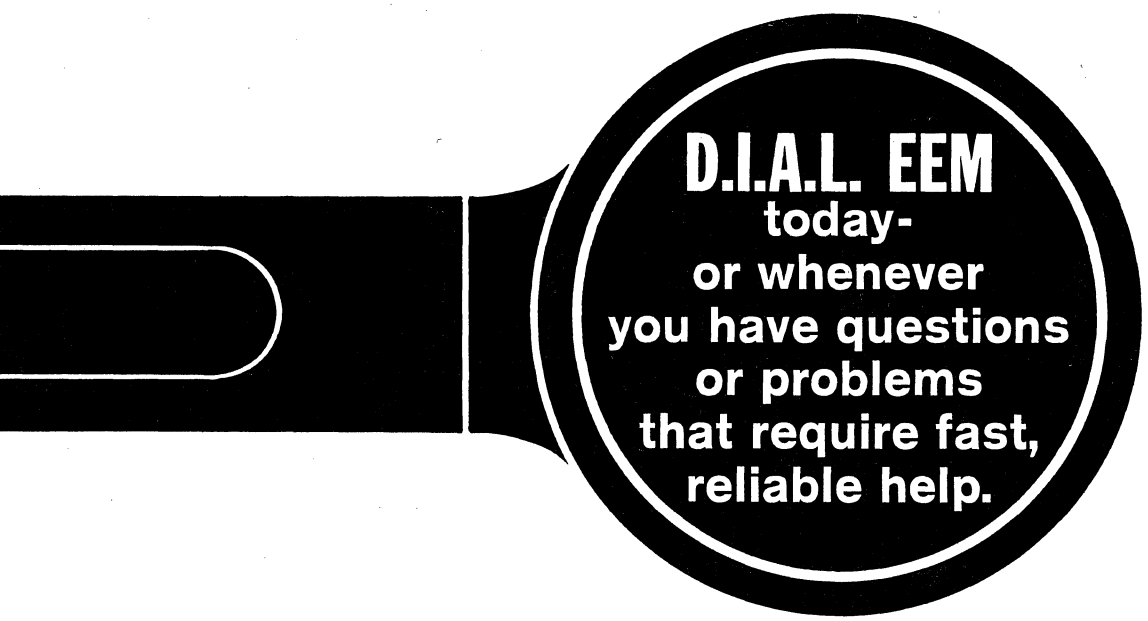

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TYPE	COMMON FEATURES (See catalog pages for exact specifications)	NOMINAL SOURCE (INPUT)	MAXIMUM OUTPUT		
			VOLTS	AMPERES	WATTS
OPEN CONSTRUCTION	SERIES STABILIZERS (REGULATORS) WITH AS LOW AS 0.05% – 0.5% SOURCE & LOAD EFFECT (REGULATION), 1-2 MV RMS PARD (RIPPLE) AND 50 MICROSECOND RECOVERY. GENERALLY LOWER WATTS PER IN^3 THAN SWITCHING STABILIZERS BELOW.	115 VAC AND 230 VAC (OPTIONAL ON SOME SERIES)	28	20.0	224
			15	1.2	30
			15	5.0	55
			28	10.0	185
			32	7.7	80
			7	3.4	23
			16	1.5	24
			16	1.5	24
	SWITCHING STABILIZERS WITH AS LOW AS 0.3% OVERALL SOURCE AND LOAD EFFECT, 0.2% RMS PARD AND 5 MILLISECOND RECOVERY. GENERALLY HIGHER WATTS PER IN^3 THAN SERIES STABILIZERS ABOVE.	115 VAC or 150 VDC	30	8.0	60
		115, 230 VAC or 12, 24/28, 48, 150 300 VDC	32	30	250
	MAGNETIC STABILIZERS WITH AS LOW AS 1% SOURCE, LOAD, FREQUENCY EFFECTS	115 VAC	48	60	480
ENCAPSULATED	SERIES STABILIZERS WITH AS LOW AS 0.05% SOURCE-LOAD EFFECTS, 1 MV RMS PARD AND 50 MICROSECOND RECOVERY. GENERALLY LOWER WATTS PER IN^3 THAN SWITCHING STABILIZERS BELOW.	115 VAC	152	6.0	75
			325	25.0	800
			±150	0.5	10
			152	30.0	750
			325	25.0	800
			325	25.0	500
	NON STABILIZED (UNREGULATED) SUPPLIES	115 VAC	1000	25.0	975
	HIGH EFFICIENCY, WIDE RANGE SWITCHING STABILIZERS WITH AS LOW AS 0.3% OVERALL SOURCE-LOAD EFFECTS, 0.2% RMS PARD AND 5 MILLISECOND RECOVERY. GENERALLY HIGHER WATTS PER IN^3 THAN SERIES STABILIZERS ABOVE.	115 VAC	160	25.0	1000
		115 VAC or 150 VDC	1000	50.0	375
		115 or 230 VAC	160	50.0	2000
	SERIES STABILIZERS "POINT OF LOAD" SUPPLIES WITH AS LOW AS 1% OVERALL SOURCE-LOAD EFFECT, 50 MICRO-SECOND RECOVERY. NO ISOLATION INPUT TO OUTPUT	7-35 VDC	24	1.5	35
			24	4.0	96
	HIGH EFFICIENCY STABILIZED CONVERTER WITH AS LOW AS 0.3% OVERALL SOURCE-LOAD EFFECTS, 0.2% RMS PARD AND 5 MILLISECOND RECOVERY. FULL INSOLATION INPUT TO OUTPUT.	24/28 VDC	1000	30.0	270
	GENERAL PURPOSE SWITCHING STABILIZER LAB SUPPLY	115 VAC	160	25.0	1000

5-YEAR WARRANTY

WARRANTY: Technipower, Inc., warrants each product manufactured by it to be free from defects in material and workmanship. Technipower's liability under this warranty is limited to servicing, or replacing at its option such product or any part thereof which is returned to Technipower with transportation charges prepaid within five years from the original date of delivery to the original purchaser, where Technipower's examination discloses a defect within the limits of this warranty. In no case shall Technipower's liability exceed the original purchase price.

Technipower reserves the right to discontinue or modify any item in its product line, without notice. In the event of modification, Technipower shall have no obligation to make identical or similar modifications to products previously sold.

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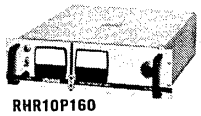

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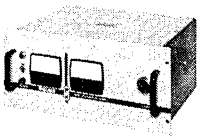

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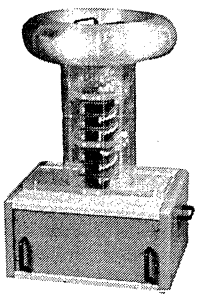

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SPECIFICATIONS:

OUTPUT VOLTAGE: Continuously adjustable over entire range from zero to rated voltage by means of ten-turn potentiometer. Resolution better than 250 ppm. Finer resolution available on special order.

INPUT VOLTAGE: 105-125 Volts AC, 55-65 Hz, single phase. Other inputs available on request.

REGULATION: Load: 0.01% +1V, for full load change. Line: ±0.01% ±1V, for ±10% change.

RIPPLE: 0.02% +2 volts, RMS. 0.1% RMS on 100KV models and above.

POLARITY: Positive, Negative, and Reversible with respect to ground available.

STABILITY: 0.02% +2 volts per hour, 0.05% +5 volts per eight hours.

TEMPERATURE COEFFICIENT (PER °C): 0.02% +2 volts.

TEMPERATURE RANGE: Operating: −20°C to +55°C
Storage: −40°C to +85°C

OVERLOAD PROTECTION: All units are overload, short circuit and arc protected by means of fast acting, self-restoring, electronic circuitry. Other protection options available. (See above.) Surge limiting resistors included.

AC POWER INPUT PROTECTION: Control Fuse.

CONTROLS: AC ON Toggle Swtch. AC ON Indicator. Output Adjust — Ten-turn potentiometer with locking read-out dial.

METERING: Single range voltmeter, 2% accuracy, Single range ammeter, 2% accuracy.

PHYSICAL CHARACTERISTICS: All units in this series up to 100KVDC output are designed for rack mounting. Panels are 19″ wide with standard notching. Units are fully enclosed for desk or table top operation. Optional bench mounting cabinet available. High voltage sections of higher voltage units are contained in a plexiglas tubular enclosure mounted on a base cabinet. The high voltage electrode is located at the top of the structure.

OPTIONS:

OVERLOAD TRIPOUT (OL): The Overload Tripout protection feature rapidly "crowbars" the power supply when the load current exceeds approximately 110% of the rated load. The power supply must be reset by OFF-ON activation of the main AC power switch. This protection arrangement provides the utmost in safety for personnel, load, and power supply.

CURRENT LIMITING (CL): This option automatically limits the load current to approximately 110% of rated load regardless of the overload imposed upon the power supply. The power supply continues to operate at any overload condition including a short circuit by automatically reducing the output voltage as required to maintain the current limit. The unit is self-restoring to its normal operating level when the overload condition is removed.

REMOTE VOLTAGE PROGRAMMING (RVC): This option enables the power supply to be controlled by an external low voltage DC source. The output voltage is directly proportional to the input voltage with linearity and proportionality of 1% of full scale.

REMOTE RESISTANCE PROGRAMMING (RC): This option permits the output voltage to be controlled by either an external potentiometer (3 terminals) or the front panel 10-turn control potentiometer.

BCD DIGITAL REMOTE PROGRAMMING (BCD): This option is supplied in the form of a separate programmer adaptor with all necessary connectors and cables for interconnection to the basic high voltage power supply. The programmer module is designed for rack mounting in standard 19″ wide cabinetry. It is 3½″ high and 6½″ deep.

All standard RHR characteristics for regulation, ripple, etc. are not affected by the addition of the programmer module.

BENCH CABINET (C): A deluxe styled rack cabinet is available for all models.

CURRENT REGULATION (CR): The RHR Series units are capable of being modified from their normal constant voltage operating mode to a constant current mode.

This type of unit is particularly suitable for gas laser excitation since the supply can provide a relatively high open circuit voltage for starting the plasma discharge. Once the arc has formed, the supply automatically operates in a constant current mode at any preset level.

220 VOLT INPUT (50-60 Hz) (220): Nominal input voltage between 220 and 250 volts RMS, 50-60 Hz, single phase can be accommodated with this option. Input current is approximately 1.5, 3 and 5 amperes RMS for 30, 60 and 120 watt models respectively.

FOCUS TAP (F): A separate, supplementary output can be included in all models up to 40KVDC. The auxiliary voltage is obtained by including a DC to DC supply selected from the SPELLMAN RM SERIES modules. Any 1.5 watt unit with voltage rating to 24KVDC may be selected.

REMOTE MONITOR TERMINALS (TP): BNC connectors are provided on the rear of the chassis for remote monitoring of voltage and current.

REMOTE CONTROL PANEL (RCP): Any standard model may be supplied with the control panel removed from the basic supply.

PARALLEL OPERATION (PM): Any model in the RHR SERIES can be used as a "master" controller for parallel operation of up to three "Slave" units of the same rating from either the RHR or UHR Series. Whether the "slave" units are from the RHR or UHR units, the overall characteristics of the parallel system are governed by the specifications of the RHR "master" supply and are the same as standard specifications.

SLAVED BI-POLAR (±) OPERATION (BPM) and (BPS): Any positive polarity model in the RHR Series can be used as a "master" for "tracking" control of the negative polarity equivalent RHR model. Thus, one control provides adjustment of both supplies from zero to rated output voltage.

WARRANTY:

3 YEAR WARRANTY FOR ALL RHR MODELS

- All parts
- All labor
- Consult factory for warrantees on other Spellman products
- Copy of Warrantee available on request

Max. Ratings KV	MA.	Watts	Model Number	H x W x D	Wt. (lbs.) Net	Ship.
5	2	10	RHR-5P10 RHR-5N10			
5	6	30	RHR-5P30 RHR-5N30 RHR-5PN30			
5	10	50	RHR-5P50 RHR-5N50 RHR-5PN50			
10	1	10	RHR-10P10 RHR-10N10			
10	3	30	RHR-10P30 RHR-10N30 RHR-10PN30			
10	6	60	RHR-10P60 RHR-10N60 RHR-10PN60			
10	10	100	RHR-10P100 RHR-10N100 RHR-10PN100			
15	0.67	10	RHR-15P10 RHR-15N10	5¼x19x16½	25	33
15	2	30	RHR-15P30 RHR-15N30 RHR-15PN30			
15	4	60	RHR-15P60 RHR-15N60 RHR-15PN60			
15	8	120	RHR-15P120 RHR-15N120 RHR-15PN120			
20	0.50	10	RHR-20P10 RHR-20N10			
20	1.5	30	RHR-20P30 RHR-20N30 RHR-20PN30			
20	3	60	RHR-20P60 RHR-20N60 RHR-20PN60			
20	6	120	RHR-20P120 RHR-20N120 RHR-20PN120			
30	0.33	10	RHR-30P10 RHR-30N10			
30	1	30	RHR-30P30 RHR-30N30 RHR-30PN30			
30	2	60	RHR-30P60 RHR-30N60 RHR-30PN60			
30	4	120	RHR-30P120 RHR-30N120 RHR-30N120			
40	0.75	30	RHR-40P30 RHR-40N30 RHR-40PN30			
40	1.5	60	RHR-40P60 RHR-40N60 RHR-40PN60	8¾x19x16½	30	50
40	3	120	RHR-40P120 RHR-40N120 RHR-40PN120			
60	0.50	30	RHR-60P30 RHR-60N30 RHR-60PN30			
60	1	60	RHR-60P60 RHR-60N60 RHR-60PN60	12¼x19x16½	35	75
60	2	120	RHR-60P120 RHR-60N120 RHR-60PN120			
100	1	100	RHR-100P100 RHR-100N100 RHR-100PN100	17½x19x16½	40	100
150	1	150	RHR-150P150 RHR-150N150	34x22x18	125	300
300	0.5	150	RHR-300P150 RHR-300N150	48x22x18	175	350
400	0.25	100	RHR-400P100 RHR-400N100	60x22x18	210	375

NOTE: Output polarity indicated by P (Positive), N (Negative), PN (Reversible).

SPELLMAN

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Our Third Decade of Leadership in High-Voltage Technology

HIGH-VOLTAGE ELECTRONICS CORPORATION

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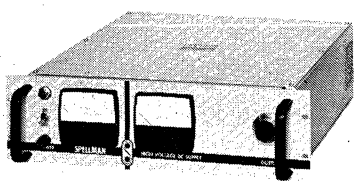
RHSR SERIES

FOR APPLICATIONS REQUIRING EVEN BETTER REGULATION AND RIPPLE THAN THAT OF THE RHR



SPECIFICATIONS:

INPUT: 105-125 volts AC, 55-65 Hz, single phase. Other inputs available on request.

OUTPUT: Continuously adjustable over entire range from zero to rated voltage by means of 10-turn potentiometer. Resolution better than 250 ppm. Finer resolution available on special order.

REGULATION: Load: 0.001% +0.1 volt, for full load change. Line: ±0.001% ±0.1 volt, for ±10% change.

RIPPLE: 0.001% +0.1 volts, RMS.

STABILITY: 0.005% per hour, 0.01% per 8 hours.

TEMPERATURE COEFFICIENT: 0.005% per degree C.

TEMPERATURE RANGE: Operating: 0°C to +50°C
Storage: −25°C to +100°C

RESETTABILITY: 0.5% of full scale.

OVERLOAD PROTECTION: All units are overload, short circuit and arc protected by means of fast acting, self-restoring, electronic circuitry. Other protection options available. (See above.) Surge limiting resistors included.

AC POWER INPUT PROTECTION: Control Fuse.

CONTROLS: AC "ON" indicator; AC "ON" toggle switch.

METERING: Single range voltmeter, 2% accuracy. Single range ammeter, 2% accuracy.

PHYSICAL CHARACTERISTICS: All units in this line are designed for rack mounting. Panels are 19" wide with standard notching. Units are fully enclosed for desk or table top operation.

MOST OF THE RHR OPTIONS AVAILABLE FOR RHSR AS WELL.

RHSR

Output Voltage Range (KV)	Output Current mA	Watts	Model Number
0-5	12	60	RHSR-5PN60
0-10	6	60	RHSR-10PN60
0-15	4	60	RHSR-15PN60
0-20	3	60	RHSR-20PN60
0-25	2.4	60	RHSR-25PN60

UHR SERIES

FOR APPLICATIONS REQUIRING LESSER REGULATION AND RIPPLE THAN THAT OF THE RHR

All specifications are the same as for the RHR Series except for the following:

REGULATION: ±1% of rated voltage for line or load change.

RIPPLE: 0.1% RMS of rated voltage.

STABILITY & TEMPERATURE COEFFICIENT (PER °C): 0.2% of rated voltage.

VOLTAGE CONTROL: Single turn potentiometer.

CURRENT LIMITING: On all UHR models.

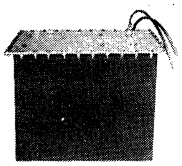
UHR

Output Voltage Range (KV)	Output Current mA	Watts	Model Number
0-5	2	10	UHR-5*10
0-5	6	30	UHR-5*30
0-5	10	50	UHR-5*50
0-10	1	10	UHR-10*10
0-10	3	30	UHR-10*30
0-10	6	60	UHR-10*60
0-10	10	100	UHR-10*100
0-15	0.67	10	UHR-15*10
0-15	2	30	UHR-15*30
0-15	4	60	UHR-15*60
0-15	8	120	UHR-15*120
0-20	0.50	10	UHR-20*10
0-20	1.5	30	UHR-20*30
0-20	3	60	UHR-20*60
0-20	6	120	UHR-20*120
0-30	0.33	10	UHR-30*10
0-30	1	30	UHR-30*30
0-30	2	60	UHR-30*60
0-30	4	120	UHR-30*120
0-40	0.75	30	UHR-40*30
0-40	1.5	60	UHR-40*60
0-40	3	120	UHR-40*120
0-60	0.50	30	UHR-60*30
0-60	1	60	UHR-60*60
0-60	2	120	UHR-60*120
0-100	1	100	UHR-100*100
0-150	1	150	UHR-150*150
0-300	0.50	150	UHR-300*150
0-400	0.25	100	UHR-400*100

* Available with either Positive or Negative polarity. Specify P (Positive) or N (Negative) in place of * in Model Number.
Size and Weight as per equivalently rated RHR.

SPELLMAN "BRUTE FORCE" POWER SUPPLIES

RS-217 DC POWER SUPPLY FOR LASERS



- Input 115V 50 Amp. AC
- Output 15KVDC @ 250 mA
- HV floating full wave bridge
- Either negative or positive may be grounded or left floating.
- 12½" x 21" x 18¼"

RS-217

Output Voltage Range (KV)	Output Current mA	Watts	Model Number
15	250	375	RS-217

HPA, HPL, HPR DC HIGH POWER/HIGH VOLTAGE POWER SUPPLIES

INPUT VOLTAGE: 208 Volt, 3 phase, 4 wire 60 Hz Nominal. 440 Volt, 3 phase, 3 wire 60 Hz available on special order.

OUTPUT VOLTAGE: Continuously adjustable from zero to rated output voltage and current.

REGULATION: Less than 7% of rated output voltage for 10% to full load change. Regulated models are available — See HPR Models below.

RIPPLE: 4.2% RMS. Three-phase full-wave bridge rectifier develops 360 Hz. fundamental ripple. Low ripple optional filter provides 1% RMS ripple. Specify by affixing letter L to Model number.

POLARITY: Reversible with respect to ground.

DUTY: Continuous for the following service conditions.

HPL SERIES

CONTROLS: MAIN POWER circuit breaker
HIGH VOLTAGE OFF-RESET pushbutton.
OUTPUT control powerstat, or RAISE-LOWER pushbuttons. Overload and overvoltage LIMIT potentiometers.
RANGE selector for Kilovoltmeter and Milliameter.

INDICATORS: MAIN POWER
OVERLOAD/OVERVOLTAGE INTERLOCK (open)
ZERO START (Interlock open) HIGH-VOLTAGE ON.

METERS: Three-range kilovoltmeter and milliameter. 3½" wide scales, 2% full scale accuracy with provision for recalibration by potentiometer adjustment.

PROTECTIVE DEVICES:

1. Overload and overvoltage trip-out circuits. Fully adjustable from 10% to 105% of rated values.
2. Circuit Breaker.
3. Door interlock.
4. Provision for external interlock.
5. Zero start interlock.
6. Surge protective devices.

HPA SERIES

These models are the same as the HPL group, except that meters are single range, and overload/overvoltage circuitry is factory set to rated values.

HPR SERIES

These models are the same as the HPA units with the addition of a servo-regulator which provides better than 0.5% regulation for line and load variations. OUTPUT voltage is adjusted by means of a linear control potentiometer.

HPA, HPL, HPR

Voltage Output Range (KV)	Current Output mA	Current Input Amps/Phase	Model Number
0-2.5	1000	8	HP*2.5-1000
0-2.5	2000	15	HP*2.5-2000
0-2.5	4000	30	HP 2.5-4000
0-2.5	6000	45	HP*2.5-6000
0-5	500	8	HP*5-500
0-5	1000	15	HP*5-1000
0-5	2000	30	HP*5-2000
0-5	3000	45	HP*5-3000
0-10	250	8	HP*10-250
0-10	500	15	HP*10-500
0-10	1000	30	HP*10-1000
0-10	1500	45	HP*10-1500
0-15	150	8	HP*15-150
0-15	300	15	HP*15-300
0-15	600	30	HP*15-600
0-15	1000	45	HP*15-1000
0-20	125	8	HP*20-125
0-20	250	15	HP*20-250
0-20	500	30	HP*20-500
0-20	750	45	HP*20-750
0-30	50	8	HP*30-50
0-30	125	15	HP*30-125
0-30	250	30	HP*30-250
0-30	500	45	HP*30-500

* Models HPL, HPA, and HPR available.

SPELLMAN MODULAR D.C. HIGH VOLTAGE POWER SUPPLIES

RM SERIES REGULATED HIGH VOLTAGE

FEATURES:
- Low Ripple
- Fully Enclosed Shielded Metal Case
- All Solid State
- Encapsulated for Full Environmental Protection
- Excellent Regulation
- Resistance Programmable

APPLICATIONS:
- Cathode Ray Tubes
- Photomultipliers
- Image Intensifiers
- Electron Beam Systems
- Scintillation Counters
- Control Grid Bias

RM

Output Voltage Range (KV)	Case Size	1.5 Watts Model Number*	1.5 Watts Output Curr. (μA)	3 Watts Model Number*	3 Watts Output Curr. (μA)	6 Watts Model Number*	6 Watts Output Curr. (μA)
0.35-0.5	II A	RM0.5(*)500D	1000	RM0.5(*)1000D	2000	RM0.5(*)2000D	4000
0.5-0.75	II A	RM0.75(*)750D	1000	RM0.75(*)1500D	2000	RM0.75(*)3000D	4000
0.75-1	II A	RM1(*)1000D	1000	RM1(*)2000D	2000	RM1(*)4000D	4000
1-1.5	II A	RM1.5(*)1500D	1000	RM1.5(*)3000D	2000	RM1.5(*)6000D	4000
2-3	II A	RM3(*)1500D	500	RM3(*)3000D	1000	RM3(*)6000D	2000
4-6	II A	RM6(*)1500D	250	RM6(*)3000D	500	RM6(*)6000D	1000
6-9	II A	RM9(*)1500D	150	RM9(*)3000D	300	RM9(*)6000D	600
9-12	II A	RM12(*)1500D	100	RM12(*)3000D	200	RM12(*)6000D	400
12-15	IIA	RM15(*)1500D	75	RM15(*)3000D	150	RM15(*)6000D	300
15-18	II A	RM18(*)1500D	60	RM18(*)3000D	120	RM18(*)6000D	250
18-20	III A	RM20(*)1500D	60	RM20(*)3000D	120	RM20(*)6000D	240
20-24	III A	RM24(*)1500D	50	RM24(*)3000D	100	RM24(*)6000D	200
24-30	IV	RM30(*)1500D	40	RM30(*)3000D	80	RM30(*)6000D	150

* Use "P" in model number for positive polarity. Use "N" for negative polarity.
† AC input option available.

GENERAL SPECIFICATIONS:

INPUT: +28 Volts DC ±10%. Case is grounded.†

REGULATION: Line: ±0.01% for ±10% input variations. Load: 1% per watt output.

RIPPLE: 0.1% RMS per watt output. 0.05% RMS at no load.

TEMPERATURE COEFFICIENT: 0.025% per degree Centigrade from 0° to 60°C.

EFFICIENCY: 40% minimum.

OUTPUT POLARITY: Available in positive or negative polarity with respect to ground (case). Letter "P" or "N" in model number designates positive or negative polarity respectively.

VOLTAGE ADJUSTMENT: A 5000 ohm potentiometer connected to the programming terminals is required for adjustment over the specified range. Output voltage is within ±10% of maximum rated value with zero resistance (short) across programming terminals.

PROTECTION: Unit is fully protected against overloads, short circuits and reverse input voltage.

MECHANICAL: See table below for size. Terminals are provided for DC input, common, and programming. A 12" flying lead is provided for the high voltage output. Units are encapsulated in a closed metal case with mounting inserts in base. Weight is 2 lbs., 2½ lbs. and 3 lbs. for Case II, III, and IV respectively.

SERVICE CONDITIONS: 0-60°C.

CIRCUIT CONCEPT: High frequency power oscillator circuit enables low ripple to be achieved wtih small, low stored energy capacitors, resulting in greater safety as well as better performance. Oscillator frequency is well above the audio range.

OPTIONS:

IMPROVED REGULATION: 0.1% per watt load regulation for full load variations. Add suffix "R" to model number.

IMPROVED RIPPLE: 0.1% peak to peak for all load conditions. Add suffix "L" to model number. Size increases for some models.

UM SERIES HIGH VOLTAGE ENCAPSULATED

RM/UM CASE SIZE TABLE

Case Size	Dimensions Width	Length	Height
I	2⅝	4½	1⅞
IIA & 11B	3⅜	5⅛	1¾
IIIA & IIIB	3⅝	6⅝	2⅛
IV	3⅝	8⅛	2⅛

UM

Output Voltage Range (Kilovolts)	Output Current (Microamperes)	Case Size	Model Number*
0-1	1000	I	UM1(*)1000D
0-1.5	1000	I	UM1.5(*)1500D
0-3	500	I	UM3(*)1500D
0-6	250	I	UM6(*)1500D
0-9	150	I	UM9(*)1500D
0-12	100	I	UM12(*)1500D
0-15	75	IIB	UM15(*)1500D
0-18	60	IIB	UM18(*)1500D
0-24	50	IIIB	UM24(*)1500D

* Use "P" in model number for positive polarity. Use "N" for negative polarity.
† AC input option available.

GENERAL SPECIFICATIONS:

INPUT: +24VDC ±10% for rated maximum output voltage†.

REGULATION: Line: Output voltage is approximately proportional to input voltage. Load: 15% per watt load variation at max. voltage.

RIPPLE: 0.1% RMS.

EFFICIENCY: 50% minimum.

OUTPUT POLARITY: Available in positive or negative polarity with respect to ground (case). Letter "P" or "N" in model number designates positive or negative polarity respectively.

VOLTAGE ADJUSTMENT: Output voltage is adjustable from near zero to rated voltage by adjustment of the DC input voltage. The output is approximately proportional to input voltage.

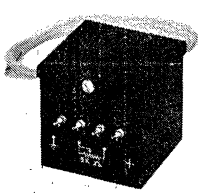
PROTECTION: Unit is fully protected against all overload and short circuit conditions.

MECHANICAL INFORMATION: See table above for size. Terminals are provided for DC input and common. A 12" "flying" lead is provided for the high voltage output. The unit is encapsulated in a closed metal case with mounting inserts in the base. Weight is 1¾ lbs., 2 and 2½ lbs. for Case I, II, and III respectively.

SERVICE CONDITIONS: 0-60°C.

CIRCUIT CONCEPT: High frequency power oscillator circuit enables low ripple to be achieved with small, low stored energy capacitors, resulting in greater safety as well as better perfomance. Oscillator frequency is well above the audio range.

RMX SERIES REGULATED MINI-MODULES



FEATURES:
- Small Size—2"x2"x2"
- Resistance Programmable
- Low Ripple
- Fully Enclosed Shielded Metal Case
- All Solid State
- Encapsulated for Full Environmental Protection
- Excellent Regulation
- Low Cost

APPLICATIONS:
- Photomultipliers
- Geiger-Muller Tubes
- Ionization Gages
- Cathode Ray Tubes
- Image Intensifiers
- Electron Beam Systems
- Scintillation Counters
- Control Grid Bias

RMX

Output Voltage	Output Current Microamperes at Min. Voltage	at Max. Voltage	Model Number
400 to 800 Volts DC	500	250	RMX0.8(*)200D
750 to 1500 Volts DC	250	125	RMX1.5(*)200D
1250 to 2500 Volts DC	160	80	RMX2.5(*)200D
2300 to 4000 Volts DC	85	50	RMX4(*)200D

* Use "P" in model number for positive polarity. Use "N" for negative polarity.
† AC input option available.

SPECIFICATIONS:

INPUT: +28 volts DC ±10%. Case is grounded. Input current is less than 60 milliamperes.

OUTPUT: 200 milliwatts at all output voltage levels.

REGULATION: Line: ±0.05% for ±10% input variations. Load: 2% for Model RMX4(*)200D. 0.5% for all others.

RIPPLE: 0.01% RMS.

TEMPERATURE COEFFICIENT: 0.025% per degree Centigrade from 0° to 70° Centigrade.

EFFICIENCY: 40% minimum.

OUTPUT POLARITY: Available in positive or negative polarity with respect to ground (Case). (Letter "P" or "N" in model number designates positive or negative polarity.)

VOLTAGE ADJUSTMENT: A 5000 ohm potentiometer or fixed resistor connected to the programming terminals is required for adjustment over the specified range. Output voltage is within ±10% of maximum rated value with zero resistance (short) across programming terminals.

PROTECTION: Unit is fully protected against all overloads, short circuit, and reverse input voltage.

MECHANICAL INFORMATION: Size is 2" x 2" x 2". Terminals are provided for DC (+) input, common (Grd), and programming. A 12" flying lead is provided for the high voltage output. Units are encapsulated in a closed metal case with mounting inserts in base. Weight is 10½ ozs.

SERVICE CONDITIONS: 0 - 70°C.

CIRCUIT CONCEPT: High frequency power oscillator circuit enable low ripple to be achieved with small, low stored energy capacitors, resulting in greater safety as well as better perfomance. Oscillator frequency is well above the audio range.

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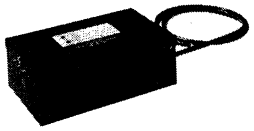
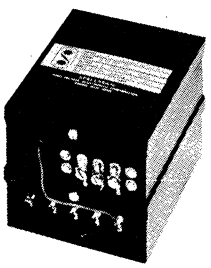
RMC SERIES MULTIPLE OUTPUT CRT SUPPLY



	Anode	G-2	G-1
OUTPUT VOLTAGE	Specify between 10-15KV	400V	−100V
OUTPUT CURRENT	200 μA	1.0mA	1.0mA
REGULATION, LINE	0.1%	0.1%	0.1%
REGULATION, LOAD	0.05%	1%	1%
RIPPLE, Peak to Peak	0.1%	0.1%	0.1%
8-Hr. STABILITY	0.2%	0.2%	0.2%

INPUT VOLTAGE	+28VDC ±10%VDC
TEMPERATURE OPERATING RANGE	0°C to 60°C
TEMPERATURE STORAGE RANGE	−20°C to 80°C
ALTITUDE	0 to 10,000 feet
SIZE	3⅝″ x 6⅝″ x 2 1/16″
WEIGHT	2½ lbs.

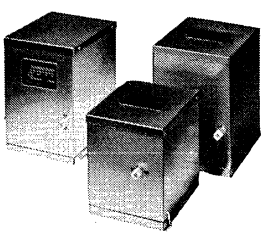
RMD5P3.75D ELECTROSTATIC DYNAMIC FOCUS HIGH VOLTAGE POWER SUPPLY FOR CRT USE



INPUT VOLTAGE	+28VDC ±10% (or ±15 volts)
INPUT CURRENT	500 mA
SIZE	3.5″ wide x 5″ deep x 3″ high
WEIGHT	4 lbs.

OUTPUT VOLTAGE (KV)	3-5	STATIC
OUTPUT CURRENT (mA)	0.75	SECTION
OUTPUT VOLTAGE ADJUSTMENT	Internal	
REGULATION	±0.02%	
RIPPLE, Peak to Peak	0.1%	
VOLTAGE (Volts)	+300	AUXILIARY
CURRENT (mA)	1	OUTPUT
OUTPUT VOLTAGE (Volts, Peak to Peak)	200V	DYNAMIC
FREQUENCY RESPONSE at Full Output (KHz)	60	SECTION
RISE OR FALL TIME (μsec)	3.5	
GAIN	20	
PHASE	Inverting	

FRHM & UHM MODULAR STYLE



Modules are built into heavy-gage aluminum housings. Seven standard sizes are available.

OPTIONAL ITEMS:

Floating outputs, positive/negative dual outputs and special taps available on order. Other modules at higher voltages available on request. Modules with adjustable output available for both DC and AC input.

SIZE AND WEIGHT:

Model Type	Input	Rated KV	Output Watts	Dimensions W″	L″	H″	Net Wt.	Ship. Wt.
FRHM	DC	5, 10, 15, & 20	10	5½	8	8	4	12
		30		5½	10	9	5	13
FRHM/UHM	DC	All	30	6¼	12	10	5	13
FRHM	AC	5, 10, 15, & 20	10	5½	10	9	13	23
		30		6¼	12	10	15	25
UHM	DC	5, 10	10	5	6	6	2	10
		15, 20, 30		5¼	6¾	8¼	3	11
UHM	AC	5, 10	10	5	6	9	10	20
		15, 20, 30		5¼	6¾	11¼	11	21

HIGH VOLTAGE POWER SUPPLIES

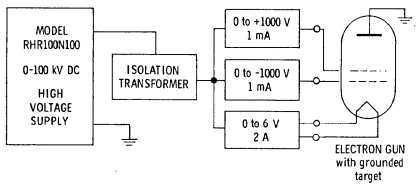
			FRHM — Regulated Adjustable Output*		UHM — Unregulated Input — Controllable†	
			DC — Input‡ 24-32V	AC — Input 105-125V	DC — Input‡ 0-24V	AC — Input 0-115V
REGULATION No load to full load			0.01% or 1V	0.01% or 1V	20% of max. voltage	20% of max. voltage
Line from Min.-Max.			±0.01% or ±1V	±0.01% or ±1V	Not applicable	Not applicable
Ripple			0.02% RMS or 2V	0.02% RMS or 2V	0.1% of max. voltage	0.5% of max. voltage
Temperature Coefficient			0.01%/°C between 0°C and 60°C	0.01%/°C between 0°C and 60°C	0.2%/°C between 0°C and 60°C	0.2%/°C between 0°C and 60°C
Max. Rating						
KV	MA.	Watts				
5	2	10	FRHM-5P10D FRHM-5N10D	FRHM-5P10A FRHM-5N10A	UHM-5P10D UHM-5N10D UHM-5PN10D	UHM-5P10A UHM-5N10A UHM-5PN10A
5	6	30	FRHM-5P30D FRHM-5N30D		UHM-5P30D UHM-5N30D UHM-5PN30D	
10	1	10	FRHM-10P10D FRHM-10N10D	FRHM-10P10A FRHM-10N10A	UHM-10P10D UHM-10N10D UHM-10PN10D	UHM-10P10A UHM-10N10A UHM-10PN10A
10	3	30	FRHM-10P30D FRHM-10N30D		UHM-10P30D UHM-10N30D UHM-10PN30D	
15	0.67	10	FRHM-15P10D FRHM-15N10D	FRHM-15P10A FRHM-15N10A	UHM-15P10D UHM-15N10D UHM-15PN10D	UHM-15P10A UHM-15N10A UHM-15PN10A
10	2	30	FRHM-15P30D FRHM-15N30D		UHM-15P30D UHM-15N30D UHM-15PN30D	
20	0.50	10	FRHM-20P10D FRHM-20N10D	FRHM-20P10A FRHM-20N10A	UHM-20P10D UHM-20N10D UHM-20PN10D	UHM-20P10A UHM-20N10A UHM-20PN10A
20	1.5	30	FRHM-20P30D FRHM-20N30D		UHM-20P30D UHM-20N30D UHM-20PN30D	
30	0.33	10	FRHM-30P10D FRHM-30N10D	FRHM-30P10A FRHM-30N10A	UHM-30P10D UHM-30N10D	UHM-30P10A UHM-30N10A
30	1	30	FRHM-30P30D FRHM-30N30D		UHM-30P30D UHM-30N30D	

* FRHM models are adjustable from zero to rated voltage by external potentiometer connected to a 3-position terminal strip.

† UHM models are adjustable from zero to rated voltage by proportional control of input voltage from zero to 24VDC or 115VAC.

‡ All 30 watt modules are convection cooled by internal fan. Standard units require 115V, 50/60 Hz to operate the fan. Thus, for DC input models, a separate 100VA AC source must be supplied for the fan. As an option, a DC fan can be provided at an additional charge.

SPECIAL UNITS MULTIPLE-OUTPUT, 100KV ISOLATED ELECTRON GUN POWER SUPPLY



PROBLEM:

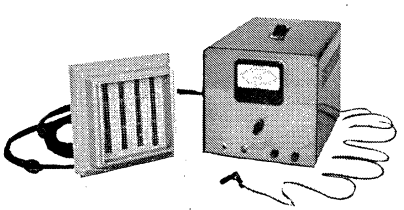
To design a multiple output high voltage power source for electron gun applications.

SOLUTION:

A standard, off-the-shelf RHR Series unit providing a 0 to 100KVDC at 1 mA output was used as the basic power source in a 6-foot rack. Two additional floating outputs of 0 to +1000-VDC and 0 to −1000 VDC used as grid bias voltages were modified Spellman RM Series modules. A 0 to 6 VDC output at 2 amps for filament voltage was specially designed for this system. The floating outputs were all isolated for operation at 100KVDC with respect to ground.

Spellman Solved the Problem!

60KV ELECTROSTATIC FLOCKING SYSTEM



PROBLEM:

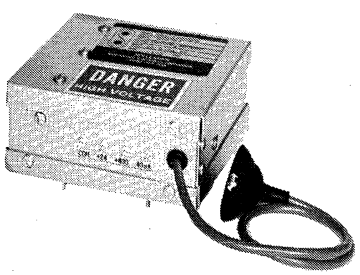
To design a compact, heavy duty, portable power unit for use in electrostatic processing, detearing, wall and object flocking, paint spraying, pinning, pinhole detection, and particle precipitation as well as general laboratory use.

SOLUTION:

The PF-60 (negative output, 50 μA) and ST-60 (positive output, 250 μA) 60KVDC power units were developed with features such as resistance surge protection and remote control operation making them ideal for the required applications.

Spellman Solved the Problem!

MODULAR POWER SUPPLY MEETING STRICT MILITARY SPECIFICATIONS



PROBLEM:

To design a compact, light weight modular high voltage power supply for use in Military applications with strict specification requirements.

SOLUTION:

The RM-10PX/MIL (one ±10KV output at up to 300 μA, one +400V ouptut at 5 μA, together wth a +400V monitor terminal capable of attachment to a microammeter to monitor the 400V output) was developed to meet strict military specifications. This model features ±0.1% line regulation and ±0.5% load regulation, with 0.25% ripple peak to peak on the 10KV output. The RM-10PX/MIL measures only 4½″ x 4″ x 2″ and weighs less than 2 lbs.

Spellman Solved the Problem!

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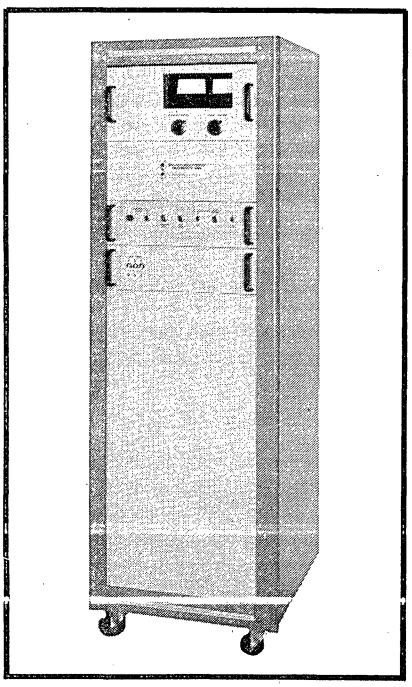
Our Third Decade of Leadership in High-Voltage Technology

HIGH-VOLTAGE ELECTRONICS CORPORATION

1930 ADEE AVENUE, BRONX, NEW YORK 10469 (212) 671-0300 TWX 710 593-4135

SERIES REGULATED POWER SUPPLIES

HP SERIES



APPLICATIONS:

- Gas Lasers • Capacitor Chargers
- Sputtering Supplies • Modulators
- General Laboratory Power Supplies

FEATURES:

- Voltage and current regulation with automatic crossover
- 100 microsecond recovery to line and load transients
- Voltage regulation better than 0.002%. Ripple better than 0.01%.
- Reversible polarity (most models)

Typical of this line is Model HP20PN-200SR, designed specifically as a gas laser power supply. The automatic regulating system permits the arc breakdown to occur at maximum open circuit voltage, followed by immediate current limiting action at any desired level. The unit features a high speed electronic series regulation system which provides fast transient response for line and load variations.

SPECIFICATIONS:

OUTPUT VOLTAGE—OUTPUT CURRENT: Continuously adjustable over the entire range from zero to rated voltage/current by means of separate ten-turn potentiometers. Resolution is better than 250 ppm. Finer resolution available on special order.

REGULATION: All models provide both voltage and current regulation with automatic crossover in accordance with the following characteristics.

Voltage Mode: Load: 0.002%, for full load changes. Line: 0.01%, for 10% line change. Specification holds down to 10% of rated output voltage.

Current Mode: Load: 0.01% + 1 microampere, for 10% load change (i.e., 10% voltage compliance variation); 100 microamperes, maximum, for full load (full voltage compliance) change. Line: 0.01% + 1 microampere, for 10% line change.

TRANSIENT RESPONSE: Voltage Mode: Less than 100 microseconds to recover to within 1% of maximum voltage level for 100% load step change, or 5% line voltage step change. Current Mode: Less than 100 microseconds to recover to within 1% of maximum current level for 10% load (voltage compliance) step change, or 5% line voltage step change. (Consult factory for response time to greater changes).

RIPPLE: Voltage Mode: 0.01% + 100 millivolts, peak to peak. Current Mode: 1% or 100 micro-amperes peak to peak.

INPUT VOLTAGE: 105-125 Volts, 55-65 Hz, single phase or 200-240 Volts line-to-line, 55-65 Hz, three phase, four wire, for "nominal" 115 Volts and 220 Volts listed in rating chart. Other voltages and frequencies available on request.

POLARITY: Reversible on all models up to 20 KVDC. Negative on all models above 20 KVDC. Positive polarity on higher voltage models available on special order only.

STABILITY: Voltage: 0.01% + 100 millivolts per hour, 0.025% + 250 millivolts per 8 hours. Current: Less than 100 microamperes, 8 hours.

TEMPERATURE COEFFICIENT: Voltage: 0.01%/°C. Current: 0.1%/°C.

TEMPERATURE RANGE: Operating: −20°C to +55°C. Storage: −40°C to +85°C.

METERS: Single range voltmeter, 2% accuracy. Single range ammeter, 2% accuracy.

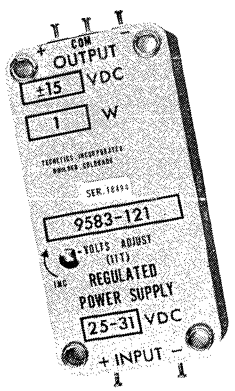
CONTROLS: Main Circuit Breaker. AC ON indicator. Interlock Open indicator. High Voltage ON pushbutton. High Voltage ON indicator. High Voltage OFF pushbutton.

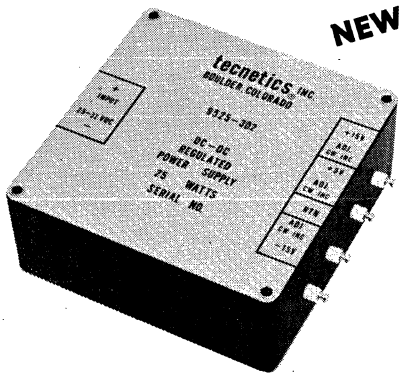
PROTECTION: Units up to 30 KVDC output are inherently protected by the automatic crossover regulating system. Thus, output voltage and output current must remain within ratings, and automatically limit at the preset levels for any extraordinary load condition. All power supplies are overload and short-circuit proof. Units are self-restoring when abnormal load condition is removed on all models up to 30 KVDC. Surge limiting resistors included. Circuit Breaker and control fuse included. Provision is made for external interlock.

Model No.	Voltage Range (Kilovolts)	Current Range (Milliamperes)	Nominal Input Voltage (Volts RMS)	Input Phases	Line Current (Amps)	Size W" x D" x H"	Weight (Lbs.)
HP2.5PN250SR	0-2.5	0-250	115	1	10	22 x 24 x 50	210
HP2.5PN500SR	0-2.5	0-500	115	1	20	22 x 24 x 50	290
HP5PN100SR	0-5	0-100	115	1	10	22 x 24 x 50	220
HP5PN250SR	0-5	0-250	115	1	20	22 x 24 x 50	305
HP5PN500SR	0-5	0-500	220	3	10	22 x 24 x 72	370
HP10PN50SR	0-10	0-50	115	1	10	22 x 24 x 50	225
HP10PN100SR	0-10	0-100	115	1	20	22 x 24 x 50	310
HP10PN250SR	0-10	0-250	220	3	10	22 x 24 x 72	370
HP10PN500SR	0-10	0-500	220	3	20	22 x 24 x 72	380
HP20PN25SR	0-20	0-25	115	1	10	22 x 24 x 50	295
HP20PN50SR	0-20	0-50	115	1	20	22 x 24 x 50	335
HP20PN100SR	0-20	0-100	220	3	10	22 x 24 x 72	375
HP20PN200SR	0-20	0-200	220	3	20	22 x 24 x 72	390
HP30N25SR	0-30	0-25	115	1	15	22 x 24 x 50	325
HP30N50SR	0-30	0-50	115	1	25	22 x 24 x 72	340
HP30N100SR	0-30	0-100	220	3	15	22 x 24 x 72	390
HP50N10SR	0-50	0-10	115	1	10	30 x 40 x 30	500*
HP50N25SR	0-50	0-25	115	1	20	30 x 45 x 30	500*
HP50N40SR	0-50	0-40	115	1	30	30 x 50 x 35	750*
HP100N10SR	0-100	0-10	115	1	20	30 x 45 x 35	750*
HP100N20SR	0-100	0-20	115	1	30	34 x 50 x 35	1000*
HP150N10SR	0-150	0-10	115	1	25	34 x 45 x 40	1000*
HP200N10SR	0-200	0-10	115	1	30	36 x 55 x 45	1250*

* Shipping weight. Oil insulation required on these models. Oil not included in shipment or in price.

tecnetics® DC-DC REGULATED POWER SUPPLIES, 28 Vin





Tecnetics, a leader in the miniature power supply field, is located within the scientific and educational community of Boulder, Colorado. As DC-DC power supply specialists, we've advanced the state of the art in solid state circuitry for aerospace, commercial, government and military systems. Through our varied capabilities — including research and development, engineering, production and quality control — our originally conceived custom-produced products have evolved into a standard line of highly reliable DC-DC power supplies. For specific case histories and applications, please contact us.

1 WATT / 9583 SERIES

Model 9583-	Output: Voltage (VDC) Nom.	Output: Current (mA) Max.	Output: Ripple (Vp-p) Max.	Regulation (VDC): Line (Vin = 25 to 31 VDC) Typ.	Line Max.	Load (½ to Full) Typ.	Load Max.	Temp. (−55°C to 100°C Case) Typ.	Price Each
101	3	330	.020	.025	.035	.098	.110	0.09	$196.00
102	5	200	.020	.035	.045	.110	.130	0.15	185.00
103	7.5	130	.025	.035	.045	.150	.165	0.23	180.00
104	10	100	.030	.045	.055	.210	.230	0.30	180.00
105	15	67	.050	.075	.085	.250	.275	0.45	175.00
106	30	33	.050	.135	.160	.440	.480	0.90	168.00
107	50	20	.030	.210	.225	.800	.850	1.50	185.00
108	75	13	.020	.300	.350	1.20	1.60	2.25	192.00
109	100	10	.150	.390	.420	1.30	1.60	3.00	192.00
110	150	6.7	.200	.670	.750	2.60	3.10	4.50	177.00
111	300	3.3	.225	1.20	1.70	4.00	5.50	9.00	177.00
112	500	2.0	.300	2.00	2.60	6.00	8.00	15.0	201.00
113	750	1.3	8.0	3.00	3.50	19.0	28.0	22.5	202.00
114	1000	1.0	3.0	4.00	5.00	24.0	26.0	30.0	232.00
115	1500	0.67	33.0	6.00	7.50	40.0	60.0	45.0	248.00
116	2000	0.50	25.0	9.50	10.5	68.0	75.0	60.0	254.00
117	2500	0.40	20.0	10.0	13.0	68.0	75.0	75.0	258.00
118	3000	0.33	25.0	12.0	15.0	68.0	75.0	90.0	270.00
121	±15	±33	.010	.060	.090	.250	.280	0.30	209.00

SPECIFICATIONS

Input Voltage: 28 VDC ±3 VDC continuous, 50 VDC for 1 sec. max. **Protection:** Reverse polarity protected to 50 VDC. **Input Current:** 27 mA typical @ 30 mW load, 87 mA typical @ full load. **Minimum Load:** 30 mW. **Output Voltage Adjust:** ±10% @ full load, −40% @ 330 mW load. **Isolation Test Conditions:** Input terminals shorted to case. Output terminals shorted together. Models 101-114 and 121, 1000 VDC. Models 115-118, 3000 VDC. **Polarity:** Inputs and outputs are isolated from each other. Filter is in positive leg. For negative filter, prefix part number with "N" (i.e., N9583-114). **Temp. Range:** Operating, −55°C ambient to +100°C case. Storage, −55°C to +150°C. Case Rise, 5°C @ full load. **Frequency:** Operating, 6 kHz ±20%. Ripple, 12 kHz ±20%. **Weight:** 2.4 oz. fully encapsulated. **Dimen.:** 2.5″ x 1.25″ x .50″ (excluding terminals). **Environment:** Designed to meet the requirements of MIL-E-5400K. **Availability:** Stock to 4 weeks.

3 WATT / 9567 SERIES

Model 9567-	Output: Voltage (VDC) Nom.	Output: Current (mA) Max.	Output: Ripple (Vp-p) Max.	Regulation (VDC): Line (Vin = 25 to 31 VDC) Typ.	Line Max.	Load (½ to Full) Typ.	Load Max.	Temp. (−55°C to 100°C Case) Typ.	Price Each
101	3	1000	0.06	.016	.025	.145	.165	0.45	$178.00
102	5	600	0.05	.026	.035	.170	.210	0.10	168.00
103	7.5	400	0.08	.036	.045	.200	.260	0.15	164.00
104	10	300	0.20	.045	.055	.220	.265	0.20	164.00
105	15	200	0.60	.080	.080	.360	.410	0.30	159.00
106	30	100	0.15	.130	.175	.425	.500	0.80	153.00
107	50	60	0.10	.220	.270	.600	.700	1.0	168.00
108	75	40	0.38	.300	.350	.900	1.20	1.5	175.00
109	100	30	0.20	.450	.550	1.00	1.30	2.0	175.00
110	150	20	0.25	.650	.850	1.50	1.75	3.0	161.00
111	300	10	0.60	1.25	1.75	3.00	3.60	6.0	161.00
112	500	6	0.45	2.20	3.00	4.50	5.20	10.0	183.00
113	750	4	0.50	3.00	4.00	16.0	19.5	15.0	184.00
114	1000	3	0.55	4.00	5.50	16.5	20.0	20.0	211.00
115	1500	2	13.0	6.50	9.00	43.0	55.0	30.0	226.00
116	2000	1.5	16.0	8.00	10.0	39.0	55.0	40.0	231.00
117	2500	1.2	12.0	10.0	13.5	45.0	55.0	50.0	235.00
118	3000	1.0	33.0	12.5	17.0	130.0	160.0	60.0	246.00
119	4000	0.75	28.0	17.0	21.0	145.0	165.0	80.0	256.00
120	5000	0.60	45.0	20.0	32.0	140.0	170.0	100.0	267.00
121	± 15	±100	0.09	.060	.090	.350	.410	0.30	190.00
122	± 25	± 60	0.03	.100	.130	.500	.600	0.50	190.00
123	± 50	± 30	0.01	.200	.300	1.00	1.25	1.00	207.00
124	±100	± 15	0.05	.400	.500	1.50	2.00	2.00	216.00

SPECIFICATIONS

Input Voltage: 28 VDC ±3 VDC continuous, 50 VDC for 1 sec. max. **Protection:** Reverse polarity protected to 50 VDC. **Input Current:** 38 mA typical @ 100 mW, 210 mA typical @ full load. **Minimum Load:** 100 mW. **Output Voltage Adjust:** ±10% @ full load, −40% @ 1 watt load. **Isolation Test Conditions:** Input terminals shorted to case. Output terminals shorted together. Models 101-114, 121-124, 1000 VDC. Models 115-120, 5000 VDC. **Polarity:** Inputs and outputs are isolated from each other. Filter is in positive leg. For negative filter, prefix part number with "N" (i.e., N9567-114). **Temp. Range:** Operating, −55°C ambient to +100° Case. Storage, −55°C to +150°C. Case Rise, 25°C @ full load. **Frequency:** Operating, 3 kHz ±20%. Ripple, 6 kHz ±20%. **Weight:** 4.0 oz. fully encapsulated. **Dimen.:** 3.0″ x 1.5″ x .60″ (excluding terminals). **Environment:** Designed to meet the requirements of MIL-E-5400K. **Availability:** Stock to 4 weeks.

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6 WATT / 9589 SERIES

Model 9589-	Output Voltage (VDC) Nom.	Output Current (mA) Max.	Output Ripple (Vp-p) Max.	Regulation (VDC) Line (Vin = 25 to 31 VDC) Typ.	Line (Vin = 25 to 31 VDC) Max.	Load (½ to Full) Typ.	Load (½ to Full) Max.	Temp. (−55°C to 100°C Case) Typ.	Price Each
102	5	1200	.050	.003	.005	.150	.230	.075	$177.00
103	7.5	800	.060	.003	.006	.200	.300	.113	172.00
104	10	600	.120	.003	.006	.240	.325	.150	172.00
105	15	400	.090	.005	.013	.260	.380	.225	167.00
106	30	200	.090	.010	.016	.360	.450	.450	161.00
107	50	120	.250	.015	.025	.700	.850	.750	176.00
108	75	80	.430	.030	.050	1.00	1.50	1.13	184.00
109	100	60	.600	.040	.065	1.10	1.60	1.50	184.00
110	150	40	.900	.050	.070	1.50	2.00	2.25	169.00
111	300	20	1.80	.100	.125	2.75	4.00	4.50	169.00
112	500	12	2.50	.200	.250	5.00	7.00	7.50	192.00
113	750	8.0	4.10	.400	.550	7.00	11.0	11.3	193.00
114	1000	6.0	6.0	.450	.700	12.5	17.0	15.0	222.00
115	1500	4.0	9.0	.500	1.25	35.0	45.0	22.5	238.00
116	2000	3.0	12.0	1.25	2.00	35.0	45.0	30.0	243.00
117	2500	2.4	15.0	1.40	2.00	50.0	75.0	38.0	247.00
118	3000	2.0	25.0	1.50	3.00	85.0	115.0	45.0	259.00
119	4000	1.5	75.0	1.60	2.20	105.0	125.0	60.0	269.00
120	5000	1.2	30.0	3.00	5.00	125.0	165.0	75.0	281.00
121	± 15	±200	.090	.005	.012	.250	.300	.225	198.00
122	± 25	±120	.120	.007	.012	.410	.500	.38	198.00
123	± 50	± 60	.300	.025	.050	.800	1.10	.75	218.00
124	±100	± 30	.500	.025	.060	1.70	2.20	1.50	227.00

SPECIFICATIONS

Input Voltage: 28 VDC ±3 VDC continuous, 50 VDC 1 sec. max. **Protection:** Reverse polarity protected to 50 VDC. **Input Current:** 100 mA typical @ 200 mW load, 400 mA typical @ full load. **Minimum Load:** 200 mW. **Output Voltage Adjust:** ±10% @ full load, −40% @ 2 watt load. **Isolation Test Conditions:** Input terminals shorted to case. Output terminals shorted together. Models 102-114, 121-124, 1000 VDC. Models 115-120, 5000 VDC. **Polarity:** Inputs and outputs are isolated from each other. Filter is in positive leg. For negative filter, prefix part number with "N" (i.e., N9589-114). **Temp. Range:** Operating, −55°C ambient to +100°C Case. Storage, −55°C to +150°C. Case Rise, 30° @ full load. **Frequency:** Operating, 3.5 kHz ±20%. Ripple, 7 kHz ±20%. **Weight:** 7.0 oz. fully encapsulated. **Dimen.:** 3.5″ x 1.75″ x .70″ (excluding terminals). **Environments:** Designed to meet the requirements of MIL-E-5400K. **Availability:** Stock to 4 weeks.

10 WATT / 9584 SERIES

Model 9583-	Output Voltage (VDC) Nom.	Output Current (mA) Max.	Output Ripple (Vp-p) Max.	Regulation (VDC) Line (Vin = 25 to 31 VDC) Typ.	Line (Vin = 25 to 31 VDC) Max.	Load (½ to Full) Typ.	Load (½ to Full) Max.	Temp. (−55°C to 100°C Case) Typ.	Price Each
102	5	2000	.030	.003	.008	.200	.260	.075	$192.00
103	7.5	1300	.045	.004	.010	.210	.270	.112	187.00
104	10	1000	.020	.005	.012	.250	.300	.150	187.00
105	15	670	.015	.008	.013	.290	.360	.225	182.00
106	30	330	.060	.011	.015	.500	.750	.450	175.00
107	50	200	.050	.025	.035	.700	1.10	.750	192.00
108	75	130	.075	.030	.045	1.10	1.50	1.13	200.00
109	100	100	.100	.037	.065	1.20	2.00	1.5	200.00
110	150	67	.150	.055	.080	2.20	3.00	2.25	184.00
111	300	33	.30	.100	.220	4.00	6.00	4.50	184.00
112	500	20	1.0	.200	.320	7.00	10.0	7.50	209.00
113	750	13	1.5	.300	.500	9.00	13.0	11.30	210.00
114	1000	10	2.5	.750	1.50	16.0	22.0	15.0	241.00
115	1500	6.7	4.0	1.00	1.60	20.0	30.0	22.5	258.00
116	2000	5.0	5.5	1.50	2.70	25.0	40.0	30.0	264.00
117	2500	4.0	5.0	2.00	3.30	60.0	75.0	38.0	268.00
118	3000	3.3	9.0	2.50	4.00	75.0	100.0	45.0	280.00
119	4000	2.5	14.0	2.50	4.50	85.0	125.0	60.0	288.00
120	5000	2.0	17.5	4.00	6.00	120.0	220.0	75.0	299.00
121	± 15	±335	.030	.007	.017	.300	.450	.225	217.00
122	± 25	±200	.050	.010	.030	.750	.850	.38	217.00
123	± 50	±100	.100	.016	.030	1.25	1.50	.75	238.00
124	±100	± 50	.100	.040	.065	1.60	2.75	1.50	243.00

SPECIFICATIONS

Input Voltage: 28 VDC ±3 VDC continuous, 50 VDC 1 sec. max. **Protection:** Reverse polarity protected to 50 VDC. **Input Current:** 120 mA typical @ 300 mW load, 750 mA typical @ full load. **Minimum Load:** 300 mW. **Output Voltage Adjust:** ±10% @ full load, −40% @ 3.3 watt. **Isolation Test Conditions:** Input terminals shorted to case. Output terminals shorted together. Models 102-114, 121-124, 1000 VDC. Models 115-120, 5000 VDC. **Polarity:** Inputs and outputs are isolated from each other. Filter is in positive leg. For negative filter, prefix part number with "N" (i.e., N9584-114). **Temp. Range:** Operating, −55°C ambient to +100°C Case. Storage, −55°C to +150°C. Case Rise, 30°C @ full load. **Frequency:** Operating, 3 kHz ±20%. Ripple, 6 kHz ±20%. **Weight:** 9.6 oz. fully encapsulated. **Dimen.:** 4.0″ x 2.0″ x .80″ (excluding terminals). **Environment:** Designed to meet the requirements of MIL-E-5400K. **Availability:** Stock to 4 weeks.

25 WATT / 9525 SERIES

SINGLE OUTPUT

Model 9525	Output Volts (VDC) Nom.	Output Current (A) Nom.	Price Each
105	5.0	5.0	$240.00
106	6.0	4.16	240.00
107	7.0	3.58	240.00
108	8.0	3.13	240.00
109	9.0	2.78	240.00
110	10.0	2.50	240.00
112	12.0	2.09	240.00
115	15.0	1.67	240.00
118	18.0	1.39	240.00
120	20.0	1.25	240.00
124	24.0	1.04	240.00

DUAL OUTPUT

Model 9525	Each Output* Volts (VDC) Nom.	Each Output Current (A) Nom.	Price Each
205	5.0	2.50	$270.00
206	6.0	2.08	270.00
207	7.0	1.79	270.00
208	8.0	1.57	270.00
209	9.0	1.39	270.00
210	10.0	1.25	270.00
212	12.0	1.05	270.00
215	15.0	0.84	270.00
218	18.0	0.70	270.00
220	20.0	0.63	270.00
224	24.0	0.52	270.00

TRIPLE OUTPUT

Model 9525	Outputs* Volts (VDC) Nom.	Outputs Current (A) Nom.	Price Each
301	±15, +5	±0.500, 2	$330.00
302	±15, +5	±0.330, 3	330.00
303	±15, +5	±0.167, 4	330.00
304	±12, +5	±0.625, 2	330.00
305	±12, +5	±0.415, 3	330.00
306	±12, +5	±0.208, 4	330.00

*Special output voltage combinations available upon request.

SPECIFICATIONS

Input: VOLTAGE: 28 VDC ±3 VDC continuous. 40 VDC for 1 sec. max. Reverse polarity protected to 100 VDC. Reflected ripple voltage 30 mV P-P at 10 kHz ±20% with a source impedance of 0.1 Ohms. CURRENT: 2.2 A Max. **Output:** VOLTAGE: Adjustment range ±5%. REGULATION: Line (25 to 31 VDC) 0.1%. Load (N.L. to F.L.) 0.2%. Temp. 0.007%/°C (typ.), 0.015%/°C max. RIPPLE V P-P: Less than ±0.5% of rated output voltage. Frequency 10 kHz ±20%. IMPEDANCE: 0.02 Ohms to 10 kHz. PROTECTION: Short circuit by current limit. **Isolation:** Input to output 1000 VDC. **Efficiency:** 50% typical at full load under nominal conditions. (V_{IN} = 28 VDC, V_{OUT} = NOM., and T_A = 25°C). **M.T.B.F.:** Calculated per Mil Handbook 217 at 85°C case temp. **Environmental:** Operating temp., −55°C ambient to +100°C Case. Storage temp., −55°C to +150°C. Case rise, 60°C in free air at full load. Vivration, shock, and altitude (designed to meet the requirements of MIL-E-5400K). **E.M.I.:** Input filter reduces reflected power line ripple 50 db from input voltage. **Mechanical:** Dimen., 4″ x 4″ x 1.5″. Terminals, turrent solder type. Case, extruded aluminum with black anodize finish vacuum filled with RTV-11. **Weight:** 36 oz. fully encapsulated. **Availability:** Stock to 4 weeks.

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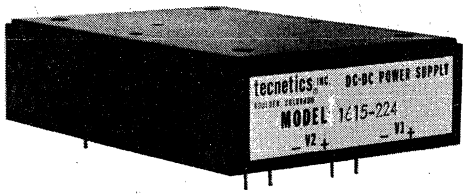
tecnetics® DC-DC REGULATED POWER SUPPLIES

1000 SERIES



SPECIFICATIONS • GENERAL

Input: Reverse polarity protected to 100 VDC (except on 5 V and 6 V input models). Reflected ripple voltage 80 mV (P-P) at 40 kHz ±20% with a source impedance of 0.1 Ohms. **Output:** VOLTAGE ADJUSTMENTS: Set at factory within 0.5% of stated output. REGULATION: Line (low to high), 0.1% max. Load (N.L. to F.L.), 0.3% max. Temperature: 0.007%/°C (typ). 0.015%/°C max. RIPPLE V (P-P): Less than 1.0% of rated output voltage. Frequency 40 kHz ±20%. IMPEDANCE: 0.02 Ohms, 0 to 10 kHz (typ). POLARITY: All outputs may be used as either positive or negative supplies. PROTECTION: Overload. Short circuit by current limiting. **Efficiency:** 40% typical at full load under nominal conditions. (V_{IN} = NOM, V_{OUT} = NOM., and T_A = 25°C). **EMI:** Input filter reduces reflected power line ripple. **Environmental:** Operating Temp., −20°C ambient to +100°C case. Storage Temp., −55°C to +150°C. Case Rise, 20°C in free air at full load. **Availability:** Stock to 4 weeks.

1 WATT / 1000 SERIES

SINGLE OUTPUT

Model	Output Volts (VDC) Nom.	Output Cur. (mA) Nom.	Input Voltage (VDC) 5±.5	6±1	12±2	24±4	28±4	48±6	Price Each
1103	3.6	278	−105	−106	−112	−124	−128	−148	$44.00
1105	5	200	−105	−106	−112	−124	−128	−148	44.00
1106	6	167	−105	−106	−112	−124	−128	−148	44.00
1107	7	143	−105	−106	−112	−124	−128	−148	44.00
1108	8	125	−105	−106	−112	−124	−128	−148	44.00
1109	9	112	−105	−106	−112	−124	−128	−148	44.00
1110	10	100	−105	−106	−112	−124	−128	−148	44.00
1112	12	84	−105	−106	−112	−124	−128	−148	44.00
1115	15	67	−105	−106	−112	−124	−128	−148	44.00
1118	18	56	−105	−106	−112	−124	−128	−148	44.00
1120	20	50	−105	−106	−112	−124	−128	−148	44.00
1124	24	42	−105	−106	−112	−124	−128	−148	44.00

SPECIFICATIONS

Isolation: Input to output 300 VDC. **MTBF:** Single output units 35,000 hours. Dual output units 25,000 hours. **Mechanical:** Dimen., 1.5″ x 1.75″ x .650″. Terminals, P.C. type. Case, Bakelite with aluminum heat plate. **Weight:** 2 oz. (typ) fully encapsulated. **Case Rise,** 20°C in free air at full load.

DUAL OUTPUT

Model	Output Volts (VDC) V1	V2	Output Cur. (mA) I1	I2	Input Voltage (VDC) 5±.5	6±1	12±2	24±4	28±4	48±6	Price Each
1110	10	10	50	50	−205	−206	−212	−224	−228	−248	$49.00
1112	12	12	42	42	−205	−206	−212	−224	−228	−248	49.00
1115	15	15	34	34	−205	−206	−212	−224	−228	−248	49.00
1118	18	18	28	28	−205	−206	−212	−224	−228	−248	49.00
1120	20	20	25	25	−205	−206	−212	−224	−228	−248	49.00
1124	24	24	21	21	−205	−206	−212	−224	−228	−248	49.00

3 WATT / 1000 SERIES

SPECIFICATIONS

Isolation: Input to output 500 VDC. **MTBF:** Single output units 35,000 hours. Dual output units 25,000 hours. Triple output units 15,000 hours. **Mechanical:** Dimen., 2.125″ x 2.35″ x .812″ (typ). Terminals, P.C. type. Case, Bakelite with aluminum heat plate. **Weight:** 6 oz. (typ) fully encapsulated. **Case Rise:** 30°C in free air at full load.

SINGLE OUTPUT

Model	Output Volts (VDC) Nom.	Output Cur. (mA) Nom.	Input Voltage (VDC) 5±.5	6±1	12±2	24±4	28±4	48±6	Price Each
1303	3.6	840	−105	−106	−112	−124	−128	−148	$69.00
1305	5	600	−105	−106	−112	−124	−128	−148	69.00
1306	6	500	−105	−106	−112	−124	−128	−148	69.00
1307	7	430	−105	−106	−112	−124	−128	−148	69.00
1308	8	375	−105	−106	−112	−124	−128	−148	69.00
1309	9	334	−105	−106	−112	−124	−128	−148	69.00
1310	10	300	−105	−106	−112	−124	−128	−148	69.00
1312	12	250	−105	−106	−112	−124	−128	−148	69.00
1315	15	200	−105	−106	−112	−124	−128	−148	69.00
1318	18	167	−105	−106	−112	−124	−128	−148	69.00
1320	20	150	−105	−106	−112	−124	−128	−148	69.00
1324	24	125	−105	−106	−112	−124	−128	−148	69.00

DUAL OUTPUT

Model	Output Volts (VDC) V1	V2	Output Cur. (mA) I1	I2	Input Voltage (VDC) 5±.5	6±1	12±2	24±4	28±4	48±6	Price Each
1310	10	10	150	150	−205	−206	−212	−224	−228	−248	$79.00
1312	12	12	125	125	−205	−206	−212	−224	−228	−248	79.00
1315	15	15	100	100	−205	−206	−212	−224	−228	−248	79.00
1318	18	18	84	84	−205	−206	−212	−224	−228	−248	79.00
1320	20	20	75	75	−205	−206	−212	−224	−228	−248	79.00
1324	24	24	63	63	−205	−206	−212	−224	−228	−248	79.00

TRIPLE OUTPUT

Model	Output Volts (VDC) V1	V2	V3	Output Cur. (mA) I1	I2	I3	Input Voltage (VDC) 5±.5	6±1	12±2	24±4	28±4	48±6	Price Each
1315	5	15	15	400	34	34	−305	−306	−312	−324	−328	−348	$89.00
1312	5	12	12	436	34	34	−305	−306	−312	−324	−328	−348	89.00

6 WATT / 1000 SERIES

SPECIFICATIONS

Isolation: Input to output 500 VDC. **MTBF:** Single output units 35,000 hours. Dual output units 25,000 hours. Triple output units 15,000 hours. **Mechanical:** Dimen., 2½″ x 3½″ x 1⁵⁄₁₆″ (typ). Terminals: P.C. type. Case, Bakelite with aluminum heat plate. **Weight:** 12 oz. (typ) fully encapsulated. **Case Rise:** 30°C in free air at full load.

SINGLE OUTPUT

Model	Output Volts (VDC) Nom.	Output Cur. (mA) Nom.	Input Voltage (VDC) 5±.5	6±1	12±2	24±4	28±4	48±6	Price Each
1603	3.6	1667	−105	−106	−112	−124	−128	−148	$79.00
1605	5	1200	−105	−106	−112	−124	−128	−148	79.00
1606	6	1000	−105	−106	−112	−124	−128	−148	79.00
1607	7	860	−105	−106	−112	−124	−128	−148	79.00
1608	8	750	−105	−106	−112	−124	−128	−148	79.00
1609	9	667	−105	−106	−112	−124	−128	−148	79.00
1010	10	600	−105	−106	−112	−124	−128	−148	79.00
1612	12	500	−105	−106	−112	−124	−128	−148	79.00
1615	15	400	−105	−106	−112	−124	−128	−148	79.00
1618	18	334	−105	−106	−112	−124	−128	−148	79.00
1620	20	300	−105	−106	−112	−124	−128	−148	79.00
1624	24	250	−105	−106	−112	−124	−128	−148	79.00

DUAL OUTPUT

Model	Output Volts (VDC) V1	V2	Output Cur. (mA) I1	I2	Input Voltage (VDC) 5±.5	6±1	12±2	24±4	28±4	48±6	Price Each
1610	10	10	300	300	−205	−206	−212	−224	−228	−248	$89.00
1612	12	12	250	250	−205	−206	−212	−224	−228	−248	89.00
1615	15	15	200	200	−205	−206	−212	−224	−228	−248	89.00
1618	18	18	167	167	−205	−206	−212	−224	−228	−248	89.00
1620	20	20	150	150	−205	−206	−212	−224	−228	−248	89.00
1624	24	24	125	125	−205	−206	−212	−224	−228	−248	89.00

TRIPLE OUTPUT

Model	Output Volts (VDC) V1	V2	V3	Output Cur. (mA) I1	I2	I3	Input Voltage (VDC) 5±.5	6±1	12±2	24±4	28±4	48±6	Price Each
1615	5	15	15	1000	34	34	−305	−306	−312	−324	−328	−348	$99.00
1612	5	12	12	1000	42	42	−305	−306	−312	−324	−328	−348	99.00

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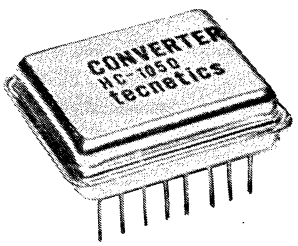
tecnetics® UNREGULATED DC-DC POWER SUPPLIES

HC SERIES



SPECIFICATIONS • 5 VOLT

Input Voltage: 3.5 VDC to 8 VDC. **Input Current:** 320 mA typical @ 1 W. 560 mA typical @ 2 W full load. **Output Power:** 2 W max. **Efficiency:** 70% typical @ full load. 62% typical @ ½ load. **Frequency:** Operating, 8 kHz nominal. **Reflected Ripple:** 1.5 A nominal.

SPECIFICATIONS • 12 VOLT

Input Voltage: 6 VDC to 20 VDC. **Input Current:** 185 mA typical @ 1.5 W. 330 mA typical @ 3 W full load. **Output Power:** 3 W max. HC-4050 thru HC-4100, 2.5 max. **Efficiency:** 75% typical @ full load. 67% typical @ ½ load. **Frequency:** Operating, 11 kHz nom. **Reflected Ripple:** 900 mA nom.

SPECIFICATIONS • 20 VOLT

Input Voltage: 10 VDC to 32 VDC. **Input Current:** 110 mA typical @ 1.5 W. 200 mA typical @ 3 W. **Output Power:** 3 W max. **Efficiency:** 80% typical @ full load. 75% typical @ ½ load. **Frequency:** Operating, 15 kHz nom. **Reflected Ripple:** 360 mA nom.

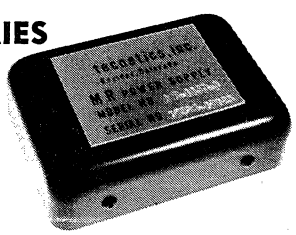
SPECIFICATIONS • GENERAL

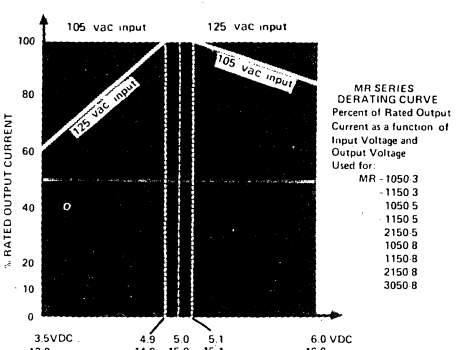
Minimum Load: 300 mW to avoid damage. **Output Voltage:** Varies with input voltage. **Isolation Test Conditions:** Input terminals shorted to case. Output terminals shorted together, 600 VDC. **Polarity:** Inputs, outputs are isolated from each other. **Temp. Range:** Operating, −55°C ambient to +125°C Case, derated above +85°C. Storage, −55°C to +125°C. Case Rise, 40°C/W dissipation. **Dimen.:** 1.050″ x .940″ x .320″ max. (excluding pins). **Weight:** 0.3 oz. **Availability:** Stock to 4 weeks. **Modifications:** Contact field representative or phone tecnetics for modifications such as different inputs, outputs or changes in termination.

Model Specifications					
Model Non-Hermetic	Hermetic	Output Voltage (VDC)	Output Current (mA) Max.	Non-Hermetic Price Each	Hermetic Price Each
5 VOLT					
HC-7150	−1	±15	±67	$49.00	$59.00
12 VOLT					
HC-4050	−1	5	500	$49.00	$59.00
HC-4060	−1	6	500	49.00	59.00
HC-4080	−1	8	375	49.00	59.00
HC-4100	−1	10	300	49.00	59.00
HC-4120	−1	12	250	49.00	59.00
HC-4150	−1	15	200	49.00	59.00
HC-4200	−1	20	150	49.00	59.00
HC-4240	−1	24	125	49.00	59.00
HC-4280	−1	28	108	49.00	59.00
HC-4300	−1	30	100	49.00	59.00
HC-4500	−1	50	60	49.00	59.00
HC-4750	−1	75	40	49.00	59.00
HC-4101	−1	100	30	49.00	59.00
HC-4151	−1	150	20	49.00	59.00
HC-4201	−1	200	15	49.00	59.00
HC-4301	−1	300	10	49.00	59.00
HC-5120	−1	±12	±125	49.00	59.00
HC-5150	−1	±15	±100	49.00	59.00
HC-5180	−1	±18	± 83	49.00	59.00
HC-5250	−1	±25	± 60	49.00	59.00
20 VOLT					
HC-1050	−1	5	600	$49.00	$59.00
HC-1060	−1	6	500	49.00	59.00
HC-1080	−1	8	375	49.00	59.00
HC-1100	−1	10	300	49.00	59.00
HC-1120	−1	12	250	49.00	59.00
HC-1150	−1	15	200	49.00	59.00
HC-1200	−1	20	150	49.00	59.00
HC-1240	−1	24	125	49.00	59.00
HC-1280	−1	28	108	49.00	59.00
HC-1300	−1	30	100	49.00	59.00
HC-1500	−1	50	60	49.00	59.00
HC-1750	−1	75	40	49.00	59.00
HC-1101	−1	100	30	49.00	59.00
HC-1151	−1	150	20	49.00	59.00
HC-1201	−1	200	15	49.00	59.00
HC-1301	−1	300	10	49.00	59.00
HC-3120	−1	±12	±125	49.00	59.00
HC-3150	−1	±15	±100	49.00	59.00
HC-3180	−1	±18	± 83	49.00	59.00
HC-3250	−1	±25	± 60	49.00	59.00

AC-DC REGULATED POWER SUPPLIES

MR SERIES





SPECIFICATIONS

Input Voltage: Selectable, 115 VAC ±10% or 230 VAC ±10%. **Input Frequency:** 57 to 440 Hz. **Output Voltage:** Screwdriver adjustable. **Temp. Range:** Operating, 0°C to 55°C ambient. Storage, −25°C to +85°C. **Temp. Coefficient:** 0.03%/°C. **Regulation:** Line, 0.15%. Load, (N.L. to F.L.) 0.15%. **Ripple:** 1.5 mV (RMS), 5.0 mV P-P. **Case:** Drawn aluminum with hard black anodized finish. **Dimen.:** 3 watt, 3.5″ x 2.5″ x 1.125″. 5 watt, 3.5″ x 2.5″ x 1.5″. 8 watt, 3.5″ x 2.5″ x 2″. **Weight:** 3 watt, 13 oz. 5 watt, 16 oz. 8 watt, 21 oz. **Protection:** Short circuit protected. **Application:** Wiring diagram supplied with unit. Dual outputs can be connected in series to obtain two times voltage output. Current and power are specified at nominal output voltage. Derate for other output voltages. **Availability:** Stock to 4 weeks.

Model MR-	Output Volts (VDC) Nom.	Output ADJ Range Voltage Volts	Output Current (A) Nom.	Output Power (Watts) Nom.	Price Each
1050-3	5	3.5 to 6.0	0.60	3	$45.00
1050-5	5	3.5 to 6.0	1.00	5	55.00
1050-8	5	3.5 to 6.0	1.50	8	65.00
1150-3	15	12 to 16	0.20	3	45.00
1150-5	15	12 to 16	0.30	5	55.00
1150-8	15	12 to 16	0.50	8	65.00
2150-5	Dual 15	12 to 16	0.15	5	55.00
2150-8	Dual 15	12 to 16	0.25	8	65.00
3050-8	5 Dual 15	3.5 to 6.0 12 to 16	1.00 0.10	8	75.00

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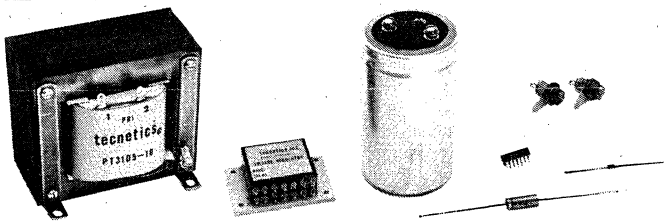
tecnetics® AC-DC POWER SUPPLY KITS



Tecnetics has been producing quality custom transformers since 1959. We now have utilized our capabilities to provide standard off-the-shelf power supply kits. These kits were designed with computer-aided techniques to optimize the design characteristics of the transformer, regulator and associated components. Select the power supply specifications you require and save design time and parts procurement problems. Contact factory for contents of specific kits.

REGULATED SERIES

SPECIFICATIONS

Regulation: Line, (L.L-H.L.) 0.15%. Load, (N.L.-F.L.) 0.2%. **Ripple:** 5 mV P-P. **AC Input:** 105-132 VAC, 57-63 Hz. **Temp. Coefficient:** 0.03%/°C. **Current Limiting. Remote Sensing:** On 5 and 10 Amp Units. **Availability:** Stock to 4 weeks.

Complete circuit diagrams and instructions are provided with Kits.

DC OUTPUT CURRENT AND KIT NUMBERS

DC Output Voltage	Prefix	2.0 Amps 1-9	2.0 Amps 10-24	5.0 Amps 1-9	5.0 Amps 10-24	10.0 Amps 1-9	10.0 Amps 10-24
5.0 VDC	PK	2105-2 $62.00	$48.50	2105-5 $74.50	$58.50	2105-10 $82.50	$65.50
	PT	18.50	15.00	28.50	23.00	33.50	27.00
6.0 VDC	PK			2106-5 75.00	59.00		
	PT			29.00	23.50		
±12 VDC	PK	2212-2 121.00	94.00	2212-5 137.00	108.00		
	PT	33.50	26.50	45.00	36.00		
±15 VDC	PK	2215-2 123.00	96.00	2215-5 139.00	110.00		
	PT	34.00	27.00	47.00	38.00		

UNREGULATED SERIES

SPECIFICATIONS

Regulation: Line, 1.2% per 1% @ F.L. Load, 20% (½ to F.L.) **Output Tolerance:** ±5% @ 115 VAC. **Ripple:** 1 V RMS, 5 to 12 VDC. 2 V RMS, 15 to 48 VDC. **AC Input:** 105-132 VAC, 57-63 Hz. **Avail.:** Stock to 4 weeks.

Complete circuit diagrams and instructions are provided with Kits.

DC OUTPUT CURRENT AND KIT NUMBERS

DC Output Voltage	Prefix	1.0 Amps 1-9	1.0 Amps 10-24	5.0 Amps 1-9	5.0 Amps 10-24	10.0 Amps 1-9	10.0 Amps 10-24
5.0 VDC	PK	1105-1 $13.10	$11.00	1105-5 $22.00	$19.00	1105-10 $34.00	$30.00
	PT	10.00	8.00	16.00	13.00	23.00	19.00
6.0 VDC	PK	1106-1 13.00	11.00	1106-5 22.00	19.00	1106-10 34.00	30.00
	PT	10.00	8.00	16.00	13.00	24.00	19.00
12 VDC	PK	1112-1 13.00	11.00	1112-5 31.00	27.00	1112-10 43.00	36.00
	PT	10.00	8.00	25.00	21.00	37.00	30.00
±12 VDC	PK	1212-1 17.00	14.00	1212-5 49.00	42.00		
	PT	14.00	11.00	37.00	30.00		
15 VDC	PK	1115-1 14.00	12.00	1115-5 31.00	27.00		
	PT	12.00	10.00	24.00	19.00		
±15 VDC	PK	1215-1 17.00	14.00				
	PT	14.00	11.00				
±18 VDC	PK	1218-1 18.50	16.00				
	PT	15.00	13.50				
24 VDC	PK	1124-1 14.00	12.00	1124-5 39.00	33.00	1124-10 50.00	42.00
	PT	12.00	10.00	31.00	25.00	42.00	34.00
28 VDC	PK	1128-1 17.00	14.00	1128-5 41.00	35.00	1128-10 58.00	48.00
	PT	14.00	11.00	33.00	27.00	50.00	40.00
48 VDC	PK	1148-1 20.00	17.00	1148-5 47.00	40.00	1148-10 90.00	76.00
	PT	17.00	14.00	40.00	32.00	80.00	64.00

HOW TO ORDER

Part Number System				
Prefix	Series	No. of Outputs	Voltage	Current
PK	2	1	05	2
Complete Kit	Regulated	One	5 Volts	2 Amps

1. Select the kit series which meets your requirements for regulation and ripple.

   Unregulated Series:
   Regulation: Line, 1.2% per 1% @ F.L. Load, 20% (½ to F.L.)
   Ripple: 1 V RMS, 5 VDC to 12 VDC. 2 V RMS, 15 VDC to 48 VDC.

   Regulated Series:
   Regulation: Line, (L.L. to H.L.) 0.15%. Load, (N.L. to F.L.) 0.2%.
   Ripple: 5 mV P-P.

   Highly Regulated Series:
   Regulation: Line, (L.L.-H.L.) 0.01% +1 mV. Load, (N.L.-F.L.) 0.01% +1 mV.

2. Pick the desired output voltage from the left hand column of the chart for the series.
3. From the second column pick the prefix designating a complete kit (PK) or the transformer only (PT).
4. Move right horizontally to the box under the desired output current. Add the number in that box to the prefix. The price for the kit is also shown in this box.

Example: Complete Regulated Series kit with 5 VDC output at 2A: PK2105-2
Transformer without other kit components: PT2105-2

HIGHLY REGULATED SERIES

SPECIFICATIONS

Regulation: Line, (L.L.-H.L.) 0.01% +1 mV. Load, (N.L.-F.L.) 0.01% +1 mV. **Ripple:** 250 μV RMS, 1 mV P-P. **AC Input:** 105-132 VAC, 57-63 Hz. **Temp. Coefficient:** 0.015%/°C. **Current Limiting, Remote Sensing. Remote Programming:** 1 K ohm/V or Volt/Volt. **Series/Parallel Operation. Availability:** Stock to 4 weeks.

Complete circuit diagrams and instructions are provided with Kits.

DC OUTPUT CURRENT AND KIT NUMBERS

DC Output Volt. VDC	Prefix	0.25 Amps 1-9	0.25 Amps 10-24	0.5 Amps 1-9	0.5 Amps 10-24	1.0 Amp 1-9	1.0 Amp 10-24	5.0 Amps 1-9	5.0 Amps 10-24	10.0 Amps 1-9	10.0 Amps 10-24
5.0	PK					3105-1 $44.	$38.	3105-5 $77.	$67.	3105-10 $99.	$89.
	PT					24.	21.	53.	46.	74.	67.
6.0	PK							3106-5 78.	68.		
	PT							54.	47.		
±12	PK	3212-0.25 $65.	$58.	3212-0.5 $70.	$62.	3212-1 75.	64.				
	PT	25.	23.	30.	27.	33.	29.				
±15	PK	3215-0.25 67.	59.	3215-0.5 72.	63.	3215-1 75.	66.				
	PT	27.	24.	32.	28.	35.	31.				
±18	PK			3218-0.5 75.	66.						
	PT			35.	31.						

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QUAD•MOD

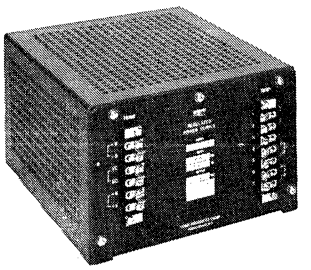

TABLE I: Available Ratings

Nominal Voltage	Voltage Range	M	Current Ratings (50°C) A	B	C	D
5	3.8-4.5	0.8	3.3	4.7	7.0	14
	4.5-5.5	0.8	3.5	5.0	7.5	15
	5.5-6.5	0.8	3.3	4.7	7.0	14
12	9-10	0.5	2.2	3.2	5.3	11
	10-12	0.5	2.4	3.5	5.8	12
	12-13	0.5	2.2	3.2	5.3	11
15	12-14	0.5	1.8	2.5	4.3	9
	14-16	0.5	2.0	2.8	4.8	10
	16-17	0.5	1.8	2.5	4.3	9
20	17-18.5	0.3	1.4	2.1	3.7	7.4
	18.5-20.5	0.3	1.5	2.25	4.0	8.0
	20.5-22	0.3	1.4	2.1	3.7	7.4
24	20-23	0.3	1.1	1.6	3.0	6.0
	23-27	0.3	1.2	1.8	3.4	6.8
	27-29	0.3	1.1	1.6	3.0	6.0

TABLE II: Available Output Combinations

Case Size	Two Outputs (±)	Three Outputs (+, ±)	Four Outputs (+, ±, Floating)	Prices 1-4	5-9	10-24
"C"	2-A	1-A & 2-M	--	165	149	135
"D"	2-C	1-C & 2A or 3-B	2-B & 1-A & 1M or 1-C & 1-B & 2M or 4-A	235	219	205
"E"	1-D & 1-C	1-D & 2-A or 3-C	2-C & 1-A & 1M or 1-D & 1-A & 2M or 4-B	295	279	265

All power supplies in the Quad-Mod Series contain a dual tracking output providing a positive and negative tracking output voltage. The negative supply will track the positive supply, but does not have to be of the same current rating. Because of the tracking feature, only the positive supply is provided with a voltage adjustment. The negative supply is factory set to within 2% of the positive. The **two output module** consists of a dual tracking output. The **three output module** consists of a dual tracking output plus an additional separately controlled positive output. The **four output module** consists of a dual tracking output, a separately controlled positive output, and a floating output that is separately adjustable and can be operated either isolated from the system common, or connected as a positive or negative supply.

Input: 105-132 VRMS, 47-420 Hz single phase.
Regulation, Line: 0.1% or 10 mv for rated line change.
Regulation, Load: 0.1% or 10 mv for rated load change.
Ripple and Noise: 1 mvRMS, 10 mv P-P to 10 MHz.
Temperature Coefficient: 0.03% per deg. C.
Recovery Time: 50 micro sec to within 50 mv for no-load to full-load change.
Overload Protection: Automatic current limiting foldback.
Operating Temperature: —20°C to + 50°C rated current to 60°C derate 10%; to 71°C derate 25%.
Storage Temperature: —55°C to +85°C.
Remote Sense: Sense terminals provided for correction of up to 0.5 volt load lead drop.
Input-Output Configuration: Barrier strip.
Optional: Over-voltage protection on any or all outputs.
Voltage Adjust: Screwdriver control.

TABLE I: Shows the current ratings available for each nominal voltage. The shaded areas of the table show the reduced current ratings for extended output voltage range operation. The currents are tabulated by a letter series. To specify the rating of an output it is only necessary to specify the nominal voltage (ex. "5") and the current letter (ex. "C") to completely specify an output rating (ex. "5C" is a nominal 5 volts @ 7.5 Amps). Consult factory for ratings not shown.

TABLE II: Shows the combination of outputs that can be incorporated in each case size.

HOW TO ORDER —

(1) Select required output ratings from Table I
(2) Establish Case Size and Price from Table II
(3) Establish Model Number as follows:

Q 5C — 15A 15C — 24M

- **Q** — Series "QUAD-MOD"
- **5C** — + Individual Voltage and Current (Omit on 2 Output only)
- **15A** — + Tracking Voltage and Current
- **15C** — − Tracking Voltage and Current
- **24M** — Floating Voltage and Current (4 Output only)

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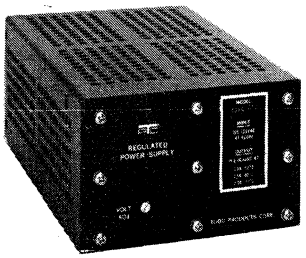

MX SERIES

OVERVOLTAGE PROTECTION:
Standard on all units thru 24 volts!

SPECIFICATIONS:

INPUT: 105-132 Volts AC 47-440 Hz.
OUTPUT: Floating, isolated from ground, 300 VDC max.
REGULATION: Line or Load .05% +5 MV for rated change
RIPPLE: 1 MV RMS, 5 MV P-P
TEMPERATURE COEFFICIENT: .02%/°C
OVERLOAD PROTECTION: Automatic electronic current limiting foldback
REMOTE SENSE: Sense terminals provided for compensation of external wiring drop for up to ½ volt.

MXA SERIES
3 7/16" x 3 21/32" x 6¼"

Model	Voltage Range	50°C	60°C	71°C	Price
MXA-4-3.6	3.6-4.4	3.6	3.3	1.8	84.
MXA-5-3.5	4.5-5.5	3.5	3.2	1.8	84.
MXA-6-3.4	5.4-6.6	3.4	3.1	1.8	84.
MXA-7-3.1	6.3-7.7	3.1	2.8	1.8	84.
MXA-8-2.8	7.2-8.8	2.8	2.6	1.8	84.
MXA-10-2.4	9-11	2.4	2.2	1.7	84.
MXA-12-2.2	10.8-13.2	2.2	2.0	1.6	84.
MXA-15-2.0	13.5-16.5	2.0	1.8	1.4	84.
MXA-20-1.4	18-22	1.4	1.3	1.0	84.
MXA-24-1.2	21.6-26.4	1.2	1.1	.88	84.
MXA-28-1.1	25.2-30.8	1.1	1.0	.80	84.
MXA-36-.88	32.4-39.6	.88	.80	.64	99.
MXA-48-.70	43.2-52.8	.70	.63	.50	99.
MXA-100-.34	90-110	.34	.31	.25	109.
MXA-120-.28	108 -132	.28	.26	.21	109.
MXA-150-.23	135-165	.23	.22	.21	109.

MXB SERIES
3 7/64" x 4 27/32" x 6¼"

Model	Voltage Range	50°C	60°C	71°C	Price
MXB-4-5.0	3.6-4.4	5.0	4.5	2.9	109.
MXB-5-5.0	4.5-5.5	5.0	4.5	2.9	109.
MXB-6-5.0	5.4-6.6	5.0	4.5	2.9	109.
MXB-7-4.6	6.3-7.7	4.6	4.2	2.9	109.
MXB-8-4.2	7.2-8.8	4.2	3.8	2.9	109.
MXB-10-3.8	9-11	3.8	3.5	2.8	109.
MXB-12-3.2	10.8-13.2	3.2	2.9	2.3	109.
MXB-15-2.8	13.5-16.5	2.8	2.6	2.1	109.
MXB-20-2.1	18-22	2.1	1.9	1.5	109.
MXB-24-1.8	21.6-26.4	1.8	1.6	1.3	109.
MXB-28-1.5	25.2-30.8	1.5	1.4	1.1	109.
MXB-36-1.2	32.4-39.6	1.2	1.1	.88	115.
MXB-48-1.0	43.2-52.8	1.0	.91	.73	115.
MXB-100-.5	90-110	.50	.46	.37	125.
MXB-120-.42	108-132	.42	.38	.30	125.
MXB-150-.34	135-165	.34	.31	.25	125.

MXC SERIES
3 7/64" x 4 27/32" x 8¾"

Model	Voltage Range	50°C	60°C	71°C	Price
MXC-4-8	3.6-4.4	8	6.5	4.3	119.
MXC-5-8	4.5-5.5	8	6.5	4.3	119.
MXC-6-7.5	5.4-6.6	7.5	6.5	4.3	119.
MXC-7-7	6.3-7.7	7	6.4	4.3	119.
MXC-8-6.4	7.2-8.8	6.6	6.0	4.3	119.
MXC-10-5.9	9-11	5.9	5.4	4.3	119.
MXC-12-5.3	10.8-13.2	5.3	4.8	3.8	119.
MXC-15-4.8	13.5-16.5	4.8	4.4	3.5	119.
MXC-20-3.7	18-22	3.7	3.4	2.6	119.
MXC-24-3.4	21.6-26.4	3.4	3.1	2.5	119.
MXC-28-3	25.2-30.8	3	2.7	2.2	119.
MXC-36-2.4	32.4-39.6	2.4	2.2	1.7	135.
MXC-48-2	43.2-52.8	2	1.8	1.3	135.
MXC-100-1	90-110	1	.94	.75	155.
MXC-120-.87	108-132	.87	.79	.63	155.
MXC-150-.7	135-165	.7	.64	.51	155.

MXD SERIES
4 25/32" x 7½" x 9⅜"

Model	Voltage Range	50°C	60°C	71°C	Price
MXD-4-15	3.6-4.4	15	13	10	189.
MXD-5-15	4.5-5.5	15	13	10	189.
MXD-6-15	5.4-6.6	15	13	10	189.
MXD-7-14	6.3-7.7	14	12	9	189.
MXD-8-13	7.2-8.8	13	11	9	189.
MXD-10-12	9-11	12	10	8	189.
MXD-12-11	10.8-13.2	11	10	8	189.
MXD-15-10	13.5-16.5	10	9	8	189.
MXD-20-7.4	18-22	7.4	6.6	5.7	189.
MXD-24-7	21.6-26.4	7	6.2	5.1	189.
MXD-28-6	25.2-30.8	6	5.4	4.6	189.
MXD-36-5.4	32.4-39.6	5.4	4.8	4.1	205.
MXD-48-4.1	43.2-52.8	4.1	3.7	3.1	205.
MXS-100-2	90-110	2	1.8	1.5	225.
MXD-120-1.7	108-132	1.7	1.5	1.3	225.
MXD-150-1.4	135-165	1.4	1.2	1	225.

MXE SERIES
4 25/32" x 7½"x 11 9/16"

Model	Voltage Range	50°C	60°C	71°C	Price
MXE-4-21	3.6-4.4	21	18.9	16.1	219.
MXE-5-20	4.5-5.5	20	18	15.3	219.
MXE-6-19	5.4-6.6	19	17	15	219.
MXE-7-18.5	6.3-7.7	18.5	16.6	14.1	219.
MXE-8-18	7.2-8.8	18	16.2	13.7	219.
MXE-10-16	9-11	16	14.4	12.2	219.
MXE-12-15	10.8-13.2	15	13.5	11.5	219.
MXE-15-14	13.5-16.5	14	12.6	10.7	219.
MXE-20-12	18-22	12	10.8	9.2	219.
MXE-24-11	21.6-26.4	11	9.9	8.4	219.
MXE-28-10	25.2-30.8	10	9	7.6	219.
MXE-36-8	32.4-39.6	8	7.2	6.1	245.
MXE-48-6	43.2-52.8	6	5.4	4.6	245.
MXE-100-3	90-110	3	2.7	2	265.
MXE-120-2.5	108-132	2.5	2.2	1.9	265.
MXE-150-2	135-165	2	1.8	1.5	265.

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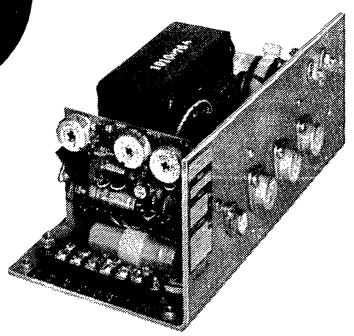
UX SERIES



OVERVOLTAGE PROTECTION:
Standard on all units thru 24 volts!

SPECIFICATIONS:

INPUT: 105-132 Volts AC 47-440 Hz.
OUTPUT: Floating, isolated from ground, 300 VDC max.
REGULATION: Line or Load .05% +5 MV for rated change
RIPPLE: 1 MV RMS, 5 MV P-P
TEMPERATURE COEFFICIENT: .02%/°C
OVERLOAD PROTECTION: Automatic electronic current limiting foldback
REMOTE SENSE: Sense terminals provided for compensation of external wiring drop for up to ½ volt.

UXA SERIES
3 1/16" x 4" x 6¾"

Model	Voltage Range	50°C	60°C	71°C	Price
UXA-4-3.6	3.6-4.4	3.6	3.3	1.8	59.
UXA-5-3.5	4.5-5.5	3.5	3.2	1.8	59.
UXA-6-3.4	5.4-6.6	3.4	3.1	1.8	59.
UXA-7-3.1	6.3-7.7	3.1	2.8	1.8	59.
UXA-8-2.8	7.2-8.8	2.8	2.6	1.8	59.
UXA-10-2.4	9-11	2.4	2.2	1.7	59.
UXA-12-2.2	10.8-13.2	2.2	2.0	1.6	59.
UXA-15-2.0	13.5-16.5	2.0	1.8	1.4	59.
UXA-20-1.4	18-22	1.4	1.3	1.0	59.
UXA-24-1.2	21.6-26.4	1.2	1.1	.88	59.

UXB SERIES
3 1/16" x4 13/16" x 6¾"

Model	Voltage Range	50°C	60°C	71°C	Price
UXB-4-5.0	3.6-4.4	5	4.5	2.9	69.
UXB-5-5.0	4.5-5.5	5	4.5	2.9	69.
UXB-6-5.0	5.4-6.6	5	4.5	2.9	69.
UXB-7-4.6	6.3-7.7	4.6	4.2	2.9	69.
UXB-8-4.2	7.2-8.8	4.2	3.8	2.9	69.
UXB-10-3.8	9-11	3.8	3.5	2.8	69.
UXB-12-3.2	10.8-13.2	3.2	2.9	2.3	69.
UXB-15-2.8	13.5-16.5	2.8	2.6	2.1	69.
UXB-20-2.1	1.8-22	2.1	1.9	1.5	69.
UXB-24-1.8	21.6-26.4	1.8	1.6	1.3	69.

UXC SERIES
3¾" x 4 13/16" x 9¼"

Model	Voltage Range	50°C	60°C	71°C	Price
UXC-4-8	3.6-4.4	8	6.5	4.3	89.
UXC-5-8	4.5-5.5	8	6.5	4.3	89.
UXC-6-7.5	5.4-6.6	7.5	6.5	4.3	89.
UXC-7-7	6.3-7.7	7	6.4	4.3	89.
UXC-8-6.4	7.2-8.8	6.6	6.0	4.3	89.
UXC-10-5.9	9-11	5.9	5.4	4.3	89.
UXC-12-5.3	10.8-13.2	5.3	4.8	3.8	89.
UXC-15-4.8	13.5-16.5	4.8	4.4	3.5	89.
UXC-20-3.7	18-22	3.7	3.4	2.6	89.
UXC-24-3.4	21.6-26.4	3.4	3.1	2.5	89.

UXD SERIES
4¾" x7½"x 9⅞"

Model	Voltage Range	30°C	60°C	71°C	Price
UXD-4-15	3.6-4.4	15	13	10	139.
UXD-5-15	4.5-5.5	15	13	10	139.
UXD-6-15	5.4-6.6	15	13	10	139.
UXD-7-14	6.3-7.7	14	11	9	139.
UXD-8-13	7.2-8.8	13	11	9	139.
UXD-10-12	9-11	12	10	8	139.
UXD-12-11	10.8-13.2	11	10	8	139.
UXD-15-10	13.5-16.5	10	9	8	139.
UXD-20-7.4	18-22	7.4	6.6	5.7	139.
UXD-24-7	21.6-26.4	7	6.2	5.1	139.

UXE SERIES

Model	Voltage Range	50°C	60°C	71°C	Price
UXE-4-21	3.6-4.4	21	18.9	16.1	169.
UXE-5-20	4.5-5.5	20	18	15.3	169.
UXE-6-19	5.4-6.6	19	17	15	169.
UXE-7-18.5	6.3-7.7	18.5	16.6	14.1	169.
UXE-8-18	7.2-8.8	18	16.2	13.7	169.
UXE-10-16	9-11	16	14.4	12.2	169.
UXE-12-15	10.8-13.2	15	13.5	11.5	169.
UXE-15-14	13.5-16.5	14	12.6	10.7	169.
UXE-20-12	18-22	12	10.8	9.2	169.
UXE-24-11	21.6-26.4	11	9.9	8.4	169.

THE STANDARD TODD 5-YEAR WARRANTY ON PARTS AND LABOR APPLIES TO ALL UNITS

todd PRODUCTS CORP. • 123 MILBAR BLVD., FARMINGDALE, N.Y. 11735 • (516) 293-3440 • TWX: 510-224-6584

Beat Balky Budget/Performance/Delivery Problems...

with TELE-DYNAMICS/WANLASS "Off-the-Shelf" TW/TWD Miniature DC Power Supplies

The TW and TWD series miniature power supplies are rugged modular assemblies that provide well regulated, reliable dc power. Twenty-three models are available in most commonly used output voltage and current ratings. Typical applications are to power operational amplifiers, decimal displays, digital logic, signal conditioners, and instrumentation.

The TW model supplies have a single output that is adjustable ±2% by using an external trim resistor. These single output units can be used individually or connected in pairs where positive and negative voltages are required. The TWD models are available for those users who prefer dual output supplies in a single assembly.

All supplies are designed to withstand substantial overloads for reasonable periods of time. The output can be shorted without causing damage to the supply, however, prolonged operation with the supply overloaded or shorted is not recommended.

The TW and TWD series supplies are packaged for either chassis or printed circuit board mounting. Electrical connections can be made either with connector pins or by soldering. Threaded inserts are used to secure the units to the mounting surface.

APPLICATIONS	MODEL	OUTPUT		REGULATION		RIPPLE	TEMP COEFF	CASE	PRICE		
		Voltage (volts)	Current (ma)	Line (%)	Load (%)	(mv rms)	(%/°C)	SIZE	1-24	25-49	50-99
SINGLE OUTPUT LOGIC SUPPLIES	TW 5-250	5.0	250	±0.05	±0.1	1.0	0.05	1	$35.00	$31.50	$29.75
	TW 5-500	5.0	500	±0.05	±0.1	1.0	0.05	3	44.00	39.60	37.40
	TW 5-1000	5.0	1000	±0.05	±0.1	1.0	0.05	4	65.00	58.50	55.25
SINGLE OUTPUT GENERAL PURPOSE SUPPLIES	TW 3.6-250	3.6	250	±0.05	±0.05	0.5	0.05	1	38.00	34.20	32.30
	TW 6-200	6.0	200	±0.05	±0.05	0.5	0.05	1	38.00	34.20	32.30
	TW 10-120	10	120	±0.05	±0.05	0.5	0.02	2	25.00	22.50	21.25
	TW 12-120	12	120	±0.05	±0.05	0.5	0.02	2	25.00	22.50	21.25
	TW 15-100	15	100	±0.05	±0.05	0.5	0.02	2	25.00	22.50	21.25
	TW 18-65	18	65	±0.05	±0.05	1.0	0.02	2	25.00	22.50	21.25
	TW 20-60	20	60	±0.05	±0.05	1.0	0.02	2	25.00	22.50	21.25
	TW 24-50	24	50	±0.05	±0.05	1.0	0.02	2	25.00	22.50	21.25
	TW 28-40	28	40	±0.05	±0.05	1.0	0.02	2	25.00	22.50	21.25
DISPLAY SUPPLIES	TW 170-10	170	10	±1.0	±1.0	15	0.2	1	40.00	36.00	34.00
	TW 180-10	180	10	±1.0	±1.0	15	0.2	1	40.00	36.00	34.00
DUAL OUTPUT OP AMP SUPPLIES	TWD 12-120	±12	120	±0.02	±0.02	0.5	0.02	3	49.00	44.10	41.65
	TWD 12-240	±12	240	±0.02	±0.05	1.0	0.02	4	73.00	65.70	62.05
	TWD 15-25	±15	25	±0.2	±0.2	2.0	0.02	3	23.00	20.70	19.55
	TWD 15-65	±15	65	±0.04	±0.02	1.0	0.02	3	37.00	33.30	31.45
	TWD 15-100	±15	100	±0.03	±0.02	1.0	0.02	3	48.00	43.20	40.80
	TWD 15-200	±15	200	±0.02	±0.05	1.0	0.02	4	73.00	65.70	62.05
	TWD 18-65	±18	65	±0.02	±0.05	1.0	0.02	4	49.00	44.10	41.75
	TWD 24-50	±24	50	±0.02	±0.05	1.0	0.02	3	49.00	44.10	41.75
	TWD 26-45	±26	45	±0.02	±0.05	1.0	0.02	4	49.00	44.10	41.75

GENERAL SPECIFICATIONS

The following general specifications apply to all TW and TWD series dc power supplies.

Input voltage: 115 ±10 VAC*

Input frequency: 50 to 400 Hz

Input isolation: 50 megohms

Output impedance: 0.2 ohms at 10 kHz

Output voltage setting: ±2% of rated voltage

Storage temperature: -25 to +85°C

Operating temperature: -25 to +71°C

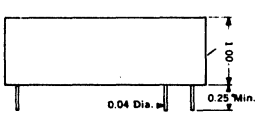
Output current vs temperature: Each output is rated for full current at temperatures between -25° and +70°C with no derating.

Trim adjustment: (TW series units only)
The output voltage of each single output power supply (model TW) is factory set to within ±2% of the labeled value. The TRIM connection provides a means of externally adjusting the output voltage precisely to the labeled voltage.

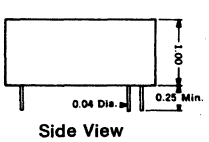
The method of adjustment is to connect a resistance (20 kilohms or larger) between the TRIM terminal and the positive (+) or negative (—) output terminal, depending on the desired direction of change. To lower the output voltage, the trim resistance is connected between the TRIM and (—) terminals. To raise the output voltage, the trim resistance is connected between the TRIM and (+) terminals.

An attempt to use the trim feature to set the output to a voltage other than the labeled value may result in the supply failing to meet its performance specifications.

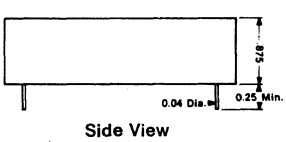
***Add $5.00 to unit price for 230 VAC input power.**



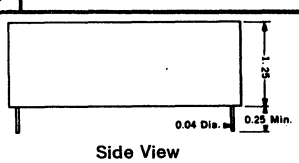
Side View



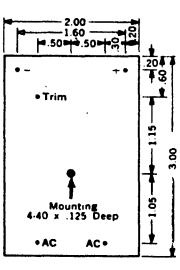
Side View



Side View

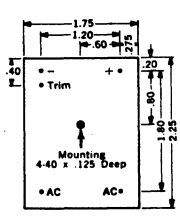


Side View



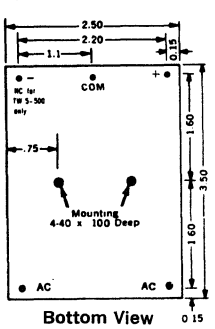
Bottom View

CASE SIZE 1



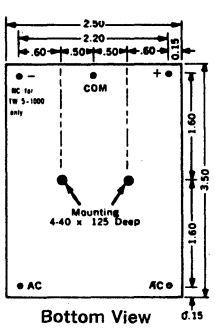
Bottom View

CASE SIZE 2



Bottom View

CASE SIZE 3



Bottom View

CASE SIZE 4

TELE-DYNAMICS/WANLASS

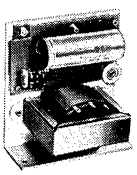
DIVISION OF AMBAC

525 VIRGINIA DRIVE • FORT WASHINGTON, PA. 19034 • 215-643-6161

Beat Balky Budget/Performance/Delivery Problems...

with TELE-DYNAMICS/WANLASS "Off-the-Shelf" OEM DC Power Supplies/AC Line Conditioners

U.L. Listed DPS SERIES Super Economy All Purpose DC Power Supplies ... to 3 Amps



20W Regulated Power Supplies

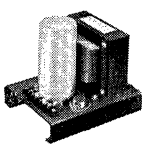
No frills, just sound "functionalized" design that offers ±1% regulation, overload and short-circuit protection, and a high-power to small-package ratio. The DPS-1 has 50% fewer parts, provides 1-Watt/cubic inch, weighs just 1.6 oz./Watt and costs only 65¢/Watt—less than you could build it yourself!

AC Input: 105-125V, 1Ø, 57 to 63Hz (derate 20% for 400Hz operation).

Model No.	DC Output	Power Rating	Prices 1-9	10-24	25-49	50-99
DPS1 DPS2 DPS3	5/6V @ 3/2.5A 12/15V @ 1.5/1.2A 24V @ 0.8A*	20 WATTS	$25.60	$24.30	$23.05	$21.75
OVP-2	Overvoltage Protection	OPTION	9.45	9.00	8.50	8.05
**DPS-4	180-220V @ 100mA		37.80	35.90	34.00	32.15

*Rated 1 amp over 115-125 volt AC line voltage
**DPS-4 only: Reg. = ± 2% line, ± 12% load
Ripple = 2% rms max

I-OEM SERIES OEM DC Power Supplies ... to 5 Amps



30-60W Regulated Power Supplies

I-OEM DC power supplies are the industry's most popular off-the-shelf units. Immediately available in eight standard DC output voltages. Automatic foldback current limiting provides built-in overload and short circuit protection at 120% maximum rated load. Overvoltage protection can be provided as a low-cost optional addition.

AC Input: 115/230V ±10%, 1Ø, 57 to 63Hz (derate output current 20% at 50Hz)

Regulation: ±1% line and load.

Model No.	DC Output	Prices 1-9	10-24	25-49	50-99
I-OEM- 5-5	5V,5A				
I-OEM- 6-5	6V,5A				
I-OEM-10-5	10V,5A				
I-OEM-12-5	12V,5A	$63.00	$59.85	$56.70	$53.55
I-OEM-15-4	15V,4A				
I-OEM-18-3	18V,3.3A				
I-OEM-24-2.5	24V,2.5A				
I-OEM-28-2	28V,2.1A				
OVP-2	Overvoltage Protection	9.45	9.00	8.50	8.05

II-OEM SERIES OEM DC Power Supplies ... to 10 Amps

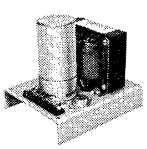
30-60-120W Regulated Power Supplies

Offering a choice of three power ratings —30-60-120W—with 4 voltage ranges in each (3.6-9V/9-17V/17-30V/30-60V), these floating-output supplies provide design flexibility and peak performance at low prices! Line/load regulation is just ±1%, they have automatic short-circuit protection.

AC Input: 105-125V, 1Ø, 57 to 63Hz

Model No.	DC Output	Prices
30-OEM-1	3.6-9V @ 2.5A	1-9 $48.30
30-OEM-2	9-17V @ 30W	10-24 45.90
30-OEM-3	17-30V @ 30W	25-49 43.45
30-OEM-4	30-60V @ 30W	50-99 41.05
60-OEM-1	3.6-9V @ 5A	1-9 60.40
60-OEM-2	9-17V @ 60W	10-24 57.35
60-OEM-3	17-30V @ 60W	25-49 54.35
60-OEM-4	30-60V @ 60W	50-99 51.35
120-OEM-1	3.6-9V @ 10A	1-9 90.55
120-OEM-2	9-17V @ 120W	10-24 86.05
120-OEM-3	17-30V @ 120W	25-49 81.50
120-OEM-4	30-60V @ 120W	50-99 76.80

III-OEM SERIES Precision OEM DC Slot Supplies ... to 10 Amps



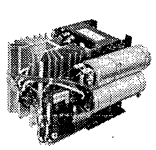
60-120W Regulated Power Supplies

Ideal for IC, OP-AMP and MOS/FETS or other voltage sensitive loads. Features dual 115/230V AC input, regulation to ±0.1%, ripple of 1 mV or less RMS at full load, and adjustable voltage. Built-in adjustable overvoltage crowbar provides overvoltage protection. Overload protection is automatic and adjustable.

AC Input: 105-125/210-250V, 1Ø, 57 to 63Hz (derate 15% for 50 or 400Hz)

Model No.	DC Output	Prices 1-9	10-24	25-49	50-99
III-OEM 5-5	5V @ 5A				
III-OEM 6-5	6V @ 5A				
III-OEM 12-5	12V @ 5A				
III-OEM 15-4	15V @ 4A	$94.00	$89.30	$84.60	$79.90
III-OEM 18-3	18V @ 3A				
III-OEM 24-2.5	24V @ 2.5A				
III-OEM 28-2	28V @ 2A				
III-OEM 5-10	5V @ 10A				
III-OEM 12-10	12V @ 10A	144.40	137.15	129.95	122.75
III-OEM 24-5	24V @ 5A				

"BRUTE" SERIES High Power OEM DC Slot Supplies ... to 50 Amps



300-600-1200W Regulated Power Supplies

AC Input: 105-130/210-260V, 1Ø, 47 to 63Hz

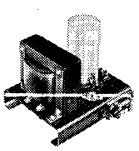
Choose any one of the three BRUTE power ranges—300-600-1200W—and you'll get a single unit that provides two continuously adjustable voltage ranges (2-25V or 5-50V), SCR closed-loop control assures ±0.1% line/load regulation. Adjustable current limiting protects against overload and "shorts". All this at lower than "slot supply" prices!

Model No.	DC Output	Prices 1-9	10-24	25-49	50-99
BRUTE I	5-50/2-25V* @ 6/12A	$170.00	$162.00	$153.00	$145.00
BRUTE II	5-50/2-25V* @ 12/24A	220.00	209.00	198.00	187.00
BRUTE III	5-50/2-25V* @ 24/50A	395.00	375.00	356.00	336.00

*Can be connected either for 5 to 50V or 2 to 25V depending upon output current desired.

Optional Kits: K1—10-Turn Potentiometer Kit (for fine voltage adj.)—$21.00/ea.
K2-1/K2-2—Ripple Reduction Kit (cuts ripple by 50%)—$26.25/ea.
K2-3—Ripple Reduction Kit for BRUTE III (cuts ripple by 50%)—$52.00/ea.
K3—OVP for all BRUTE types (may also be used with any DC power supply within a 6-60V/0-500A range)—$54.60/ea.

C-214 Economy DC Relay Power Supply ... to 2.5 Amps

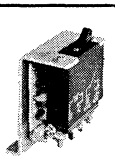


60W Regulated Power Supply

Low-cost DC power for inductive loads such as relays, solenoids, and motors. 150-125/210-250V, 1Ø, 57 to 63Hz AC input; 26V DC, 2.5A output. Handles up to 4 amps with pulsed duty cycles up to 20 mSec. ±2% line and load regulation. 0.1% plus 10mV maximum ripple. Internally fused for overload protection.

Quantity	Price
1- 9	$48.30
10-24	45.90
25-49	43.45
50-99	41.05

OVP-1 Overvoltage Protection Device



AC or DC Break
Remote or Local Sensing

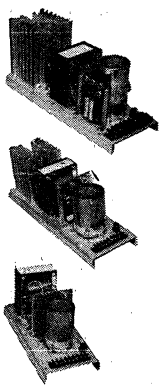
Circuit breaker with solid-state sensing and control circuitry. 0.5 to 50 amp DC current range. 10mSec typical shutdown time. DC voltage range 3.6 to 50, trip voltage adjustable 6.5 to 60. Circuit breaker ratings: DC line, 50 amp at 50V DC; AC line, 50 amp at 250V AC.

Quantity	Price
1- 9	$54.60
10-24	51.85
25-49	49.15
50-99	46.40

Beat Balky Budget/Performance/Delivery Problems...

with TELE-DYNAMICS/WANLASS "Off-the-Shelf" OEM DC Power Supplies/AC Line Conditioners

IC SERIES OEM DC Power Supplies for Op-Amps, ICs, MOS/FETs ...to 25 Amps



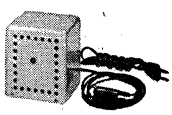
60-120-200W, ±0.25% Regulated Power Supplies

Designed specifically to power ICs, Op-Amps, and MOS/FETs. Precision ±0.25% regulation and foldback current limiting. Four voltage ranges. Optional overvoltage protection. Simple. Reliable. Affordable.

AC Input: 10-130V, 1Ø, 57-63Hz (derate 20% at 50Hz)

Model No.	DC Output	Prices 1-9	10-24	25-49	50-99
60-IC-1 60-IC-2 60-IC-3 60-IC-4	3.6-6.3V @ 7.5A 12-18V @ 60W 24-36V @ 60W 48-60V @ 60W	$131.25	$124.70	$118.13	$111.55
120-IC-1 120-IC-2 120-IC-3 120-IC-4	3.6-6.3V @ 15A 12-18V @ 120W 24-36V @ 120W 48-60V @ 120 W	178.50	169.60	160.65	151.75
200-IC-1 200-IC-2 200-IC-3 200-IC-4	3.6-6.3V @ 25A 12-18V @ 200W 24-36V @ 200W 48-60V @ 200W	236.25	224.45	212.65	200.80
1A/2A Crowbar for -1 units only		21.00	19.95	18.90	17.85

BE-12 Battery Eliminator ...to 1.8 Amps



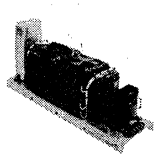
12V DC Regulated Power Supply

Drive auto radios, stereos, tape decks and cassette players. All silicon solid-state components provide reliable, regulated DC power from standard house current. Special overload protection circuit protects supply and line from overloads including output dead shorts.

AC Input: 115V, 1Ø, 60Hz

Model No.	DC Output	Prices 1-9	10-24	25-49	50-99
BE-12	12V @ 1.8A	$26.50	$25.20	$23.85	$22.50

PARAFORMER® PEC SERIES ...over 50dB Noise Attenuation



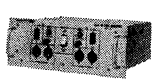
60 to 1000VA AC Line Conditioners

A patented concept, the novel Paraformer® provides a number of important design advantages... over 50dB noise filtering at frequencies below 1MHz, line voltage regulation, unilateral operation, phase-locked output voltage and inherent overload and short-circuit protection. Its simple, no moving parts structure assures trouble-free, highly reliable operation under the most stringent conditions.

AC Input: 105-125V, 1Ø, 60Hz (50 to 150VAC depending on load current)
AC Output: 117V, 1Ø, 60Hz

Model No.	Capacity	Regulation Line/Load	Prices 1-9	10-24	25-49	50-99
PEC-60	60VA	±0.25%/±1.5%	$99.75	$94.75	$89.80	$84.80
PEC-150	150VA	±0.5%/±2.0%	157.50	149.65	141.75	133.90
PEC-500	500VA	±0.5%/±2.0%	236.25	224.44	212.65	200.80
PEC-1000	1KVA	±0.5%/±2.0%	446.25	423.95	401.65	379.30

PARAFORMER® P1405Q P1405RPA PD1410 ...over 50dB Noise Attenuation



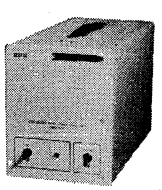
500-1000VA AC Line Conditioners

Laboratory or test instrument supplying transient free regulated and filtered AC power through the use of the patented Paraformer®. Noise attenuation is 50dB. Power output for the P1405 is 500VA. The PD1410 is basically two P1405 devices in a single rack mounting package. PD1410 outputs are 1000VA or dual 500VA with 100dB isolation between outputs. Features inherent overload and short circuit protection.

AC Input: 105-125V, 1Ø, 60Hz (50 to 150V depending on load current)
AC Output: 118V
Regulation: ±0.5% line
±1.5% load

Model No.	Power Rating	Price
P1405Q	500VA	$325.00
P1405RPA	500VA	350.00
PD1410	1000VA (or 2 x 500VA)	550.00

P-TEK Oscilloscope AC Line Conditioner ...50dB Noise Attenuation



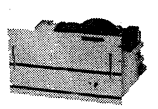
Compatible with all common scopes

Eliminates AC line disturbances, false triggering, jitter. Also improves zero line stability. All passive circuit featuring the Paraformer® is inherently short circuit and overload protected. Suppresses transients as fast as 1mSec rise time. Phase shift is 90°.

AC Input: 105-125V
AC Output: 110V
Regulation: ±0.25% line
±1.5% load

Model No.	Power Rating	Price
P-TEK	375VA	$375.00

PARAFORMER® P1425/50 ...over 50dB Noise Attenuation



2500-5000VA AC Line Conditioners

Heavy-duty units for supplying continuous regulated and filtered AC power to production or test equipment. Nine models in each VA rating allow choice of 115, 230 or 460V nominal AC input and 118, 236 or 472V regulated AC output. Units may be paralleled to 10KVA, and may also be used in certain three-phase applications by using one unit in each phase of the system. Features inherent overload and short circuit protection.

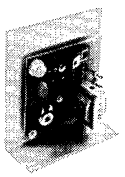
AC Input: 115, 230 or 460V, 1Ø, 60Hz
AC output: 118, 236 or 472V
Regulation: (RMS) ±0.25% line
±1.5% load

Model No.	Power Rating	Price
P1425	2500VA	$750.00
P1450	5000VA	1500.00

Beat Balky Budget/Performance/Delivery Problems...

with TELE-DYNAMICS/WANLASS "Off-the-Shelf" OEM DC Power Supplies/AC Line Conditioners

CLIP-AC™ CVR-120 AC Line Regulator ...120VA



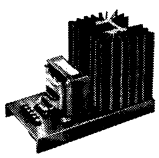
LOW-COST AC Line Voltage Regulators

A peak clipping AC regulator to minimize AC power line fluctuations. Features include ±10% output peak adjustment, 10-50 m Sec. response time, and internal overcurrent protection.

AC Input: 100-130V, 1Ø, 47-420Hz
AC Output: 135V peak ±10% (270V P-P)
Regulation: (RMS) ±1.0% line for
±10% line variations.
±1.0% load
Power Factor Regulation: ±1.0%

Model No.	Power Rating	Prices			
		1-9	10-24	25-49	50-99
CVR-120	120VA	$27.85	$26.45	$25.05	$23.65

CLIP-AC™ C 3000 SERIES AC Regulators ...30 to 1000VA



LOW-COST AC Line Regulators

Tele-Dynamics/Wanlass CLIP-AC™ regulators are the ideal successors to ferroresonant transformers for the majority of AC regulation requirements to 1KVA. *Frequency insensitive*, they offer a host of advantages such as: wide input voltage and frequency ranges, adjustable output voltage, *line transient suppression*, line regulation to 0.1%, instant response, "clipped" sinusoidal output, excellent TC and efficiency. All this, plus their low-cost, small size and light weight make them a "best buy" in AC regulators.

AC Input: 100-130V, 1Ø, 47-420Hz
AC Output: 117V, nominal
Regulation: (RMS) ±0.5% (for ±10% line change)
±0.5% (for 10% to full load change)
Power Factor Regulation: ±0.5%
Frequency Regulation: ±0.5%

Model No.	Ratings	Prices			
		1-9	10-24	25-49	50-99
C-3003	30VA	$40.95	$38.90	$36.86	$34.80
C-3006	60VA	48.30	45.90	43.45	41.05
C-3012	120VA	53.55	50.90	48.20	45.50
C-3025	250VA	94.00	89.30	84.60	79.90
C-3050	500VA	131.25	124.70	118.15	111.55
C-3100	1000VA	200.50	209.45	198.25	187.45

PHASAC® P-2410 1φ to 3φ Converter

1000VA Phase Converter

All passive 1Ø to 3Ø static converter. Uses inherent 90° phase shift from primary to secondary of the Paraformer® to produce quadrature phase signals to a modified Scott-T phase converter. All passive elements used throughout for maximum reliability. Selection for wye or delta output configuration is provided. Typical efficiency is 85%.

AC Input: 105-125V, 1Ø, 60Hz
AC Output: Three phase 120/208V (4 wire) or
240V (3 wire) 60Hz
Power: 1000VA, 333VA per phase
Regulation: ±5% line and load

Model No.	Power Rating	Price
P-2410	1000VA	$475.00

VARAX™ C474 AC Line Voltage Regulator

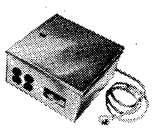
2000VA

A breakthrough in magnetic AC regulation. No SCRs or transistors used in the power circuits . . . you get maximum reliability for continuous use applications. Because it is a closed-loop regulating device, it is frequency insensitive and provides true rms regulation for line and load with efficiency up to 90% at full load.

AC Input: 105-130V, 1Ø, 60 Hz
(45 to 75 Hz with derating)
AC Output: 120V
Regulation: ±1% line, ±1.5% load

Model No.	Power Rating	Price
C474	2000VA	$75.00

VARAX™ VRC-2000 AC Line Regulator



2000VA

Provides low-cost filtered and regulated AC voltage for machines and utility tools operated in plants with poor AC line sources. Ideal for electric motors. Patented circuit gives inherent overvoltage, overcurrent, and short circuit protection, plus transient suppression. No semiconductors in AC path insure highest reliability.

AC Input: 105-130V, 1Ø, 60Hz
AC Output: 120V, adjustable ±3%
Regulation: ±1% line, ±1.5% load

Model No.	Power Rating	Price
VRC-2000	2000VA	$95.00

WANLASS has 70 stocking distributor locations—one near you. Allied • Cramer • Intermark • Olive Radio Newark • Philadelphia Electronics • Pioneer Radio Products • Ralph's • Stark • Summit • T.I. Supply • Zack

Call your WANLASS regional office

Boston	(617) 245-5100	Cleveland	(216) 486-0782	Kansas City	(816) 761-6543	Rochester	(716) 544-5626
Buffalo	(716) 874-4900	Dallas	(214) 270-5200	Kingston	(914) 338-8833	San Francisco	(415) 328-5180
Chicago	(312) 394-4900	Dayton	(513) 294-2838	Los Angeles	(714) 546-8990	St. Louis	(314) 731-5799
		Detroit	(313) 582-5450	Minneapolis	(612) 544-3614	Seattle	(206) 632-4290
		Ft. Wayne	(219) 744-4331	New York City	(201) 727-5335	Syracuse	(315) 454-2469
		Hartford	(203) 233-5503	Orlando	(305) 859-2160	Washington D.C.	(301) 937-2215
		Huntsville	(205) 772-9237	Philadelphia	(215) 885-1715	Winston-Salem	(919) 722-9671

TELE-DYNAMICS/WANLASS

DIVISION OF AMBAC

525 VIRGINIA DRIVE • FORT WASHINGTON, PA. 19034 • 215-643-6161

ROTARY MOTOR-GENERATOR SYSTEMS

TELEDYNE INET
. . . PIONEERS IN PRECISE POWER

Let Teledyne Inet Rotary Systems Supply Reliable, Precise Power to Your Critical Loads.

Frequency Converters and Power Conditioners

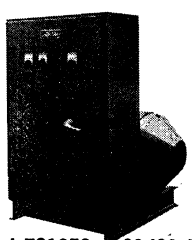
Teledyne Inet's 60/400 Hz conversion systems are designed for data processing, shipboard, and aircraft ground power applications. Built around a rugged, synchronous motor-generator set and advanced solid-state regulation and control circuitry, they deliver clean, precisely-regulated 400 Hz power reliably and efficiently. Single-phase models are rated from 3 to 125 KW and three-phase units from 5 to 500 KW.

An IBM-compatible, 60 Hz/415 Hz induction motor-synchronous generator frequency converter is available in capacities from 5 to 150 KW.

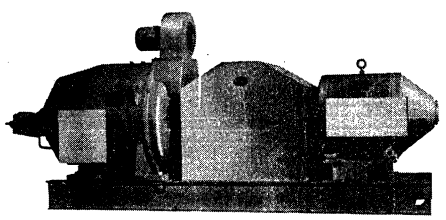
60/60 Hz rotary power conditioners supply precisely-regulated, noise- and transient-free power to critical computer and data processing system loads. Output ratings range from 30 to 150 KW.

These low maintenance high-reliability units have better than 15,000-hour mean time between failure (MTBF). The exciter is mounted on the rotor shaft, which eliminates slip rings and brushes, the primary source of wear, maintenance, and RF interference, and makes these systems safe for use in hazardous areas. 40 KW, 400 Hz and 150 KW, 60 Hz and larger are available as vertical units; horizontal units are available up to 125 KW in 60 Hz and 400 Hz. Inet's vertical M-G sets have logged up to 100,000 hours of continuous operation. Vertical units are available for parallel operation, and can be servo-rotated for optimum phase alignment.

Model VF21060 — 60/400 Hz, 75 KVA, Synchronous, Vertical Motor-Generator Set.



Model T21050 — 60/60 Hz, 62.5 KVA, Synchronous, Horizontal Motor Generator Set.



Rotary Power Ride-Through, 60 Hz, 240 KW, Motor-Generator Power Supply With Flywheel.

MOTOR/GENERATOR SETS

FRAME SIZE	HORIZONTAL (H) VERTICAL (V)	CYCLE CHARACTERISTICS (INPUT/OUTPUT) 60/400 HZ	60/60 HZ	50/400 HZ	50/60 HZ
17/17	H	3-30KW	3-40KW	3-40KW	3-40KW
20/20	H	30-75KW	40-125KW	30-75KW	40-125KW
23/23	H	—	150-250KW	—	150-250KW
20/29	H	75-125KW	—	75-125KW	—
20/23	V	40-125KW	50-150KW	40-125KW	—
23/29	V	125-250KW	150-250KW	125-250KW	—
29/29	V	—	300-500KW	—	—
29/40	V	300-500KW	—	300-500KW	—

TYPICAL FEATURES AND SPECIFICATIONS INCLUDE:

• 1ϕ output, 115 or 120 volts • 3ϕ output (up to 250 KW), 115/200 volts or 120/208 volts (over 250 KW), 254/440 volts or 227/480 volts (other voltage levels optional) • Voltage adjustment, ±10% • Regulation, ± ½% • Line-to-Neutral balance, 1% (balanced load) • Harmonic output, 3% RMS (1ϕ), 2% RMS (3ϕ, 400 Hz), 3% RMS (3ϕ, 60 Hz) • Voltage and frequency modulation, 0.25% • Short circuit current (3ϕ), 300% of rated • Overload capacity, 110% continuously and 120% for one-half hour • Input, 460 volts ±10%, 3ϕ, 60 Hz (other voltage levels optional)

A WIDE RANGE OF OPTIONS INCLUDES:

• Reduced starting current limited to 300% to 400% full load • Out of step synchronous motor protection • Over and under-voltage protection • Reversed phase sequence detection • Fail-safe remote voltage sensing • MIL spec. Electromagnetic Interference Filters (EMI) • Custom instruments and protective switchgear • Caster, or trailer mounting available • Indoor or outdoor enclosures • Integral or separately mounted control cabinets

RIDE-THROUGH GENERATORS

Teledyne Inet's flywheel, ride-through motor-generator units bridge short-term interruptions in utility power. Designed for use in high priority electrical/electronic systems, such as data processors and communications centers, they are available in output power ratings up to 150 KW. Flywheel size is determined by the energy required to deliver rated voltage and load current for a user-specified, ride-through interval and frequency droop. Inertial energy stored in the rotating flywheel drives the generator during momentary (typically 500 millisec. or less) losses of input power. On-line ride-through generators driven, by low-slip induction motors, deliver clean, precisely-regulated power, offering a low-cost alternative to auxiliary and uninterruptible power systems in applications where only short-term breaks in utility power occur or where the system can deliver quality power long enough for an orderly shutdown of the critical load. Extended ride-through capabilities are available using optional techniques.

TYPICAL FEATURES AND SPECIFICATIONS INCLUDE:

• Shaft-mounted, solid-state exciters • Solid-state voltage regulators • Input power, 208 or 460 volts ±10%, 3ϕ • Transients, ±10% of input voltage less than 2 sec. long • Spikes, 1 KV amplitude, less than 100 ms. long • Voltage adjustment, ±10% • Voltage regulation, 1% • Voltage imbalance, ±1% (balanced load) • Harmonics, 3% RMS • Overload capability, 110% of rated continuously, 120% for one-half hour • Short circuit capacity, 300% of rated current into a three-phase short • Internal temperature sensor (optional) • Under-frequency sensor with remote and/or automatic shutdown • Remoting for OFF/ON control and MOTOR ON indicator.

TELEDYNE INET
711 West Knox Street ■ Gardena, California 90248
(213) 327-0913 Telex 67-7228

UPS* | TELEDYNE INET

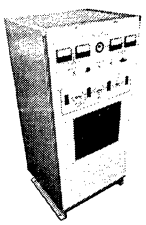
. . . PIONEERS IN PRECISE POWER

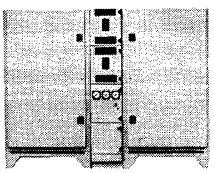
MODULES RANGING IN SIZE FROM 5 KVA TO 300 KVA

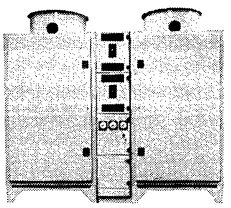
Teledyne Inet, pioneer in precise power, has an on-line UPS with the power capacity, control features, and rock-solid reliability to take care of your requirements.

Uninterruptible Power Systems from Teledyne Inet deliver much more than emergency and standby power. Critical loads receive only high-quality, regulated, noise- and transient-free, AC power . . . whether line power is present or not. Quality, reliability, and superior performance make these Inet UPS systems the best insurance for any data processing, communications, or high-priority system that cannot tolerate power problems.

The Power Converter (Rectifer/Charger and Static Inverter) is the basic element of the UPS system. Two or more power converters may be paralleled to provide redundancy or greater capacity. Input and output switchgear, bypass, and system control electronics are located in a separate enclosure whose size varies with system configuration and the options. All are available with 208, 240, or 480 volt input or output, and 50 or 60 Hz input or output. All units are 3-phase input.







UPS POWER CONVERTER FEATURES/SPECIFICATIONS

MODEL	OUTPUT KW	OUTPUT KVA	OUTPUT PHASE	DIMENSIONS W x D x H	WEIGHT LBS.	EFFICIENCY %	COOLING TYPE
UPS-1606	5	6.25	1	24 x 20 x 66	1150	60	Convection
UPS-1608	7.0	8.75	1	24 x 20 x 66	1300	62	Convection
UPS-1612	10	12.5	1	24 x 20 x 66	1550	64	Convection
UPS-1615	12	15	1	24 x 20 x 66	1700	65	Convection
UPS-3037	30	37.5	3	78 x 36 x 90	3200	76	Convection
UPS-3075	60	75	3	78 x 36 x 90	4400	82	Convection
UPS-3125	100	125	3	78 x 36 x 96	6600	83	Convection
UPS-3170	140	175	3	108 x 42 x 106	8900	85	Blower
UPS-3300	240	300	3	108 x 48 x 106	12000	86	Blower

FEWEST SCR's The output DC/AC inverter uses the smallest possible number of silicon-controlled power rectifiers. In three-phase systems, the same set of 12 SCR's (4 per phase) which convert DC power to AC power in the inverter, are used for inverter turn on, and inverter turn off, and output AC line disconnect. The result, a UPS with the lowest possible parts count and the highest degree of reliability. High-speed inverter disconnect (under 300 usec.) by SCR's minimizes load transients if the inverter fails.

DERATED SEMICONDUCTORS SCR's and rectifier diodes are never operated at more than 65% of their maximum ratings, greatly extending their operating lifetime.

INDEPENDENT PHASE REGULATORS Inverters on each phase of three-phase systems are independently regulated. These UPS systems sustain any degree of load unbalance and maintain 2% regulation on all phases.

HIGH-OVERLOAD CAPACITY UPS systems built by Inet withstand overloads of 150% for fifteen minutes. Large inductive transients will not cause shutdown or line disturbance.

INVERTER ENERGY RESERVOIR The inverter energy storage tank circuit smooths load switching transients and clears protective fuses or circuit breakers, while maintaining in-spec power to the critical load, if a load bus fault occurs.

MODULAR CONTROL LOGIC Each UPS module has its own control logic. In redundant UPS systems, if one module fails, the faulty module is disconnected without disturbing the overall system operation. The entire system continues to operate in a normal mode. All common synchronizing circuitry and interconnecting wiring is redundant, so that failure of any component, terminal, connector or wire in either the open or shorted mode, generates transients less than +10%, —8%, on the critical load bus.

LOW HARMONIC CONTENT Harmonic currents generated by the rectifier-charger are less than 5% of rated current (for units rated at 75 KVA or larger). The UPS does not degrade the power quality for other equipment on the same line.

HIGH EFFICIENCY System efficiency is as high as 86% on large UPS systems, for low power losses and reduced operating costs.

DESIGNED FOR LOW EMI Every Inet UPS system can be supplied with filters to fully comply with MIL STD 461 for electromagnetic interference (EMI). Standard equipment, without EMI filters, is totally free of interference regardless of proximity to data processing equipment.

AUTOMATIC BYPASS An optional sensing and switching circuit is available, which automatically bypasses the UPS and transfers to utility power if a major failure occurs in the UPS. If line power is present, the transfer takes place without disturbing the critical load.

AUXILIARY POWER SOURCES

Teledyne Inet is a **single source** supplier for all your power needs. If your high-priority systems are subject to long-term power outages that batteries cannot economically handle, Inet supplies a complete line of Auxiliary Engine/Turbine-generator units (APU) of all types and ratings to back up your UPS.

APPLICATIONS FLEXIBILITY

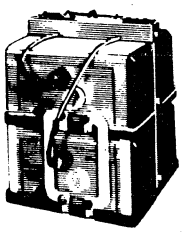
Inet's UPS equipment is modular for easy expandability and rapid servicing. Units with the same power ratings can be parallelled as needed for extra capacity or to implement ultra-reliable redundant systems. Automatic bypass and emergency shutdown switchgear can further insure your critical electronics against the most catastrophic power failure conditions, short of physical destruction. Our applications engineers are on call, to provide you with a UPS system tailored to fit your specific requirements. Teledyne Inet also provides a complete turnkey service, assuming total system responsibility for switchgear, emergency generators, installation, startup, and long-term maintenance for any size UPS installation.

* *Uninterruptible Power Systems*

TELEDYNE INET
711 West Knox Street ■ Gardena, California 90248
(213) 327-0913 Telex 67-7228

Terado DC-AC Inverters

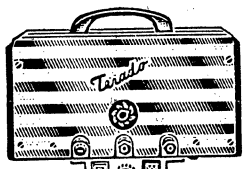
CHANGES BATTERY CURRENT TO 117 VAC, 60 HERTZ, FREQUENCY STABILIZED*
CAN BE ADAPTED FOR 50 Hz USE† REMOTE CONTROL‡



QUAD CONTINENTAL

QUAD CONTINENTAL*†
Transistorized, 1200 watts

Converts 12 VDC to 117 VAC, 60 Hz, 1100 to 1200 watts. Frequency stable within ¼ Hz, not affected by change in input or load. Filtered for sensitive electronic equipment. Operates small refrigerators, lights, tape recorders, video cameras and recording tapes, electric tools, lab test equipment, televisions including color, and portable hospital equipment. Adjustable output control and accurate AC output meter. Sophisticated solid state design. Variable control head may be installed from main unit with four optional plug-in extension cables. Size: 12″ w. x 12″ d. x 15″ h. Shipping Weight, 140 lbs.
Terado No. 50-110—Net Each..... **$671.05**



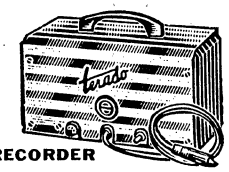
ATLAS TITAN
SUPREME, CONTINENTAL

DUAL CONTINENTAL-3*†‡
Transistorized, 600 watts

Ultra fine frequency stable inverter converts 12 VDC to 117 VAC, 60 Hz, 550 to 600 watts. Frequency variation ±¼ Hz with changing input and load. Ideal for operation of fine or critical video-tape equipment and instruments. Includes battery cables, remote control and variable AC output. Size: 10¾″ w. x 13″ d. x 6″ h. Shipping Weight, 60 lbs.
Terado No. 50-202-3—Net Each.... **417.64**

CONTINENTAL-3*†‡
Transistorized, 300 watts

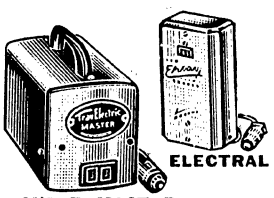
Same as DUAL CONTINENTAL-3 except: 275-300 watts capacity. Size: 10¾″ w. x 6″ d. x 6″ h. Shipping Weight, 30 lbs.
Terado No. 50-191-3—Net Each.... **$233.40**



RECORDER

DUAL CONTINENTAL-24 VOLT*†‡
Transistorized, 800 watts

Ultra fine frequency inverter converts 24 VDC to 117 VAC, 60 Hz, 700 to 800 watts. Frequency stable to ±¼ Hz with changing input and load. Designed for duty in aircraft or other 24 VDC applications. Includes battery cables, remote control and variable AC output. Size: 10¾″ w. x 13″ d. x 7¼″ h. Shipping Weight, 60 lbs.
Terado No. 50-152—Net Each..... **$621.23**



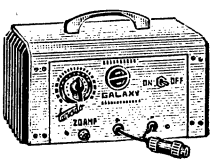
ELECTRAL
SUPER, MASTER

CONTINENTAL-24 VOLT*†‡
Transistorized, 400 watts

Same as DUAL CONTINENTAL above, except: 350-400 watts capacity. Size: 10¾″ w. x 6″ d. x 6″ h. Shipping Weight, 30 lbs.
Terado No. 50-190—Net Each..... **$305.35**

DUAL CONTINENTAL*†‡
Transistorized, 600 watts

Converts 12 VDC to 117 VAC, 60 Hz, 550 to 600 watts. Filtered for tape recorders. Frequency stable within ¼ hertz with changing input voltage load. Includes battery cables, remote control, variable AC output. Size: 10¾″ w. x 13″ d. x 6″ h. Shpg. Wt., 70 lbs.
Terado No. 50-202—Net Each..... **$360.51**



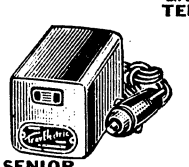
GALAXY,
TEMPEST†

CONTINENTAL*†‡
Transistorized, 300 watts

Same as DUAL CONTINENTAL except: 275-300 watts capacity. Size: 10¾″ w. x 6″ d. x 6″ h. Shpg. Wt., 30 lbs.
Terado No. 50-191—Net Each..... **$174.24**

ATLAS*†‡
Transistorized, 200 watts

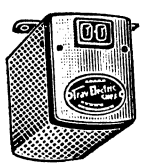
Same as DUAL CONTINENTAL except: 175-200 watts capacity. Size: 10¾″ w. x 6″ d. x 6″ h. Shpg. Wt., 21 lbs.
Terado No. 50-200—Net Each..... **$128.15**



SENIOR,
DYNAMO

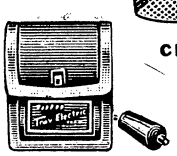
TITAN*†
Transistorized, 175 watts

Same as DUAL CONTINENTAL except: less remote control; 150-175 watts capacity; on-off switch; AC receptacle. Size: 10¾″ w. x 6″ d. x 6″ h. Shpg. Wt., 20 lbs.
Terado No. 50-201—Net Each..... **$100.51**



CHIEF

SUPREME*†‡
Non-transistorized. Converts 12 VDC to AC. Power output, 175-200 W, filtered. Remote control has variable AC output switch and signal light. Size: 10¾″ w. x 6″ d. x 6″ h. Shpg. Wt., 20 lbs.
Terado No. 50-153—Net Each..... **$98.67**



AUTO SHAVER

RECORDER*†
150-175 watt version of SUPREME, less remote control. Plugs into cigarette lighter. Size: 10¾″ w. x 6″ d. x 6″ h. Shpg. Wt., 21 lbs.
Terado No. 50-175—Net Each..... **$85.80**

SUPER*†
Single input. Size: 3½″ w. x 6½″ d. x 4″ h. Shpg. Wt., 8 lbs.
Terado No. 50-126—Input, 6 V; AC power output, 60-75 watts. Net Each.. **$47.19**
Terado No. 50-127—Input, 12 V; AC power output, 75-100 watts. Net Each..... **$47.19**

MASTER*†
Voltage input, 12 V; AC power output, 60-75 watts. Size: 3½″ w. x 6½″ d. x 4″ h. Wt., 6 lbs.
Terado No. 50-122— Net Each..... **$43.89**

CHIEF*†
Operates tape recorders, power tools, dictation machines, mixers, blenders, etc. Front AC receptacle connects direct to battery. Toggle switch output control. Ventilated steel case. Size: 3½″ w. x 6½″ d. x 4″ h. Shpg. Wt., 8 lbs.
Terado No. 50-138—Input, 12 V; AC power output, 100-125 watts. Net Ea.. **$59.29**

ELECTRAL*
Glove compartment size inverter, available in 12 volt input. Easy installation into cigarette lighter. Coated steel case. Size: 3″ w. x 2¼″ d. x 5½″ h. Shipping Weight, 3 lbs.
Terado No. 50-167—Voltage input, 12 V; AC power output, 42-52 watts. Net. **$23.43**

SENIOR*
Operates radios, lights, phonographs and small tape recorders. Simple to install into cigarette lighter. Aluminum case; baked enamel. Size: 2½″ w. x 4½″ d. x 2¼″ h. Shpg. Wt., 3 lbs.
Terado No. 50-116—Voltage input, 12 V; AC power output, 40-50 watts. Net. **$22.17**

DYNAMO* AUTO SHAVER
Operates AC radios, shavers and small calculators on 12 VDC battery. Power output, 25-30 watts. Size: 2″ x 2″ x 3¾″. Shpg. Wt., 2 lbs. **$18.11**
Terado No. 50-197—Net Each..... **$18.11**

TRANSISTORIZED AUTO SHAVER
Operates all electric shavers. Transistorized 12 V (15-20 W) input. Plugs into cigarette lighter. Polyethylene non-breakable case. Size: 3⅝″ w. x 2¼″ d. x 4¼″ h. Shpg. Wt., 2 lbs.
Terado No. 50-103—12 volts. **$11.85**
Net Each..... **$11.85**

SUPER GEMINI—1500 WATTS
Transistorized 12 VDC to 117 VAC. Designed to operate equipment not sensitive to frequency change. Power output, 1500 watts intermittent. Size: 12½″ x 12″ x 6″. Shipping Weight, 40 lbs.
Terado No. 50-133-3— **$316.80**
Net Each..... **$316.80**

DUAL GEMINI—1000 WATTS
Same as SUPER GEMINI except 1000 watts intermittent. Size: 12½″ x 12″ x 6″. Shipping Weight, 40 lbs. **$272.80**
Terado No. 50-133—Net Each..... **$272.80**

GEMINI 3—750 WATTS
Same as SUPER GEMINI except 750 watts intermittent. Size: 12½″ x 12″ x 6″. Shipping Weight, 40 lbs. **$136.95**
Terado No. 50-128-3—Net Each... **$136.95**

GEMINI—500 WATTS
Transistorized 12 VDC to 117 VAC. Power output, 450-500 watts. Designed to operate equipment not sensitive to frequency change. Size: 11½″ x 6″ x 6″. Shpg. Wt., 20 lbs. **$106.88**
Terado No. 50-128—Net Each..... **$106.88**

FALCON—300 WATTS
Transistorized 12 VDC to 117 VAC. Power output, 275-300 watts. Designed to operate equipment not sensitive to frequency change. Size: 12½″ x 6″ x 6″. Shpg. Wt., 20 lbs. **$85.46**
Terado No. 50-129—Net Each..... **$85.46**

REMOTE CONTROL
Remote control accessory for GEMINI 50-128, 50-128-3 and FALCON 50-129. **$14.37**
Terado No. 50-130—Net Each..... **$14.37**

GALAXY—200 WATTS
Transistorized 12 VDC to 117 VAC, 175-200 watts filtered. Adjustable voltage and frequency. Ideal where frequency is not critical. Size: 10¾″ w. x 6″ d. x 6″ h. Shpg. Wt., 9½ lbs. **$56.65**
Terado No. 50-205—Net Each..... **$56.65**

TEMPEST—175 WATTS
Transistorized 12 VDC to 117 VAC, 150-175 watts. Ideal where frequency is not important. Size: 10¾″ w. x 6″ d. x 6″ h. Shpg. Wt., 9½ lbs.
Terado No. 50-170— **$49.99**
Net Each..... **$49.99**

ALL TERADO INVERTERS SUPPLIED WITH BATTERY CABLES

Terado **CORPORATION** 1074 RAYMOND AVENUE, ST. PAUL, MINNESOTA 55108
PHONE (612) 646-2868

Terado BATTERY CHARGERS, VOLTAGE ADJUSTERS, STANDBY POWER SYSTEMS

CHANGES BATTERY CURRENT TO 117 VAC, 60 HERTZ, FREQUENCY STABILIZED*
CAN BE ADAPTED FOR 50 Hz USE†

INTERCEPTOR*†
"STANDBY" ELECTRIC POWER

Automatically provides 117 VAC when power fails. Capacity up to 175 watts, 60 Hz, 117 VAC. Operates test equipment, monitors, recorders, lights, alarms, thermostats, electric tools, portable TV, electric cameras etc. Complete with rechargeable battery, high and low battery charger, inverter and crossover, all self-contained. Simple installation. Size: 12" x 5½" x 8". Shipping Weight, 36 lbs.
Terado No. 50-168—Net Each..... **$129.69**

SOLID STATE POWER SUPPLIES
POWR-MITE

Supply and charge rate 10 amps continuous, 20 amps intermittent (one minute); 12 VDC output. Capacity as battery charger, 10 amps or trickle. Filtered for 1 amp loads. With output meter. Size: 3½" w. x 6½" d. x 4" h. Shipping Weight, 10 lbs.
Terado No. 50-105—Net Each..... **$36.19**

POWR-ALL

Supply and charge rate 25 amps continuous, 40 amps intermittent (one minute); 12 VDC output. Capacity as battery charger, 25 amps or trickle. Two complete circuits; separate circuit breakers. Filtered for 1 amp loads. With output meter. Size: 12½" w. x 6" d. x 6" h. Shipping Weight, 21 lbs.
Terado No. 50-106—Net Each..... **$67.32**

VOLTAGE ADJUSTERS

For TV, hi-fi and AC motorized equipment. Change high or low voltage over range of 95–135 V to normal. Input: 117 VAC line.
Terado No. 50-204 Polaris—Cap., 300 W cont., 500 W int. Size: 5½" x 3" x 2¼". Wt., 3 lbs. Net Each..... **$13.46**
Terado No. 50-172 Saturn—Same as Polaris, but with AC voltmeter. Net Each..... **$20.64**
Terado No. 50-141 Appollo—Similar to Polaris, but 1200 W cont., 1500 W int. Increases voltage in 10 and 15-V steps. Size: 4" x 3½" x 6½". Weight, 8 lbs. Net Each..... **$27.22**

SHAVERTER

Operates any American shaver on foreign countries' power. With all necessary adapters. Size: 3⅝" w. x 2¼" d. x 4¼" h. Weight, ½ lb. **$8.85**
Terado No. 50-124 Shaverter—Net Each.

TRANSVERTER
FOREIGN POWER

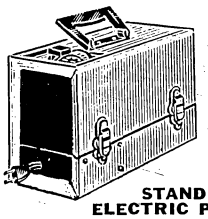
Changes 220 VAC foreign power to 120 VAC USA power. Operates hair dryers, mixers, etc., in foreign countries up to its capacity of 1000 watts. Complete with adapter plugs. Size: 3½" w. x 6½" d. x 4" h. Shipping Weight, 8 lbs.
Terado No. 50-123—Input 220 VAC; output 120 VAC, 750–1000 watts. **$24.50**
Net Each.....

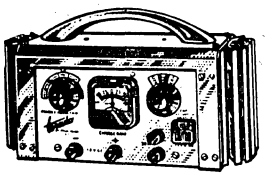
INVERTER-BATTERY CHARGERS
MARK I

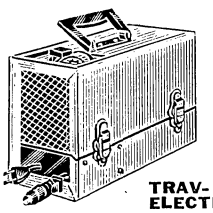
Solid state, transistorized unit changes battery voltage to 117 V or charges 12 V storage battery at 20 amps, 10 amps or trickle. AC capacity, 450 to 500 watts. Built-in charge meter. Copper baked enamel case. Size: 12½" w. x 6" d. x 6" h. Shipping Weight, 21 lbs. **$119.35**
Terado No. 50-131 Mark I—Net....
Terado No. 50-132 Mark II—As above but 275–300 watt capacity. Net Each..... **$98.45**

TRAV-ELECTRIC*†

Changes battery current to 117 VAC, 60 Hz, ± ½ Hz, regardless of load; 50 Hz adaptable. Operates anything using 117 VAC, 60 Hz from 30 amps rechargeable wet storage battery enclosed. Capacity, 175 watts; 125 watts continuous. Frequency stable within ½ Hz with load change. Plugs into AC outlet or car cigarette lighter to recharge battery. Charger has automatic overcharge protection. Meter shows charge rate and hours of anticipated output. Size: 12" x 5½" x 8". Wt.: Net, 30 lbs. including battery; shpg., 36 lbs. **$86.66**
Terado No. 50-160—Net Each.....


STANDBY ELECTRIC POWER


MARK I, MARK II


TRAV-ELECTRIC

DYN-A-MITE

SUPER CHARGER, CHALLENGER

SOLID STATE BATTERY CHARGERS

Chargers have ventilated steel cases, heavy duty cords and battery clamps. Brackets for coiling wire included. Baked hammer finish. Completely portable.

Taperite has low position causing charge automatically to taper to zero; won't overcharge battery. Can be connected indefinitely.

Super Charger has color coded meter to show battery condition and charge rate.

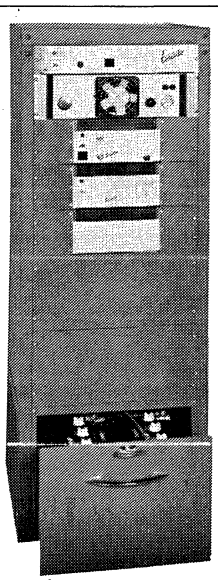
Powerhouse solid state, full wave, reverse polarity protected, with 4 silicon rectifiers. Boost charge position 50 amps, 20 amps and trickle charge position. Available for 24 V and 12 V.

Charge rates listed are for both 6 and 12 V except as noted.

Terado Model No.	Name	Charge Rate	Size, Inches	Wt., Lbs.	Net Each
50-186	Dyn-A-Mite	1 A§	1¾ sq. x 3¼	1	$ 7.19
50-194	Chargrite	5 A#	4 x 5 x 6	10	23.30
50-192	Taperite	6 A#	4 x 5 x 6	7½	28.42
50-189	Challenger	6 A	4 x 5 x 6	5	23.92
50-181	Super Charger	10 A	4 x 5 x 6	7½	29.05
50-183	Powerhouse	35 A#	11 x 6 x 6	20	54.15
50-182-24V	Powerhouse	35 A•	11 x 6 x 6	20	65.00

§Not metered; all others have meter. #12 V charge rate only. •24 V charge rate only.

ALL TERADO INVERTERS SUPPLIED WITH BATTERY CABLES



NEW SERIES SIX-60 STANDBY POWER SYSTEMS

STANDBY/EMERGENCY AC POWER SOURCE FOR

- **MEDICAL ELECTRONICS**
- **TELEPHONE, TELETYPE, TELEGRAPH**
- **PAGING SYSTEMS**
- **FIRE ALARMS**
- **RADIO COMMUNICATIONS**

Series Six-60 is engineered to be a complete package ready for immediate operation. Compact, standing floor cabinet contains DC battery power source, charging system, inversion system and automatic crossover which are engineered to work together with reliability and efficiency. **DC Battery Source:** Lead acid type; lead calcium or nickel cadmium stationary types also available. **Inverter System:** Solid state DC to AC type. Input of 12 VDC from batteries; output, 117 VAC, 60 Hz single phase. Continuous duty rating. **Charging System:** Battery charger contains an analog computer; Controls all charging functions; constantly monitors line voltage and makes instant adjustments; maintains batteries at constant peak charge. **Panel Indicators:** Two pilot lights indicate incoming AC power and standby or test mode. Ammeter indicates output of charging system. Convection cooling on the charger and load transfer circuits; forced air cooling on the inversion circuit. Splatter gray finish cabinet with computer blue facing; satin chrome panel components. **Size:** 22" w. x 22" d. x 37⅞" h.

OTHER SYSTEMS AVAILABLE PER QUOTATION: All systems available with lead calcium or nickel cadmium batteries; additional batteries and rack for longer duty cycle operation time; higher wattage output; zero load transfer time for constant power loads; sine wave systems; and cabinets 59½" high for additional equipment.

STANDARD SERIES SIX-60 STANDBY POWER SYSTEMS

Standard computer 10 amp charger; 200 AH lead acid batteries; 70 msec crossover; system recovery, 24 hours.

FREQUENCY ± ¼ Hz

Terado Model	Output W	Operation Hours	Net Each
6-60-101	250	8	$ 807.45
6-60-102	500	4	993.72
6-60-103	1000	2	1304.26

FREQUENCY 60 Hz ±10%

Terado Model	Output W	Operation Hours	Net Each
6-60-108	250	8	$740.00
6-60-109	500	4	795.00
6-60-110	1000	2	906.00
6-60-111	1500	1½	996.00

Terado CORPORATION 1074 RAYMOND AVENUE, ST. PAUL, MINNESOTA 55108 PHONE (612) 646-2868

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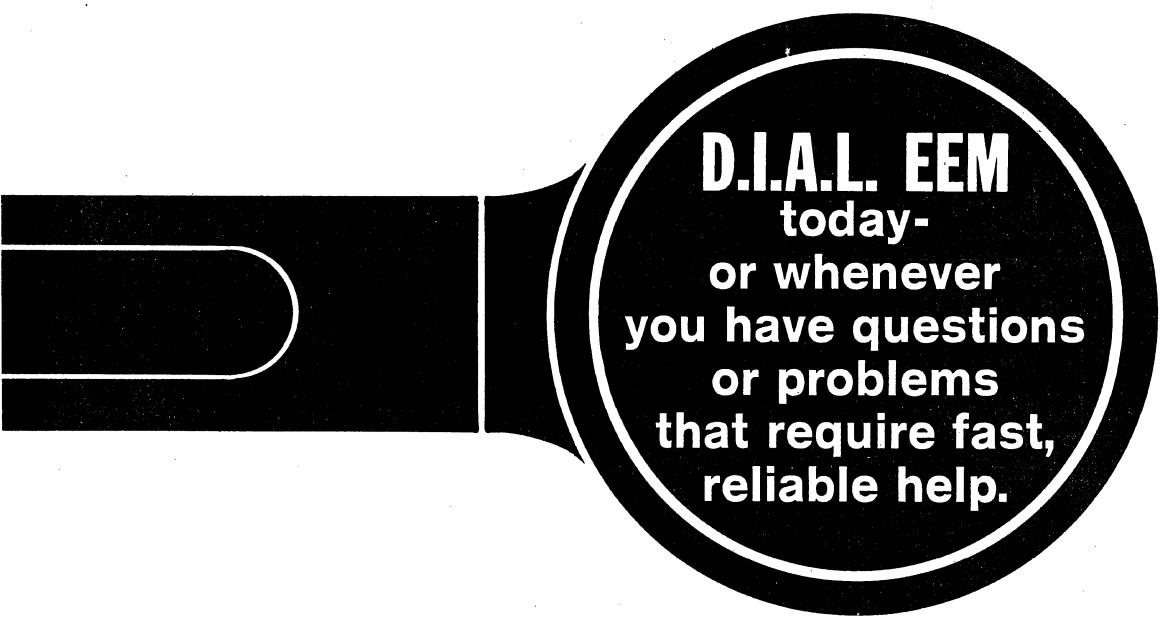

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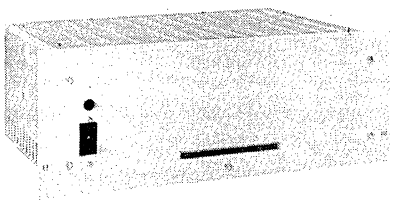
TOPAZ ELECTRONICS

POWER CONVERSION EQUIPMENT

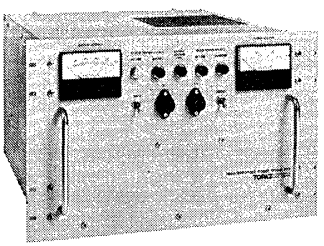
3855 Ruffin Road, San Diego, CA 92123—714-279-0831



INVERTERS & FREQUENCY CHANGERS

See page Vol.1•910

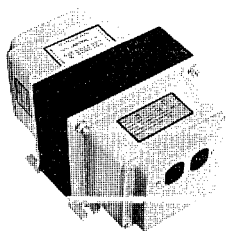
Over 200 models—the industry's most reliable power conversion equipment. DC inputs from 12 V to 250 V, stable AC outputs from 200 VA to 30,000 VA at 50, 60 and 400 Hz.



UNINTERRUPTIBLE POWER SYSTEMS

See page Vol.1•911

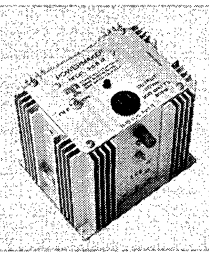
Highly reliable 500, 1000 and 2000 VA systems contain sealed batteries, switch automatically in event of failure. Other models rated from 300 VA to 10,000 VA per phase.



ULTRA-ISOLATION TRANSFORMERS

See page Vol.2•582

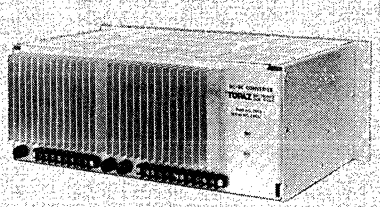
Noise problems go away when noise-sensitive or noise-producing equipment is Ultra-Isolated. Common mode and transverse mode noise are attenuated more than 1,000,000:1. Models from 125 VA to 20,000 VA.



POWERMAKERS

Versatile 300 VA, 60 Hz square wave inverter operates TVs, radios, small appliances, test equipment, recorders, etc. Models available for operation from 12Vdc, 24 Vdc and 48 Vdc.

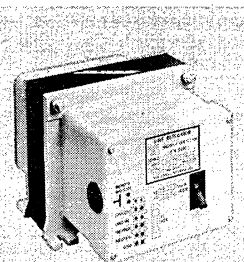
$109 Each (12 V)



DC-DC CONVERTERS

- Fully protected
- Fully isolated
- 115 Vac, 60 Hz fan output (100 VA)
- ±15 Vdc adjustable to ±12 V

Input VDC	Model Number	DC Outputs				List Price†
48	250-DC-48	+5 V,	+15 V,	−15 V,	+24 V,	$825
125	250-DC-125	15 A	1 A	1 A	2 A	$875
48	350-DC-48	+5 V,	+15 V,	−15 V,	+24 V,	$925
125	350-DC-125	30 A	2 A	2 A	2 A	$975



AC LINE REGULATORS

- 98% Efficiency
- Produces no distortion
- Small and light
- Low cost

KVA Ratings	Model Designation	Input Vac	Output Vac	2 kVA Price†
.5, 2, 4	LRA117SN	85-125	117 ±7%	$450
.5, 2, 4, 8	LRB115SN	105-125	115 ±3.3%	$370
2, 4, 8	LRA208SL	151-222	208 ±7%	$450
2, 4, 8, 16	LRB208SL	190-225	208 ±3.3%	$370
2, 4, 8	LRA230SL	167-246	230 ±7%	$450
2, 4, 8, 16	LRB230SL	211-250	230 ±3.3%	$370

Also available: 220 V, 240 V and 3-phase versions

†Current March, 1973

TOPAZ ELECTRONICS

SINE WAVE INVERTERS & FREQUENCY CHANGERS

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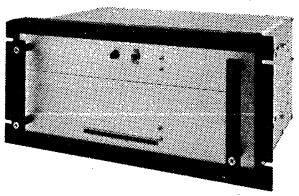
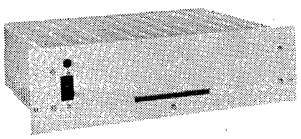


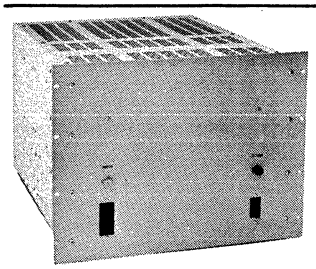
GW & FW SERIES

Input Protection: High and low voltage Reverse polarity
Output Voltage Regulation: Less than ±5% line and load
Frequency Stability: ±0.5% of fixed frequency; ±0.05% optional
Output Protection: Overload and short circuit
Total Harmonic Distortion: Less than 5% at full load and nominal line
Operating Temperature: −20°C to +55°C
Inverter Efficiency: Typically 70% at full load



GP & FP SERIES

Input Protection: Low voltage Reverse polarity
Output Voltage Regulation: Less than ±5% line and load
Frequency Stability: ±1% of fixed frequency;
Output Protection: Overload and short circuit
Recovery Time: Less than 100 milliseconds for 50% load change
Total Harmonic Distortion: Less than 10% at worst case; 5% typical
Operating Temperature: 0°C to +55°C
Inverter Efficiency: Typically 72% at full load



GX & FX SERIES

Input Protection: High and low voltage and reverse polarity
Output Voltage Regulation: ±3% for line and load
Frequency Stability: ±1% of fixed frequency; ±0.05% optional
Output Protection: Overload and short circuit
Total Harmonic Distortion: Less than 5% at full load and nominal line
Operating Temperature: −10°C to +55°C
Inverter Efficiency: Typically 75% at full load
Recovery Time: 50 milliseconds for 20% load change

INPUT SPECIFICATIONS

Nominal Input Voltage	Product Series	Voltage Range
12/24 VDC	GW	11 to 15 or 22 to 30
12 VDC	GP	11 to 15
24 VDC	GP	22 to 30
28 VDC	GW	24 to 32
48 VDC	All	42 to 56
125 VDC	All	105 to 140
250 VDC	GW & GX	210 to 280
115 VAC	FW	100 to 125
115 VAC	FP & FX	105 to 125
208 V, 3Ø	FX	190 to 225
230 VAC	FW & FX	210 to 250
240 V, 3Ø	FX	220 to 260
480 V, 3Ø	FX	440 to 520

INPUT FREQUENCY RANGES
FW 45 to 500 Hz
FP & FX 48 to 420 Hz

SIZES (Inches)

Code	Height	Width	Depth
A	5¼	19	13½
B	7	19	14
C	8¾	19	13½
D	8¾	19	17
E	8¾	19	19¾
F	14	19	21
G	17½	19	13½
H	17½	19	19¾
J	21	19	13½
K	21	19	21
L	26¼	19	13½
M	26¼	19	19¾
N	28	19	13½
O	35	19	17
P	6'	22¾	25⅝

OPTIONS AVAILABLE
0.05% frequency control
External frequency synchronization
Voltage and/or current meters
Automatic restart

INVERTERS

Output VA	Product Series	Input Voltage	Output Frequency	Output Voltage	Size	Weight (Lbs.)	List Price (See Note)
50 Hz Output Inverters							
200	GW	12/24, 28, 48 or 125*	50	115/230	A	39	$ 775†
200	GP	12, 24, 48 or 125*	50	115 or 230*	A	35	675†
400	GW	12/24,28,48 or 125*	50	115/230	C	80	1350†
400	GP	12, 24, 48 or 125*	50	115 or 230*	B	55	850†
800	GW	12/24, 28, 48 or 125*	50	115/230	C	95	1850†
1,600	GW	12/24 or 28*	50	115/230	G	190	3200
2,000	GX	48 or 125*	50	115 or 230*	F	185	2500†
2,400	GW	12/24 or 28*	50	115/230	L	285	4700
4,000	GX	48 or 125*	50	115 or 230*	K	265	3900†
8,000	GX	125 or 250*	50	115 or 230	P	605	7550†
60 Hz Output Inverters							
250	GW	12/24, 28, 48 or 125*	60	115	A	39	695†
250	GP	12, 24, 48 or 125*	60	115 or 230*	A	35	625†
500	GW	12/24, 28, 48, 125 or 250*	60	115	C	80	1195†
500	GP	12, 24, 48 or 125*	60	115 or 230*	B	55	795†
1,000	GW	12/24, 28, 48 or 125*	60	115 or 115/230*	C	95	1750†
1,500	GW	12/24, 28, 48 or 125*	60	115 or 115/230*	G	175	2800†
2,000	GW	12/24 or 28*	60	115 or 115/230*	G	190	3000†
2,500	GX	48 or 125*	60	115 or 230*	F	185	2300†
3,000	GW	12/24 or 28*	60	115 or 115/230*	L	285	4400†
5,000	GX	48 or 125*	60	115 or 230*	K	265	3500†
10,000	GX	125 or 250*	60	115 or 230*	P	605	7300†
400 Hz Output Inverters							
250	GW	12/24, 28, 48 or 125*	400	115	A	30	825†
500	GW	12/24, 28, 48 or 125*	400	115	C	43	1450†
1,000	GW	12/24, 28, 48 or 125*	400	115	C	56	2000†
2,000	GW	12/24 or 28*	400	115	G	112	3400†
2,500	GX	125	400	115	F	130	2500
3,000	GW	12/24 or 28*	400	115	L	168	5000†
5,000	GX	125	400	115	K	265	3900
10,000	GX	125	400	115	P	605	7550

*Specify with order

FREQUENCY CHANGERS

Output VA	Product Series	Input Voltage	Output Frequency	Output Voltage	Size	Weight (Lbs.)	List Price (See Note)
50 Hz Output Frequency Changers							
200	FW	115	50	115/230	A	47	$ 895
200	FW	230	50	115/230	A	56	995
200	FP	115	50	115 or 230	A	45	725†
400	FW	115	50	115/230	E	100	1495
400	FW	230	50	115/230	E	110	1595
400	FP	115	50	115 or 230*	B	73	925†
800	FW	115	50	115/230	E	140	2050
1,600	FW	115	50	115/230	G	200	3700
2,000	FX	115, 208, 230 or 240*	50	115 or 230*	F	240	3200
2,400	FW	115	50	115/230	L	420	5150
4,000	FX	115, 208, 230 or 240*	50	115 or 230*	K	325	4450
8,000	FX	115, 208, 230 or 240*	50	115 or 230*	P	725	8850
60 Hz Output Frequency Changers							
250	FW	115	60	115	A	47	825
250	FW	230	60	115	A	56	925
250	FP	115	60	115 or 230	A	45	695†
500	FW	115	60	115	E	100	1350
500	FW	230	60	115	E	110	1450
500	FP	115	60	115 or 230*	B	73	895†
1,000	FW	115	60	115 or 115/230*	E	140	1900†
2,000	FW	115	60	115 or 115/230*	G	280	3500†
2,500	FX	115, 208, 230 or 240*	60	115 or 230*	F	240	2995
3,000	FW	115	60	115 or 115/230	L	420	5000†
5,000	FX	115, 208, 230 or 240*	60	115 or 230*	K	325	4250
10,000	FX	115, 208, 230 or 240*	60	115 or 230*	P	725	8550
400 Hz Output Frequency Changers							
250	FW	115	400	115	A	40	895
250	FW	230	400	115	A	49	995
250	FW	115	400	115	E	73	1495
250	FW	230	400	115	E	83	1595
1,000	FW	115	400	115	E	90	2050
2,000	FW	115	400	115	G	180	3700
2,500	FX	115, 208, 230 or 240*	400	115	F	165	3200
3,000	FW	115	400	115	L	270	5150
5,000	FX	115, 208, 230 or 240*	400	115	K	260	4450
10,000	FX	115, 208, 230 or 240*	400	115	P	595	8850

*Specify with order

ORDERING INFORMATION

Model numbers are constructed by combining information in the order in which it is presented above. For example, Model 1000 GW-12/24-60-115/230 designates a 1000 VA, GW Series Inverter which will operate from either 12 or 24 VDC (selected by tap changes) and provides an output of 60 Hz at 115 or 230 V (selected by tap changes). Three phase output units also available.

PRICING INFORMATION

Prices shown are March 1973 prices for the more popular voltage versions shown on that line. Prices followed by (†) may vary slightly for different voltage ratings.

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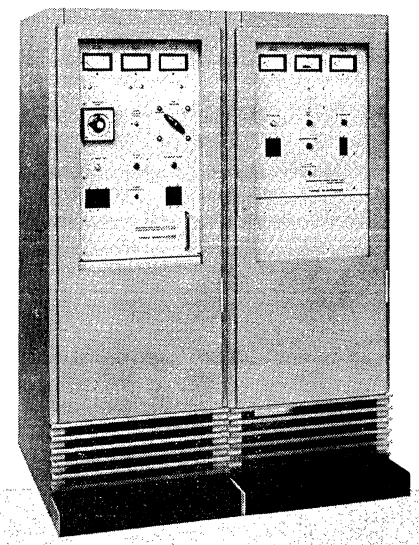
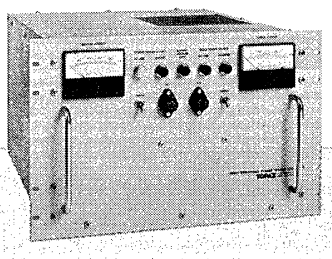


10 kVA SYSTEM



1 kVA SYSTEM

Specifications

AC INPUT
105-130 V line to neutral or (210-260 V) normal range 95-105 V (or 190-210 V) extended range with reduced back-up time
60 Hz ±5%

INPUT PROTECTION
Undervoltage and overvoltage protection on all inverters
Reverse polarity protection on all inverters
AC input failure indicated by relay contact closure

AC OUTPUT (INVERTER)
5% voltage regulation for line and load
0.5% frequency stability
Sinusoidal, with 5% total harmonic distortion at full load and nominal line
10% voltage overshoot/undershoot for 20% instantaneous load change

OUTPUT PROTECTION
Current limiting on all chargers
Overload and short-circuit protection on all inverters

AUTOMATIC LOAD TRANSFER
25 millisecond transfer (typical). Panel light indicates that load is powered by the ac line.
4 millisecond switch optional.

METERS
Battery voltage
System output voltage

OPERATING TEMPERATURE
0°C to +50°C

OPTIONS AVAILABLE
- AC Line Frequency and/or Phase Synchronization
- Static Transfer Switch with 4 milliseconds maximum transfer time, phase synchronized
- Float/Equalize Switch, mounted on front panel
- Low Battery Voltage Alarm and Indicator
- Special meters, switches, cabinetry and paint, etc.

Output Power (VA)	System Part Number	Input Vac	Input Phase	Input Hz	Output Vac	Output Phase	Output Hz	Output Current	Battery	Full Load Back-up Time	Recharge	Size	Approx. Weight	List Price†
500	3151-1	115	1	60	115	1	60	4.3 A	Internal	15 minutes	Half charge in 3 hours	19″ rack 12.25″ H. 19″ D.	140#	$ 1,825
1,000	3152-1	115	1	60	115	1	60	8.7 A	Internal	20 minutes	Half charge in 3 hours	19″ rack 12.25″ H. 19″ D.	210#	$ 2,450
2,000	2529-1	115	1	60	115	1	60	17.4 A	Internal	15 minutes	Half charge in 3 hours	Cabinet 36.5″ H. 23.25″ W. 25.62″ D.	550#	$ 3,950
3,000	2534-1	115	1	60	115	1	60	26.0 A	External 48 V	Dependent on batteries	25 Amperes	Cabinet 36.5″ H. 23.25″ W. 25.62″ D.	425#	$ 4,750
	2534-2	230	1	60	230	1	60	13.0 A						
	2534-3	115	1	60	115	1	60	26.0 A	External 125 V		10 Amperes			$ 4,400
	2534-4	230	1	60	230	1	60	13.0 A						
5,000	2520-1	115	1	60	115	1	60	43.5 A	External 125 V	Dependent on batteries	20 Amperes	Cabinet 55″ H. 23.25″ W. 30″ D.	700#	$ 6,600
	2520-2	230	1	60	230	1	60	21.7 A						
10,000	2570-1	208	3	60	115	1	60	87.0 A	External 125 V	Dependent on batteries	40 Amperes	2 Cabinets each is 62″ H. 23.25″ W. 30″ D.	1700#	$11,300
	2570-2	230	3	60	230	1	60	43.5 A						

Notes: 1. External batteries may be connected in parallel with internal batteries, thus extending the back-up and recharge times.
2. Sealed internal batteries are supplied as part of 500, 1000 and 2000 VA systems; external batteries are not supplied.

ALSO AVAILABLE: Low Cost 300 VA Model

300* VA	315-BK-12*	120 V	1 Phase	60 Hz	120* Vac	1 Phase	60* Hz	2.6 A	External 12 V	Dependent on battery	3 Amperes	7″ H. 7″ W. 5.5″ D.	13#	$ 250

*The 315-BK-12 is a 300 VA, approximately 60 Hz, square wave output, forward transfer UPS. It is a very low cost alternative for many less critical applications. It contains no meters and is housed in an extruded aluminum package. Full details are specified in a separate data sheet.

†Current March, 1973

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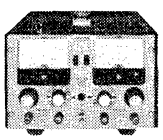

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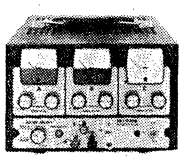
DL Series Dual Lab

- Dual Outputs — Independently Adjustable
- Dual Ranges on Each Output
- 0.01% Regulation
- 250 uV RMS Ripple
- 0.05% Stability
- Calibrated Adjustable Current Limiting

DL Series:
Switchable dual range ammeter/voltmeter for each supply; selectable current limit ranges; 47-420 Hz input; 50°C operation.



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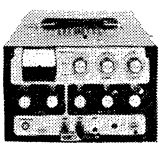
TL Series Triple Lab

- Triple Outputs — Independently Adjustable
- 0.02% Regulation
- 0.5 mV RMS Ripple
- 0.05% Stability
- Automatic Current Limiting
- Overvoltage Protection Option

TL Series:
Switchable ammeter/voltmeter for each supply; 57-420 Hz input; 40°C operation.



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PLS Series Precision Lab

- 5 Dial Calibrated Output, 0.1% Accuracy
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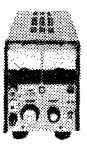
- 250μV RMS Ripple
- 0.002% Stability
- Fast Programming
- Adjustable Current Limiting
- Current Sink Capability
- Panel Overload Indicator

PLS Series:
47-420 Hz input; Multi-Versatile Remote Programming: Ohms/Volt, Volt/Volt, Analog Voltage, Current Limiting; Programming Compatible with Trygon Digital Programmer for Computer Applications; Overvoltage Protection Option.



Priced from $199. to $245.

HH Series Quarter Rack

- Constant Voltage/Current
- 0.01% Regulation
- 0.5 mV RMS Ripple
- 0.05% Stability (0.01% Optional)

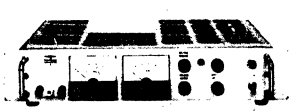
HH Series:
CV/CC Mode Light; 47-420 Hz input; 60°C operation; Overvoltage Protection option; High Stability option.

Priced from $360. to $575.

HR Series Half Rack

- Constant Voltage/Current
- 0.01% Regulation
- 0.5 mV RMS Ripple
- 0.05% Stability (0.01% Optional)
- Adjustable Current Limiting

HR Series:
CV/CC Mode Light; 55-65 Hz input; 60°C operation; Overvoltage Protection option.



Priced from $460. to $645.

RS Series Low Profile

- Constant Voltage/Current
- 0.01% Regulation
- 0.5 mV RMS Ripple
- 0.05% Stability (0.01% Optional)

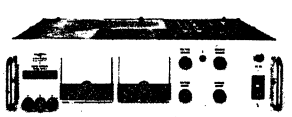
RS Series:
CV/CC Mode Light; 55-65 Hz input; 71°C operation; Overvoltage Protection option; High Stability option.

$1495.

CR Series Intermediate Regulation

- Constant Voltage/Current
- 0.2% Regulation
- 150 mV RMS Ripple
- 0.25% Stability

CR Series:
CV/CC Mode Light; 208 VAC, 55-65 Hz 3-phase input; 50°C operation; Overvoltage Protection option.



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M-C/M-P Series Super Mercury

- Constant Voltage/Current
- 0.005% Regulation
- 1 mV RMS Ripple
- 0.015% Stability (0.005% Optional)
- Adjustable Current Limiting
- Automatic Load Share Paralleling
- Master Slave Tracking

M-C/M-P Series:
CV/CC Mode Light; 47-65 Hz input; Overvoltage Protection option.

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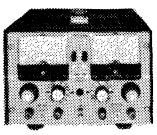

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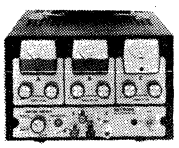

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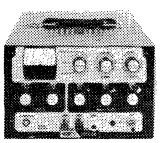

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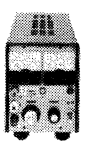
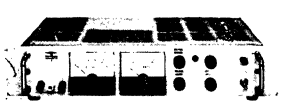
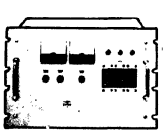


HH Series

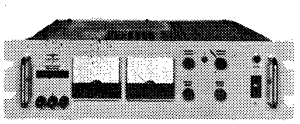
HR Series



RS Series



CR Series



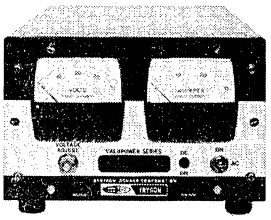
M-C/M-P Series

Voltage Range VDC	Max. Current Amps	Size	Price Metered $	OV Option $	Model**
0 to 5	130	7" Rack	1095	STD	M7C5-130 OV
0 to 7	4	¼ Rack*	199	65	HH7-4
0 to 8	3	½ Rack	275	24	TL8-3 (3 output)
0 to +32	1				
0 to −32	1				
0 to 8	25	3½" Rack	585	STD	M3P8-25 OV
0 to 8	50	5¼" Rack	680	STD	M5P8-50 OV
0 to 8	100	7" Rack	895	STD	M7C8-100 OV
0 to 15	3	¼ Rack	199	65	HH15-3
0 to 15	30	5¼" Rack	655	STD	M5P15-30 OV
0 to 15	50	5¼" Rack	775	STD	M5C15-50 OV
0 to 15	80	7" Rack	1325	STD	M7C15-80 OV
0 to 20	10	½ Rack	390	65	HR20-10B
0 to 20	15	3½" Rack	460	65	RS20-15A
0 to 20	150	12¼" Rack	1495	175	CR20-150
0 to 32	1.5	¼ Rack	199	65	HH32-1.5
0 to 36	15	5¼" Rack	625	STD	M5P36-15 OV
0 to 36	100	12¼" Rack	1495	175	CR36-100
2X0 to 40	1	½ Rack	275	—	DL40-1 (2 output)
0 to 40	5	½ Rack	360	65	HR40-5B
0 to 40	7.5	½ Rack	450	65	HR40-7.5B
0 to 40	10	3½" Rack	495	65	RS40-10A
0 to 40	30	5¼" Rack	695	STD	M5C40-30 OV
0 to 40	50	7" Rack	875	STD	M7C40-50 OV
0 to 50	1	½ Rack	325	—	PLS50-1
0 to 50	1	¼ Rack	199	65	HH50-1
0 to 60	2.5	½ Rack	380	65	HR60-2.5B
0 to 60	5	½ Rack	425	65	HR60-5B
0 to 60	7.5	3½" Rack	525	65	RS60-7.5A
0 to 60	15	5¼" Rack	690	STD	M5C60-15 OV
0 to 60	30	7" Rack	1050	STD	M7C60-30 OV
0 to 65	55	12¼" Rack	1495	175	CR65-55
0 to 110	30	12¼" Rack	1495	—	CR110-30
0 to 160	0.3	¼ Rack	245	—	HH160-300
0 to 160	1	3½" Rack	545	65	RS160-1A
0 to 160	2	½ Rack	575	65	HR160-2B
0 to 160	3	3½" Rack	645	90	RS160-3A
0 to 160	5	5¼" Rack	1015	120	M5C160-5
0 to 160	8	7" Rack	1455	130	M7C160-8
0 to 160	15	7" Rack	1790	150	M7C160-15
0 to 320	1.5	3½" Rack	625	—	RS320-1.5B

*All ½ Racks and ¼ Racks mount in 5¼" panel height. Rack adapters available.

**Detailed Specifications for these units available on request.

NEW ValuPower™ Half Rack VPH Series



Nothing like it in size and performance at the price. A truly unique innovation in DC power technology. It's your best value in a half rack.

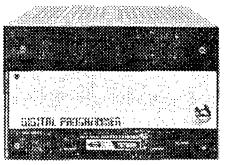
- Low noise for IC & systems applications
- Extremely low output impedance
- Unique self-test output indicator
- Adjustable current limiting
- Versatile rack mounting capability for multiple output power applications.

Model	Volts	Max. Current at 40°C	Price
VPH5-60 OV	4.75 to 5.5	60	$425.
VPH12-35	11 to 13	35	400.
VPH15-31	14 to 16	31	400.
VPH24-22	23 to 26	22	400.
VPH28-19	26 to 30	19	400.
VPHD15-13 (Dual)	±11.5 to 15.5	13	425.

For meters add suffix (M) and $50.00
For Overvoltage Protection add suffix OV and $50.00

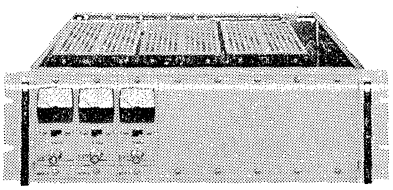
NEW Digital Power Supply Programmers

A Digital-to-Analog Interface for Computers and Power Supplies Priced from $875.



- Single or dual channel programmer in one 5¼" half rack package
- Digital inputs isolated from analog outputs—Eliminates ground loops
- Digitally programs DC power supplies in standard BCD codes with binary option available
- Power supply output voltage, overcurrent limit and overvoltage protection can be programmed independently
- Individually addressable memory stores up to 16 functions and reduces the number of computer I/O circuits required
- Self-verification option signals data parity check, data transfer time, overcurrent alarm and status of power supply voltage error amplifier.

Rack Adapters for Multiple Output Power



It's as easy as ABC to assemble a multiple output power packages with Trygon's 3½" or 5¼" ModuPanel Rack Adapters.

A. Select the power modules, from these pages, that meet your voltage and current specifications. Now list them to determine the size of the rack adapter required.

B. The size of the largest module will determine the panel height and depth of the required rack adapter.

ModuPanel Rack Adapter	Size	Price
RM314	3½"H x 19"W x 14"D	$40
RM321	3½"H x 19"W x 21"D	60
RM514	5¼"H x 19"W x 14"D	50
RM521	5¼"H x 19"W x 21"D	80

C. Select the front and rear panel acces sories such as blank panels, meters, controls and rear panel barrier strips. For a complete quotation to your specifications, contact Trygon or your local Scientific-Devices Sales Office.

ModuPanel Accessory	Description	Price
CBP	Circuit Breaker Panel	$20
BP	Blank Panel	10
MCP	Switchable Voltage/Current Meter & Voltage Control Panel	30
MVP	Voltmeter Panel	20
CTJ	Voltage Control & Test Jack Panel	15
TJ	Test Jack Panel	8
RBAC	Rear Panel AC Barrier Strip	7
RBB	Rear Panel Barrier Strip	10
RBM	Rear Panel Barrier Strip & Shunt	15

IT'S AS EASY AS ABC!

5 Year Warranty on every Standard Trygon Power Supply

ORDERING INFORMATION BY MODEL
When ordering a Trygon power supply, ask for the Model number as listed in the charts and include the suffix that denotes the option desired. i.e.: RS60-7.5OV, that's a 60VDC, 7.5 amp, 3½" rack mounted unit with overvoltage protection built-in at the factory.

PRICES
Prices given for all standard models and options are FOB Factory, Westbury, New York. Any Federal, State or Local Taxes are extra. Terms are Net 30 days to rated accounts. Prices and Specifications are current as of publication date. They are subject to change without notice as technical advances warrant.

DISCOUNTS
Generous quantity discounts are available on all Trygon power supplies. Contact the factory for a quotation on your specific requirements.

INSTRUCTION BOOKS
All Trygon power supplies are shipped with one copy of an instruction book. Extra instruction books may be ordered as required at $10.00 each.

FORMS PREPARATION
Preparation of DD250 Forms, add $10.00 per Form Set.

SOURCE INSPECTION
For Government or Customer Source inspection, add 2%; $25.00 minimum per shipment.

FACTORY COMMUNICATIONS
Trygon Sales, Applications Engineering and Administration may be reached via any of the following:

Mail Address:

TRYGON ELECTRONICS, INC.
1200 Shames Drive, Westbury, N.Y. 11590
Telephone: (516) 997-6200
TWX Number: (510) 222-0492
WUX Address: Trygon Westbury, N.Y.
Cable Address: Trygon Westbury, N.Y.
or your local Scientific-Devices Sales Office

Most models available for European operation at slightly higher prices.

TRYGON ELECTRONICS
SUBSIDIARY

SYSTRON DONNER CORPORATION
1200 Shames Drive, Westbury, N.Y. 11590 (516) 997-6200

The Systron-Donner Instruments Group: Concord Instruments ☐ Computer Systems ☐ Datapulse ☐ Kruse Electronics ☐ Microwave ☐ Trygon Electronics

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TRYGON DC POWER SUPPLIES

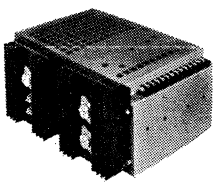
For Slot Range Systems Applications

Systems Power in Every Package Size!

Features

- Low Noise for IC Applications
- No Turn On/Turn Off Transients
- Extremely Low Output Impedance
- Compact Size — Modular & Metered Models
- Complete Series of ModuPanel Rack Adapters
- Wide Slot Adjustment Units
- Full Range Units
- UL Listed or Designed

E & G Size Package

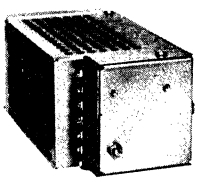


Priced from $219. to $399.

5" x 8" x 10"
TPWE
TPZE
TP3E
TP2E
5" x 8" x 15"
TP3G

TP-E, TP-G Super Trypack

A Size Package



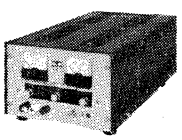
Priced from $45. to $98.

3" x 3 9/16" x 6"
TPSA

TP-A Super Trypack

Half Rack Package

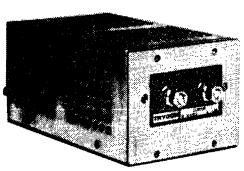
Priced from $340. to $490.



5 1/4" x 7 3/4" x 16 1/4"
LHS

Liberator Sub Rack LHS (metered option)

B Size Package

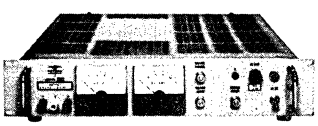


$125.

3 1/8" x 4" x 6 1/2"
LVS
LVW

LV Liberator Sub Rack

Full Rack Package

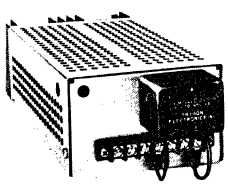


3 1/2" x 19" x 18 1/8"
L3R
5 1/4" x 19" x 18 1/8"
L5R

Priced from $478. to $650.

L-R Series Liberator

C Size Package

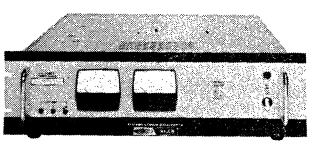


Priced from $122. to $155.

3" x 4 5/8" x 9"
TPSC
TPWC
TPZC
(with OVS)

TP-C Super Trypack

NEW Full Rack Package

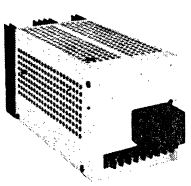


5 1/4" x 19" x 18 1/8"

$595.

VP Series ValuPower

D Size Package

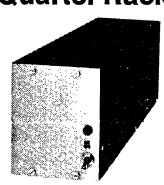


Priced from $75. to $159.

5" x 4 5/8" x 9 1/2"
TPZD
(with OVS)

TP-D Super Trypack

Quarter Rack Package



$190.

4 1/4" x 5" x 15 3/4"
(cased)

FTR Series Ferroresonant

Other Features and Options

TPS Series: Systems Modules. Two package sizes; dual output versions available; UL Listed; .02% regulation; 1 mV RMS ripple; Overvoltage Protection Modules optionally available; standard OV on low voltage units; 47-420 Hz input; 60°C operation; Automatic Current Limiting.

LVS/LVW Series: Low Power Slot & Wide Range Modules for systems use; UL Listed; .01% regulation; .5 mV RMS ripple; Overvoltage Protection Modules optionally available; 47-420 Hz input; 60° C operation; remotely programmable; remote sensing; Auto Current Limiting.

TPW Series: Systems Modules, Wide Range. Two package sizes; UL Design; .02% regulation; 1 mV RMS ripple; Overvoltage Protection Modules optionally available; 47-420 Hz input; remotely programmable; remote sensing; Automatic Current Limiting.

TPZ Series: Systems Modules; Three package sizes; UL Design; .02% regulation; 1 mV RMS ripple; Overvoltage Protection Modules optionally available; standard OV on low voltage units; 47-420 Hz input; 40°C operation; remotely programmable; remote sensing; Automatic Current Limiting.

TP3E/TP3G Series: Triple Output Module; UL Listed; .02% regulation; 2 mV RMS ripple; built-in sequencing option; Overvoltage Protection Modules optionally available; 47-420 Hz input; 50°C operation; Automatic Current Limiting.

LHS Series: Half Rack, Sub-Rack Modules with meters and controls optionally available; UL Listed; .01% regulation; .5 mV RMS ripple; Internal Overvoltage Protection optionally available; 47-420 Hz input; 60°C operation; remotely programmable; remote sensing; Adjustable Auto Current Limiting.

L3R/L5R Series: Full Rack Systems Power Supplies; UL Listed; .005% regulation; .5 mV RMS ripple; .01% high stability standard; Automatic Load Share Paralleling; CV/CL Mode Light; Overvoltage Protection optionally available; 47-65 Hz input; 60°C operation; remotely programmable; remote sensing; Adjustable Auto Current Limiting.

VP Series: Full Rack Systems Power Supplies; UL Design; .05% regulation; 1 mV RMS ripple; Automatic Load Share Paralleling; Overvoltage Protection optionally available; remotely programmable, remote sensing; Adjustable Auto Current Limiting.

FTR Series: Fixed Output Modules with ON-OFF switch; ±1% line regulation; 60 Hz input; 55°C operation; Automatic Current Limiting.

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POWER SUPPLY SELECTOR & PRICE LIST

Systems Modules

Voltage (Nominal)	Voltage Range VDC	Max.[3] Current Amps	Package Size	Price $ Non Metered	OV Option S	Model[1]
Wide Range	0 to 12	1.4	B	125	30[2]	LVW12-1.4
	0 to 12.5	3.3	C	150	30[2]	TPWC12-3.3
	0 to 12.5	9	E	239	45[2]	TPWE12-9
	0 to 20	1	B	125	30[2]	LVW20-1
	0 to 50	0.32	B	125	30[2]	LVW50-.32
	0 to 52	1.2	C	150	30[2]	TPWC50-1.2
	0 to 52	3.2	E	269	45[2]	TPWE50-3.2
	Dual TPZD Ratings[6]		E	269	45[2]	TP2E
Multi-Output	10 to 26	1.8		–	–	
	5 to 16	1.5		–	–	(3 output)[4]
	3.2 to 5.5	6	E	219	STD	TP3E
				269		TP3ES
	or					
	3.2 to 5.5	18	G	349	STD	TP3G
				399		TP3GS
5	2.5 to 5.5	2.1	B	125	30[2]	LVS4-2.1
	2.5 to 5.5	6.5	C	127	STD	TPZC5-6.5 OV
	2.5 to 5.5	10	D	159	STD	TPZD5-10 OV
	2.5 to 5.5	20	E	239	STD	TPZE5-20 OV
	3.2 to 6.0	1.25	A	77	STD	TPSA6-1.25 OV
	3.2 to 6.0	5	C	122	STD	TPSC6-5 OV
	3.5 to 6.5	5.4	C	127	STD	TPZC6-5.4 OV
	3.5 to 6.5	8	D	159	STD	TPZD6-8 OV
	3.5 to 6.5	16	E	239	STD	TPZE6-16 OV
	6	25	¼ Rack	190	–	FTR6-25
	4.5 to 7.8	1.9	B	125	30[2]	LVS6-1.9
8	5.5 to 8.5	4.7	C	127	30[2]	TPZC8-4.7
	5.5 to 8.5	7	D	149	45[2]	TPZD8-7
	5.5 to 8.5	13	E	229	45[2]	TPZE8-13
	6.5 to 10.5	1.6	B	125	30[2]	LVS8-1.6
10	8.5 to 11.5	1.7	B	125	30[2]	LVS10-1.7
12	7.5 to 12.5	4	C	127	30[2]	TPZC12-4
	7.5 to 12.5	6	D	149	45[2]	TPZD12-6
	7.5 to 12.5	11	E	229	45[2]	TPZE12-11
	12	15	¼ Rack	190	–	FTR12-15
	11 to 15	1.4	B	125	30[2]	LVS12-1.4
	±11.5 to 15.5	2X0.5	A	98	30[2]	TPSA15D-.5[5]
	11.5 to 15.5	0.75	A	77	30[2]	TPSA15-.75
	±11.5 to 15.5	2X1.8	C	122	30[2]	TPSC15D-1.8[5]
	11.5 to 15.5	3	C	122	30[2]	TPSC15-3
	11 to 16	3.6	C	127	30[2]	TPZC15-3.6
	11 to 16	5.5	D	149	45[2]	TPZD15-5.5
	11 to 16	9.5	E	229	45[2]	TPZE15-9.5

Quantity Prices Available – Consult Factory

NEW ValuPower Half Rack Series

Ratings:
5V/60A
12V/35A
15V/22A
24V/22A
28V/19A
±15V/13A

See page 3 for Details

Voltage (Nominal)	Voltage Range VDC	Max.[3] Current Amps	Package Size	Price $ Non Metered	OV Option S	Model[1]
15 to 18	13.5 to 20.5	1.1	B	125	30[2]	LVS18-1.1
	15	10	¼ Rack	190	–	FTR15-10
	15 to 19	8.5	E	229	30[2]	TPZE18-8.5
	18	10	¼ Rack	190	–	FTR18-10
24	16 to 26	2.5	C	127	30[2]	TPZC24-2.5
	16 to 26	3.8	D	149	45[2]	TPZD24-3.8
	16 to 26	6.4	E	229	45[2]	TPZE24-6.4
	18.5 to 27.5	0.8	B	125	30[2]	LVS24-.8
	24	8	¼ Rack	190	–	FTR24-8
28	22 to 30	0.5	A	77	30[2]	TPSA28-.5
	22 to 33	0.75	B	125	30[2]	LVS28-.75
	22 to 30	2	C	122	30[2]	TPSC28-2
	20 to 30	2.4	C	127	30[2]	TPZC28-2.4
	20 to 30	3.6	D	149	45[2]	TPZD28-3.6
	20 to 30	6	E	229	45[2]	TPZE28-6
	28	1	A	45	–	TPUA28-1
	28	7	¼ Rack	190	–	FTR28-7
	28	7.5	D	75	–	TPUD28-7.5
50	32 to 53	0.37	B	125	30[2]	LVS48-.37
	32 to 52	1.7	C	150	30[2]	TPZC48-1.7
	32 to 52	2.5	D	149	45[2]	TPZD48-2.5
	32 to 52	4	E	269	45[2]	TPZE48-4
	48	4	¼ Rack	190	–	FTR48-4
	50 to 63	1.4	C	150	30[2]	TPZC60-1.4
	50 to 63	3.3	E	269	45[2]	TPZE60-3.3
	50 to 83	0.25	B	125	30[2]	LVS65-.25
100	60 to 110	0.6	C	155	–	TPZC100-.6
	60 to 110	1.8	E	269	–	TPZE100-1.8
	80 to 126	0.18	B	125	30[2]	LVS100-.18
150	110 to 160	0.35	C	155	–	TPZC150-.35
	110 to 160	1.3	E	269	–	TPZE150-1.3
	150	1	¼ Rack	190	–	FTR150-1
	115 to 161	0.15	B	125	–	LVS150-.15
160 to 300	160 to 210	0.24	C	155	–	TPZC200-.24
	160 to 210	0.75	E	269	–	TPZE200-.75
	200	0.15	A	45	–	TPUA200-.15
	300	0.5	¼ Rack	190	–	FTR300-500

1. Detailed specifications for these units available on request.
2. OVS Modules available for LVS, LVW, and TP units. OVS Modules mount externally.
3. For TP and LVW Series current derates at low end of voltage range.
4. Includes three outputs: +3.2 to +5.5 VDC (OV) at 6A or 18A; +10 to +26 VDC at 1.8A; –5 to –16 VDC at 1.5A.
5. Dual Output modules.
6. Any two TPZD ratings in a TP-E package. Special order only, minimum quantity 10.

Systems Racks

Voltage (Nominal)	Voltage Range VDC	Max. Current Amps	Package Size	Price $ Non Metered	Price $ Metered	OV Option $	Model**
5	2.5 to 5.5	25	½ Rack	340	390	60	LHS4-25
	2.5 to 5.5	40	3½" Rack	458*	478	75	L3R4-40
	2.5 to 5.5	70	5¼" Rack	585*	605	90	L5R4-70
	4.5 to 7.8	24	½ Rack	340	390	60	LHS6-24
	4.5 to 7.8	40	3½" Rack	458*	478	75	L3R6-40
	4.5 to 7.8	70	5¼" Rack	585*	605	90	L5R6-70
	4.7 to 5.5	135	5¼" Rack	595	645	80	VP5-135
8	6.5 to 10.5	21	½ Rack	380	430	60	LHS8-21
	6.5 to 10.5	25	3½" Rack	458*	478	75	L3R8-25
	6.5 to 10.5	50	5¼" Rack	585*	605	90	L5R8-50
10	8.5 to 11.5	21	½ Rack	380	430	60	LHS10-21
	8.5 to 11.5	25	3½" Rack	458*	478	75	L3R10-25
	8.5 to 11.5	50	5¼" Rack	585*	605	90	L5R10-50
12	11 to 15	18	½ Rack	340	390	60	LHS12-18
	11 to 15	25	3½" Rack	458*	478	75	L3R12-25
	11 to 15	50	5¼" Rack	585*	605	90	L5R12-50
	11 to 13	90	5¼" Rack	595	645	80	VP12-90
15 to 18	13.5 to 20.5	13	½ Rack	380	430	60	LHS18-13
	13.5 to 20.5	20	3½" Rack	458*	478	75	L3R18-20
	13.5 to 20.5	40	5¼" Rack	585*	605	90	L5R18-40
	14 to 16	85	5¼" Rack	595	645	80	VP15-85

Voltage (Nominal)	Voltage Range VDC	Max. Current Amps	Package Size	Price $ Non Metered	Price $ Metered	OV Option $	Model**
24	18.5 to 27.5	10	½ Rack	340	390	60	LHS24-10
	18.5 to 27.5	15	3½" Rack	458*	478	75	L3R24-15
	18.5 to 27.5	30	5¼" Rack	585*	605	90	L5R24-30
	23 to 26	60	5¼" Rack	595	645	80	VP24-60
28	22 to 33	9	½ Rack	340	390	60	LHS28-9
	24 to 33	15	3½" Rack	458*	478	75	L3R28-15
	24 to 33	30	5¼" Rack	585*	605	90	L5R28-30
	26 to 30	50	5¼" Rack	595	645	80	VP28-50
50	32 to 53	5.8	½ Rack	440	490	60	LHS48-5.8
	32 to 53	8.5	3½" Rack	458*	478	75	L3R48-8.5
	32 to 53	17	5¼" Rack	585*	605	90	L5R48-17
	50 to 83	2.8	½ Rack	440	490	60	LHS65-2.8
	50 to 83	6	3½" Rack	510*	530	75	L3R65-6
	50 to 83	12	5¼" Rack	630*	650	90	L5R65-12
100	80 to 126	2.1	½ Rack	490	540	60	LHS100-2.1
	80 to 126	4	3½" Rack	545*	565	75	L3R100-4
	80 to 126	8	5¼" Rack	630*	650	90	L5R100-8
150	115 to 161	1.9	½ Rack	490	540	60	LHS150-1.9
	115 to 161	3	3½" Rack	545*	565	75	L3R150-3
	115 to 161	6	5¼" Rack	630*	650	90	L5R150-6

*This unit is normally stocked in metered version. NM (non-metered) units available on special order.
**Detailed specifications for these units available on request.

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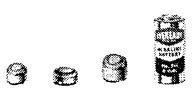
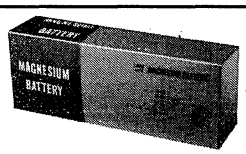
...From the manufacturer of the most complete dry battery line in the world.

	FEATURES	APPLICATIONS
CARBON ZINC	Low cost, voltage drops gradually with use, variety of shapes and sizes ranging from 1.5 to 510 volts.	Radios, barricade flashers, telephone amplifiers, marine depth finders, toys, lighting systems, signaling circuits, novelties, flashlights, cameras and flash guns, paging devices, laboratory instruments, cassette tape recorders and players.
ALKALINE MANGANESE Primary-Secondary	Good low temperature performance, voltage falls gradually with use, good shelf life, low impedance, 50 to 100 percent more energy than carbon-zinc batteries, high efficiency under continuous or heavy-duty high-drain conditions.	Radios, heated clothing, bicycle lights and horns, shavers, electronic photoflash, lighting systems, movie cameras, radio-controlled models, model-plane ignition, toys, television sets, cassette tape recorders and players. Portable communication systems.
NICKEL CADMIUM	Hermetically sealed, maintenance free, relatively constant discharge voltage, good high and low-temperature performance, competitive in terms of cost per hour of use, high resistance to shock and vibration, button/cylindrical/rectangular configurations, long life, low self-discharge rate, high effective capacitance.	Portable hand tools and appliances, shavers, toothbrushes, photoflash equipment, dictating machines, movie cameras, instruments, portable communication equipment, tape recorders, slide projectors, radios, television sets, blenders, office equipment.
MERCURIC OXIDE	Excellent high-temperature performance, constant voltage under discharge, long shelf life.	Secondary voltage standard, radios, walkie-talkies, paging devices, radiation detection, test equipment, hearing aids, transistorized instruments, electric watches.
SILVER OXIDE 	Constant voltage under discharge, good low-temperature performance, excellent shelf life.	Hearing aids, electric/electronic watches, reference voltage source, photo-electric exposure devices, instruments, wireless microphones, electronic thermometers.
MAGNESIUM 	Reliable, lightweight, high performance, excellent high temperature storage capabilities.	Military electronic communications and portable radar equipment.
LEAD-ACID	Spill-resistant, lightweight, pressure vented construction, no maintenance, high discharge rate capability, relatively high cycle life, economical.	Portable TV sets, portable light systems, camping and underwater sport equipment, portable power tools, radios, transmitters and receivers, emergency lighting, portable lawn and garden tools, tape recorders, record players, toys, alarm systems.

Union Carbide Corporation provides a consulting service of experienced battery engineers as an aid to manufacturers in need of special battery designs. For help with your specific battery problems, call (212) 551-3833 or write Battery Engineering Dept. No. 18 in New York (address shown below).

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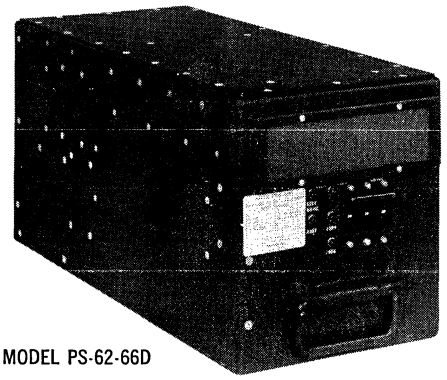
UNION CARBIDE
The Discovery Company

FREQUENCY CONVERTERS
400 Hz to 60 Hz
SINE WAVE OUTPUT

Meets Applicable MIL Specifications for Airborne and Ground Support Equipment



MODEL PS-62-66D

FEATURES

■ High efficiency ■ RFI protection ■ Short circuit and overload protection ■ Long, maintenance-free operation ■ Self-contained cooling ■ Light weight ■ Low distortion

APPLICATIONS

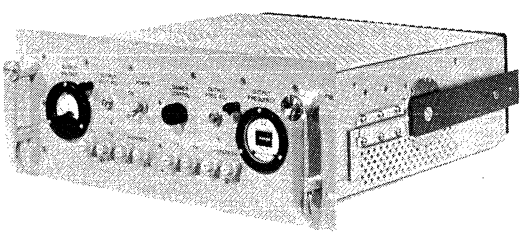
These converters provide a dependable source of 60 Hz sine wave power for airborne and air-transportable test equipment. They are also used with 60 Hz ground equipment wherever primary power available is 400 Hz. Applications include use with oscilloscopes, metering equipment, recorders, cryptographic machines, and teletypes.

MODEL	POWER	INPUT (VAC*)	OUTPUT (VAC†)	SIZE (Dim. in Inches)	WT. (Lbs.)
PS-65-225-7	400 VA	115/200	115 ± 5%	7.8 x 5.2 x 21.3	27
PS-64-162	750 VA	115/200	115 ± 5%	7.5 x 12.0 x 20.5	63
PS-69-359	2000 VA	115/200	115 ± 2.5%	10.0 x 9.0 x 21.6	80
PS-62-66D	3500 VA	115/200	115 ± 2.5%	10.0 x 9.0 x 21.6	95
PS-61-33D	8000 VA	115/200	115 ± 2.5%	12.2 x 20.0 x 23.5	230

*All units available with other input voltages, and frequencies of 360-1000 Hz.
†All standard units available with frequency regulation of ±1.0%. Tighter regulation available on special request.

FREQUENCY CONVERTERS
60 Hz to 400 Hz
SINE WAVE OUTPUT

Meets Applicable MIL Specifications for Shipboard and Ground Support Equipment



MODEL PS-65-243-1

FEATURES

■ High efficiency ■ Small size ■ Light weight ■ Low distortion ■ Virtually no audible noise ■ Long, maintenance-free operation ■ Short circuit and overload protection ■ RFI protection

APPLICATIONS

Extremely stable and quiet-operating, these converters are excellent for flight simulators, and wherever 400 Hz power is required to operate airborne-type equipment. Other applications include ground support systems, design and test labs, and shipboard installations.

MODEL	POWER	INPUT (VAC)	OUTPUT (VAC†)	SIZE (Dim. in Inches)	WT. (Lbs.)
PS-65-243-1	1000 VA	115**	115 ± 2%	7.0 x 19.0 x 20.5	87
PS-67-325R	2000 VA	115/200**	115 ± 2%	17.5 x 19.0 x 21.5	150
PS-67-326R	2500 VA	115/200**	115/200 ± 2%	17.5 x 19.0 x 21.5	165
PS-68-346R	3500 VA	115/200**	115 ± 2%	17.5 x 19.0 x 21.5	190
PS-65-216-2	8000 VA	115/200§	115/200 ± 2%	19.3 x 19.0 x 21.8	264
PS-70-367R	10000 VA	115/200§	115/200 ± 2%	19.3 x 19.0 x 21.8	295

†All standard units available with frequency regulation of ±1.0%. Tighter regulation available on special request.
**Input frequency 47-63 Hz. §Input frequency 47-420 Hz.

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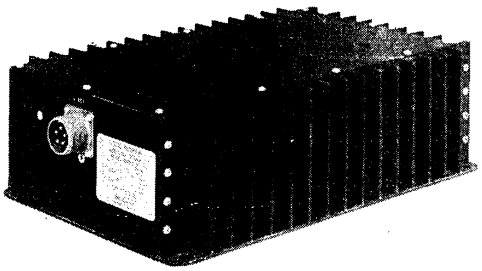
STATIC INVERTERS

28 VDC to 400 Hz
SINE WAVE OUTPUT

Meets Applicable MIL Specifications for Airborne and Ground Support Equipment



MODEL 4SI-500-1P

FEATURES

■ Overload and short-circuit protected ■ High efficiency ■ Light weight ■ Voltage-regulated ■ Low distortion ■ Stable output frequency ■ Long, maintenance-free operation ■ Virtually no audible noise ■ RFI protection

APPLICATIONS

These inverters are ideal for providing AC power from DC sources to one or more items of airborne equipment, and also are excellent sources of power for 400 Hz ground support equipment. Typical applications include use with weather radar, Doppler navigation systems, artificial horizons, omni's, autopilots, ADF, DME, transceivers, transponders, and engine analyzers.

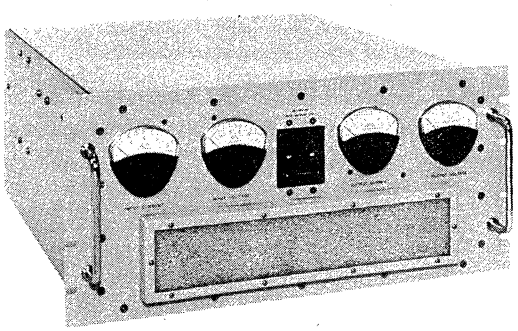
MODEL	POWER	INPUT (VDC)	OUTPUT (VAC†)	SIZE (Dim. in Inches)	WT. (Lbs.)
4SI-125-1P	125 VA	24 to 32	115 ± 2%	3.4 x 6.0 x 9.7	9
4SI-250-1P	250 VA	24 to 32	115 ± 2%	4.2 x 6.5 x 11.2	14
4SI-500-1P	500 VA	24 to 32	115 ± 2%	4.2 x 8.7 x 14.7	25
4SI-750-3P	750 VA	24 to 32	115/200 ± 2%	7.7 x 10.2 x 17.4	47
PS-68-350	3000 VA	22.5 to 30	115/200 ± 3%	19.9 x 21.6 x 25.3	355

†All standard units available with frequency regulation of ±1.0%. Tighter regulation available on special request.

STATIC INVERTERS

28 VDC to 60 Hz
SINE WAVE OUTPUT

Meets Applicable MIL Specifications for Airborne and Ground Support



MODEL PS-67-324-1

FEATURES

■ High efficiency ■ Light weight ■ Small size ■ Low distortion ■ Virtually no audible noise ■ Long, maintenance-free operation ■ Short circuit and overload protection ■ RFI protection.

APPLICATIONS

For aircraft instrumentation systems with 28 VDC electrical systems, and for flying laboratories, these instruments provide an excellent source of 60 Hz power. Applications for these inverters include power for oscilloscopes, meters, cryptographic machines, teletypes, and recorders.

MODEL	POWER	INPUT (VDC)	OUTPUT (VAC†)	SIZE (Dim. in Inches)	WT. (Lbs.)
PS-65-178B	250 VA	24 to 32	115 ± 2%	7.9 x 10.4 x 14.0	35
PS-65-236	500 VA	24 to 32	115 ± 2%	7.9 x 10.4 x 17.3	65
PS-63-81A	1000 VA	24 to 32	115 ± 2%	8.8 x 19.0 x 20.2	100
PS-67-324-1	2000 VA	24 to 32	115 ± 5%	8.8 x 19.0 x 20.0	178
PS-64-154-1	3600 VA	24 to 32	115 ± 5%	13.0 x 22.8 x 24.4	260

†All standard units available with frequency regulation of ±1.0%. Tighter regulation available on special request.

UNITRON
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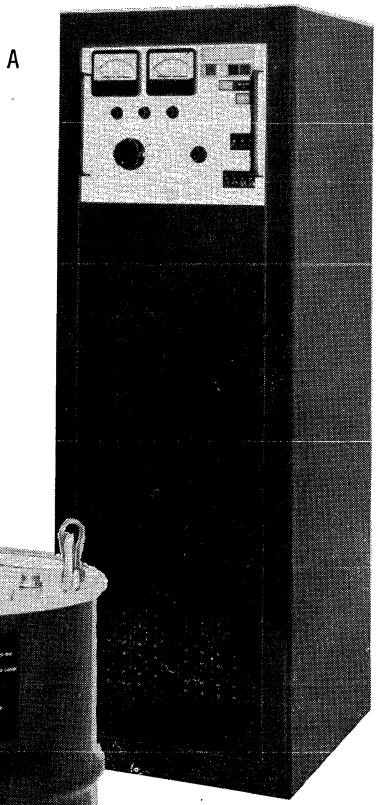
high VOLTAGE DC POWER SUPPLIES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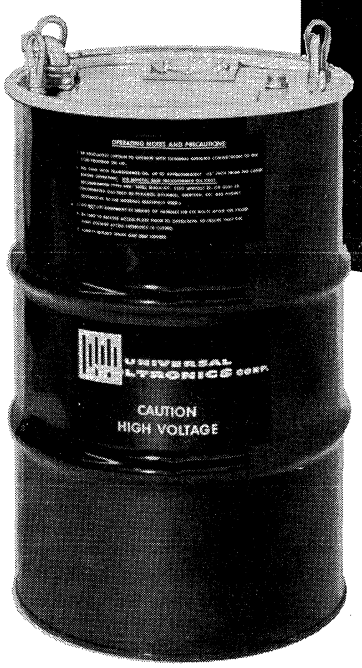

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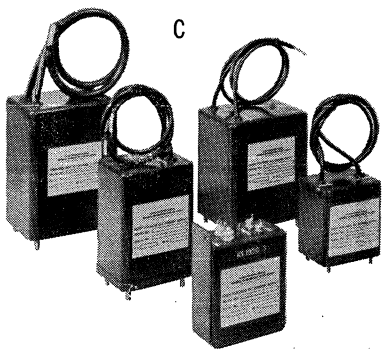
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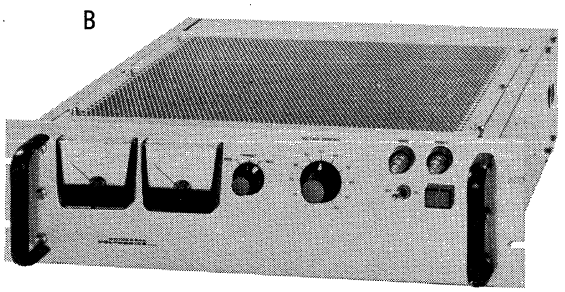

B

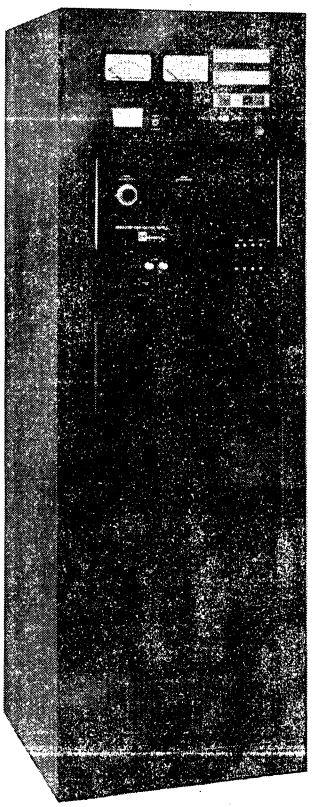
ADJUSTABLE OUTPUT POWER SUPPLIES

Series "BA" adjustable power supplies and series "BP" power packs are available at voltage ratings from 1 KVDC through 2000 KVDC at output power ratings from 1 watt to 250 kilowatts continuous. The adjustable series includes applications oriented control features and package design as shown in photos A and B. The power pack series (photos C and D) has many applications in OEM systems and for general laboratory use.

Every UVC power supply includes conservatively rated high voltage components designed and manufactured under the strict control of the specialized UVC technical staff to insure continuous duty, long term, trouble free operation. A one year factory backed and field supported warranty policy accompanies each shipment.

LOOK AT THESE FEATURES

1. **Ripple** Each power supply offers a standard ripple specification of 5% maximum or better. Optional filters and attenuators are available for every UVC supply to reduce ripple to as low as .01% rms.
2. **Polarity** Each power supply offers the flexibility of reversible output polarity performance.
3. **Protection** Overvoltage and overcurrent protection features are available as both adjustable range and fixed value circuits. All access areas and doors are interlocked for personnel protection and all energy storage components and circuits are discharge protected for personnel protection.
4. **Package** Rack mounted, floor and bench operable as well as portable design are among the packages available for UVC standard high voltage power supplies.

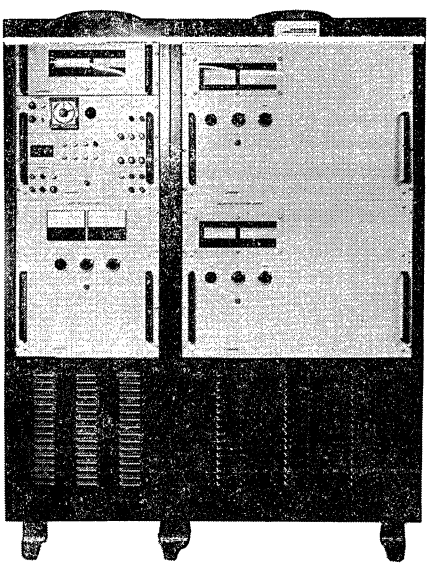


PRECISELY REGULATED EQUIPMENT

Precisely regulated performance over wide adjustment range, low ripple, fast response and high stability enable the series "BRE" power supplies to be used in exacting work for x-ray spectroscopy, electron microscopes, TWTs, ion bombardment experiments, particle separators.

These precisely regulated power supplies are available in voltage ratings from 1 KV through 500 KVDC at continuous duty output power up to 100 KW. Our regulation circuitry techniques realize performance specifications which are virtually independent of input line variations or no load-full load changes. Ripple in most cases is 0.01% rms and the output polarity is available as both fixed and reversible. Two voltage adjustment schemes are offered, namely digital dialable control for the most exacting applications and continuous coarse and vernier controls. In the digital dialable scheme, we allow for adjustment in increments of 10 KV, 1 KV, 100 volts, 10 volts, 1 volt and 0-1 volt vernier. This system provides the assurance that the actual output is always within 1% of the dial readings. As indicated, you may select a coarse and vernier voltage adjustment scheme and realize economic savings without sacrificing basic regulated performance. Regulation accuracy of $\pm 0.25\%$; $\pm 0.1\%$; $\pm 0.05\%$ and $\pm 0.01\%$ for line or load changes are available on most series "BRE" power supplies.

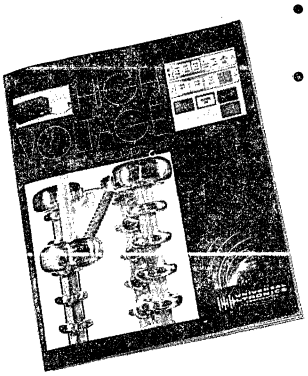
TWT/CFA POWER SUPPLY SYSTEMS



Chances are your TWT tubes were production tested by a UVC Power Supply. As a matter of record, UVC has been supplying power supplies to leading TWT manufacturers for low, medium and high power TWT's that not only satisfy the demanding requirements of TWT production, quality control and life testing, but in-the-field performance and reliability as well.

You can forget about power problems when you marry your TWT's to UVC Black Boxes. They are available with Cathode, Heater, Collector, Anode and Helix outputs. Each UVC Black Box system features:

- **Pulsed or CW operation**
- **Turn ON/OFF Sequence Control To Insure Safe and Proper Performance**
- **Fast-Acting Crowbar Protection**



Write or phone for Catalog UVC-E-72 containing complete specifications for the extensive line of UVC high voltage power supplies.

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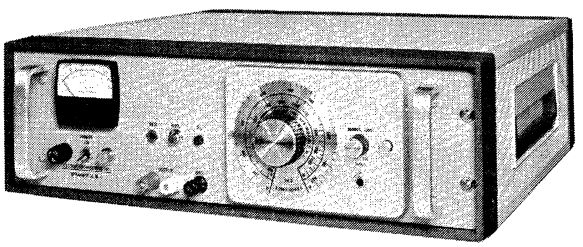
FREQUENCY CONVERTERS, AC POWER SUPPLIES SINGLE and THREE PHASE

SOLID STATE "S" SERIES POWER SUPPLIES

THE STANDARD "S" SERIES FEATURES:

- All silicon solid state components.
- Multiple output voltages 0-32, 0-75, 0-135, 0-270.
- Instantaneous overload protection.
- Accepts over 50 different plug-in oscillators
- Frequency stabilities to 0.001%.
- 18 models from 130VA to 4500VA.
- 45 Hz to 10,000 Hz frequency range.



MODEL 200S-B/V141B

All aluminum parts are finished in gold iridite or black anodize. Steel parts are cadmium plated and finished with gold iridite. Front panels are standard Vector light blue gray semi-gloss enamel. Other paint available on special order. Furnish color chip and federal specification number.

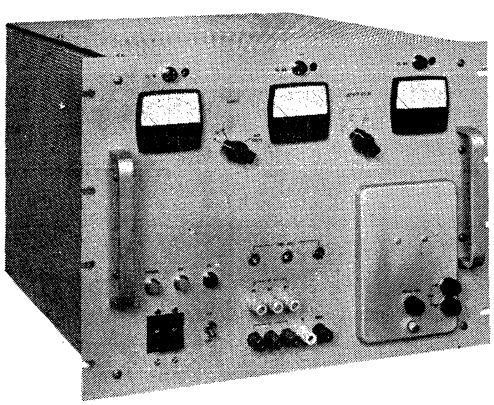
SINGLE PHASE OUTPUT

MODEL	POWER OUTPUT VA	DIMENSIONS (INCHES) H	W	D	APPROX. WEIGHT
130S	130	5¼	19	14	53
200S	200	5¼	19	14	60
300S	300	7	19	20	90
500S	500	7	19	20	105
600S	600	7	19	20	125
750S	750	14	19	20	190
1000S	1000	14	19	20	215
1500S	1500	14	19	20	235

THREE PHASE OUTPUT

MODEL	POWER OUTPUT VA	DIMENSIONS (INCHES) H	W	D	APPROX. WEIGHT
Y150S	150	5¼	19	17	85
Y390S	390	5¼	19	17	115
Y500S	500	7	19	20	150
Y600S	600	7	19	20	165
Y900S	900	14	19	20	240
Y1500S	1500	14	19	20	320
Y1800S	1800	14	19	20	390
Y2700S	2700	24½	19	20½	360
Y3000S	3000	24½	19	20½	370
Y4500S	4500	51	26	24	750

"T" SERIES HIGH POWER FREQUENCY CONVERTERS



MODEL Y2500T/F34C

The "T" Series of regulated AC power sources is an extension of the "S" Series in the higher power range with outputs up to 20,000 VA. The standard "T" Series feature all silicon solid state components except for the output stage where rugged, forced air vacuum tubes are used. These units can also be used as higher power audio amplifiers. The supplies are compact, ruggedly constructed, and contain all of the electrical and mechanical features of the "S" Series.

SINGLE PHASE OUTPUT

MODEL	POWER OUTPUT VA	DIMENSIONS (INCHES) H	W	D	APPROX. WEIGHT
1000T	1000	14	19	20	265
1500T	1500	21	19	17	310
2000T	2000	21	19	17	325
2500T	2500	21	19	17	350
5000T	5000	45	25	25	845
10000T	10000	56	42	42	1600
15000T	15000	56	42	34	1700
20000T	20000	56	42	34	2100

THREE PHASE OUTPUT

MODEL	POWER OUTPUT VA	DIMENSIONS (INCHES) H	W	D	APPROX. WEIGHT
Y1250T	1250	14	19	20	285
Y1500T	1500	14	19	20	345
Y1800T	1800	14	19	20	355
Y2000T	2000	14	19	20	360
Y2500T	2500	14	19	20	365
Y5000T	5000	45	25	25	940
Y7500T	7500	45	25	25	975
Y15000T	15000	78	35	36	1700
Y20000T	20000	78	35	36	1900

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ELECTRICAL SPECIFICATIONS FOR "S" and "T" SERIES

Input Voltage: 105 to 125 Volts AC single phase for all units 1000 VA and below (nominal 115 Volts). All models from 1250VA to 20,000VA are normally supplied with 208/230 Volts AC three phase input.

Input Frequency: 47 to 65 Hz.

Output Configuration: Single phase models have two wire floating output (one side may be grounded) insulated for 500 Volts RMS.

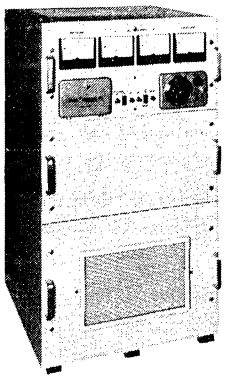
Output Voltage: Adjustable 0 to 32, 0 to 75, 0 to 135 and 0 to 270 Volts AC.

Voltage Regulation: Less than 0.5% for no load to full load change. ±0.5% for rated input voltage change.

Load Power Factor: 0.7 lead or lag to unity at rated output; wider power factor range with slight derating.

Output Wave Shape: Sine wave. Less than 3% total harmonic distortion over the 45-10000 Hz frequency range. Less than 2% 45 to 6000 Hz.

Hum and Noise: 60 db below maximum output voltage.



Model 5000T/V135C

ADDITIONAL SPECIFICATIONS FOR THREE PHASE UNITS

Output Configuration: Three Phase, 4 wire wye, neutral floating.

Output Voltage: 0-135 Volts line-to-line and 0-234 Volts line-to-line; both sets of terminals are presented at output. Full power available at output of 115-135 Volts and 200-234 Volts. Master gain control and phase 2 and 3 trim controls provided on the Plug-In Oscillator.

Unbalanced Phase Loading: Separate power amplifiers and regulation circuits are provided for each output phase. Therefore, unbalanced phase loading has negligible effect as long as the rated output power per phase is not exceeded.

Output Phase Separation: 120 ±1° for fixed frequency models as well as 300-500 Hz models. 120 ±2° for 45-75 and 320-2,000 Hz models. 120 ±3° for 45-6,000 and 45-10,000 Hz models.

Output Power: Rated output power for each model is shown on the chart. Maximum power per phase is ⅓ of 3φ output.

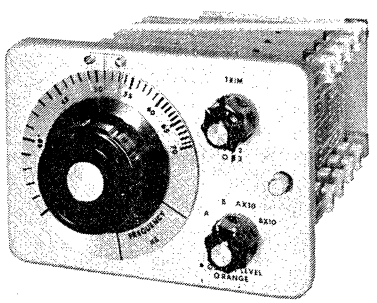
Protective Circuits: All models are equipped with instantaneous overload protection and front panel reset. An overload in any phase causes all phases to shut down, thus protecting 3φ loads. Front panel lamps also indicate which phase has been overloaded.

Meters: Models rated 150VA to 600VA are furnished with output voltmeter and selector switch to monitor any line-to-line and line-to-neutral voltage. Models rated 900VA to 20KVA have three (3) output voltmeters with selector switch to monitor any line-to-line and line-to-neutral output voltage as well as plate current of the 3φ amplifier for the T series.

PLUG-IN OSCILLATORS FOR "S" and "T" SERIES

These oscillators feature all silicon solid state components and precision variable frequency determining elements and are available in **single phase, two phase,** and **three phase.** All single phase oscillators are provided with an external signal input.

Frequency Stability: Oscillators may be ordered with frequency stability ranges from ±0.5% thru ±0.001% as shown in the table below.



	PLUG-IN OSCILLATORS									
	SINGLE PHASE FREQUENCY STABILITY					THREE PHASE FREQUENCY STABILITY				
OUTPUT FREQUENCY	±0.5%	±0.25%	±0.1%	±0.01%	±0.001%	±0.5%	±0.25%	±0.1%	±0.01%	±0.001%
50 Hz	F15A	F15B	F15C	F15D	F15E	F35A	F35B	F35C	F35D	F35E
60 Hz	F16A	F16B	F16C	F16D	F16E	F36A	F36B	F36C	F36D	F36E
400 Hz	F14A	F14B	F14C	F14D	F14E	F34A	F34B	F34C	F34D	F34E
800 Hz	F18A	F18B	F18C	F18D	F18E	F38A	F38B	F38C	F38D	F38E
50/60/400/800 Hz	F158A	F158B	F158C	Spec. Ord.	Spec. Ord.	F358A	F358B	F358C	Spec. Ord.	Spec. Ord.
45-75 Hz	V147A	V147B	V147C	X	X	V347A	V347B	V347C	X	X
300-500 Hz	V135A	V135B	V135C	X	X	V335A	V335B	V335C	X	X
320-2,000 Hz	V132A	V132B	V132C	X	X	V332A	V332B	V332C	X	X
45-6,000 Hz	V146A	V146B	X	X	X	V346A	V346B	X	X	X
45-10,000 Hz	V141A	V141B	X	X	X	V341A	V341B	X	X	X
45-10,000 Hz	ESA-1 External Signal Adapter					ESA-3 External Signal Adapter				

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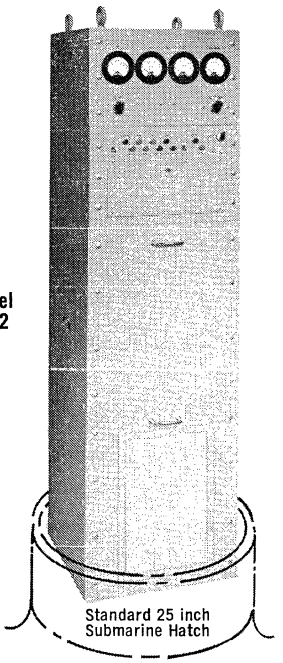
WIDE BAND-POWER AMPLIFIERS

"STV" SERIES 1 KVA to 100 KVA

MODEL	POWER KVA	INPUT	POWER FACTOR	STANDARD OUTPUT IMPEDANCE TAPS	DIMENSIONS (INCHES) H	W	D
A1S	1	115V, 1ϕ, 60 Hz	±0.3 to unity	4-16-36-144	21	19	17
S1S	1	115V, 1ϕ, 60 Hz	±0.3 to unity	4-16-36-144	21	17	17
A1T	1	115V, 1ϕ, 60 Hz	±0.0 to unity	4-16-36-144	21	19	17
S1T	1	115V, 1ϕ, 60 Hz	±0.0 to unity	4-16-36-144	21	17	17
A2T	2	208/230V, 3ϕ, 60 Hz	±0.1 to unity	4-16-36-144	21	19	17
S2T	2	416/460V, 3ϕ, 60 Hz	±0.1 to unity	4-16-36-144	21	17	17
A5T	5	208/230V, 3ϕ, 60 Hz	±0.1 to unity	8-32-72-288	45	25	25
S5T	5	416/460V, 3ϕ, 60 Hz	±0.1 to unity	8-32-72-288	61	17	17
A10T	10	416/460V, 3ϕ, 60 Hz	±0.1 to unity	16-64-144-576	56	42	34
A20T	20	416/460V, 3ϕ, 60 Hz	±0.3 to unity	16-64-144-576	56	84	34
A30V	30	416/460V, 3ϕ, 60 Hz	±0.1 to unity	16-64-144-576	70	70	36
A50V	50	416/460V, 3ϕ, 60 Hz	±0.1 to unity	8-32-128	70	70	36
A100V	100	416/460V, 3ϕ, 60 Hz	±0.1 to unity	8-32-128	80	140	50



ELECTRICAL SPECIFICATIONS

Input Signal: 1.0 volt RMS required for rated output.

Signal Input Impedance: 600 ohms single ended.

Output Configuration: 2 wire floating.

Output Frequency: 100 Hz to 10 KHz. Other frequency ranges from 5 Hz to 500 KHz are available in some models.

Frequency Response: ±0.5 db, 100 Hz to 10 KHz.

Harmonic Distortion: 3% maximum.

Hum & Noise: −60 db below full output.

Duty Cycle: Continuous at full rated VA including stated power factor. Pulse operation may be employed. (Consult Vector Engineering Department for details.)

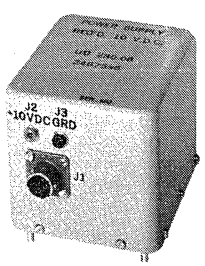
NOTES

Models S1S, S1T, S2T and S5T are provided with eyebolts and are capable of passing through a standard 25" submarine hatch.

For dual input of 208/230 and 416/460V specify —2 after Model No. (S5T—2).

CUSTOM DC POWER SUPPLIES MIL SPEC or COMMERCIAL

- MP SERIES: MIL SPEC MINIATURE LOW VOLTAGE REGULATED POWER SUPPLIES
- MPC SERIES: CONSTANT CURRENT FOR AVALANCHE DIODE OSCILLATORS
- PM SERIES: HIGH VOLTAGE REGULATED POWER SUPPLIES
- CP SERIES: HIGH VOLTAGE LONG TERM STABILITY



CP SERIES

MODEL	MAIN OUTPUTS	LINE & LOAD REGULATION
CP-2202-HV	−3200 Volts @ 23 ma	±0.05%
CP-2156-HVR	1 to 50,000 Volts @ 0-50 ma	±0.0005%
CP-2020-VTR	1000-3000 Volts @ 0-50 ma	±0.005%
CP-2065-CC	0 to 25 Volts @ 1 to 10 Amps	±0.001%
CP-2213-TR	750 Volts @ 0 to 85 ma	±0.01%
CP-2210-HV	−875 to −1265 Volts @ 80 Watts	±0.02%

PM SERIES

MODEL	OUTPUT VOLTAGE	RIPPLE P-P
PM-1K-01A	200-1800	2 mv
PM-2K-01A	500-2500	3 mv
PM-3K-01A	500-3500	4 mv

MPC SERIES

MODEL	CURRENT RANGE	VOLTAGE COMPLIANCE
MPC-10025	8-25 ma	50-100 Volts
MPC-10050	10-50 ma	50-100 Volts
MPC-7080	12-80 ma	30-70 Volts
MPC-50100	15-100 ma	10-50 Volts
MPC-30200	30-200 ma	0-30 Volts

MP SERIES

MODEL	REGULATED OUTPUT VOLTAGE
MP-51	5 Volts @ 0.1 Amp
2MP-55	+5 Volts and −5 Volts @ 0-0.5 Amp
2MP-93	+9 Volts and −9 Volts @ 0-0.3 Amp
MP-96	9 Volts @ 0-0.6 Amp
2MP-1525	+12 Volts and −12 Volts @ 0-0.3 Amp
MP-126	12 Volts @ 0-0.6 Amp
2MP-1526	+15 Volts and −15 Volts @ 0-0.25 Amp
MP-155	15 Volts @ 0-0.5 Amp
MP-302	30 Volts @ 0-0.2 Amp
MP-601	60 Volts @ 0-0.1 Amp
MP-12005	120 Volts @ 0-0.05 Amp
MP-55DC	+5 Volts and −5 Volts @ 0-0.5 Amp 28 Volt DC Input

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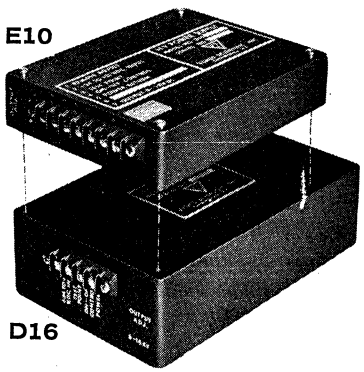
HIGH CURRENT DISPLAY POWER SUPPLIES

Stable, low ripple, high voltage supplies modularly assembled for use in precision display systems...or be used individually as precision high voltage sources.

Model D-16 is an adjustable 8-16KV high voltage power supply featuring tight regulation, low ripple and solid state reliability. This unit is capable of delivering 1 ma of current at full output voltage. Additional features include a logic controlled on-off sweep failure protection circuit, a high voltage monitoring test point and short circuit and reverse polarity protection.



SPECIFICATIONS	MODEL D-16
Input	24 to 30VDC
Output	8-16KV (adjustable) @ 1ma
Regulation	Line—.003% Load—.06%
Ripple	.015% P-P @ F.L.
Mechanical	Size 5" x 8" x 2¼", Fully encapsulated & Shielded
Oper. Temp.	−25°C to +71°C
Temp. Coefficient	±100PPM/°C
Test Point	Scale Factor 1V/1KV
Logic Control	T²L Compatible
Price	$490.

Model E-10 (output 100 to 1000VDC) is a precision regulated modular high voltage power supplies featuring tight regulation and low ripple. These reliable, all silicon units are ideally suited for photomultiplier, CRT focus, laboratory and systems application. The output is controllable by a screwdriver adjustment on the unit or remotely by an analog signal 0-12VDC. Additional features include logic controlled on-off, a high voltage monitoring test point and short circuit and reverse polarity protection.

SPECIFICATIONS	MODEL E 10
Input	24 to 31VDC
Output	100 to 1000VDC @ 10ma
Regulation	Line .01%, Load .1%
Ripple P-P	.02% (<200mvP-P @ F.L.)
Oper. Temp.	−25°C to +71°C
Logic Control	T²L Compatible
Test Point (Scale Factor)	1V/100V ±10%
Mechanical	5" x 6½" x 1⅜"
Price	$280.

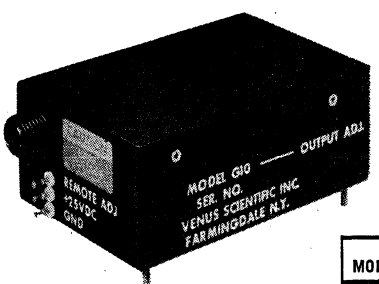
For applications requiring dual output voltage the E10 may be combined with the D16 and ordered as integral assembly from the factory. The units will be supplied bolted together, with common inputs externally strapped together.

PRECISION MINIATURE CATHODE RAY TUBE POWER SUPPLIES

The G Series precision regulated high voltage power supplies are mil type DC to DC converters featuring high efficiency and high reliability in miniature packages. These units are particularly useful in airborne applications.

FEATURES:

- All Silicon Circuitry
- Remotely Adjustable
- Short Circuit and Reverse Polarity Protected
- Shielded and Encapsulated
- Mil-E-5400
- MTBF 42,000 hrs.



G SERIES

Input Voltage	24 to 32VDC (50DVC Surge)
Output Current	500ua (max)
Efficiency	>50%
Temp Range	−55°C to +71°C
Temp Coefficient	.025%/°C from−55°C to +71°C
Size/Weight	3¾" x 2⅝" x 1½" (15 cu in) / 1¼ lb.
Altitude	0-50,000 ft.

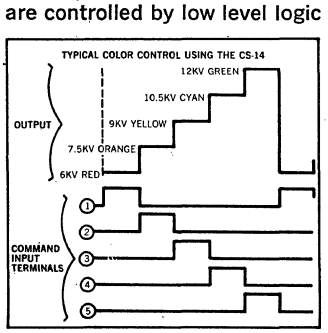
MODEL	OUTPUT VOLTAGE RANGE	LINE/LOAD REG.	RIPPLE P-P AT FULL LOAD	PRICE
G-5	500V to 5000V	0.1%	0.15%	$450
G-10	1000V to 10,000V	0.1%	0.15%	$490
G-12	1200V to 12,000V	0.1%	0.15%	$550

FAST SWITCHING "COLOR DISPLAY" HIGH VOLTAGE POWER SUPPLY

The CS-14 is a programmable solid state high voltage power supply capable of step switching its output voltage over a range of 6-14KV and thereby varying the accelerating potential necessary for beam penetration CRT operation.

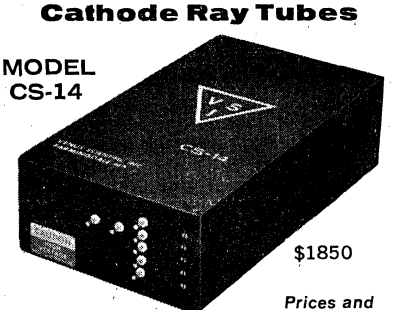
This unit has provision for 5 individually adjustable preset output potentials. These levels are controlled by low level logic commands to any one of five input terminals.

Designed for use with Color Beam Penetration Cathode Ray Tubes



Input Power	28VDC ±10% @ 800ma
Command Signal	2.5V to 5.5V
Output	Switchable 5 levels 6KV to 14KV
Repetition Rate	60Hz (ie) a sum total of 8KV switching transitions permitted per each 16msec period
Capacitive Load	600Pf (max)
DC Load	4.5W (max)
Slewing Rate	20V/usec (with 150Pf load)
Settling Time	75usec to within 100V of final value
Regulation Line/Load	0.5%
Ripple P-P	0.1%
Size	4" x 7½" x 1⅞"

MODEL CS-14



$1850

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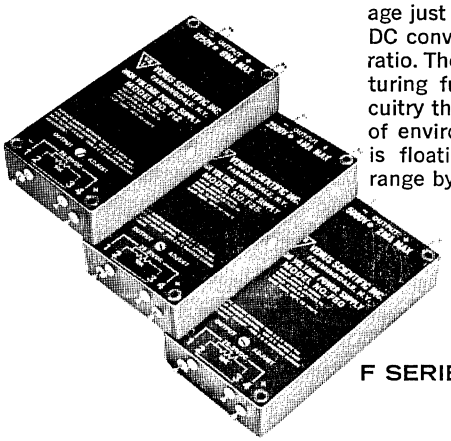
MINIATURE PMT AND FOCUS HIGH VOLTAGE POWER SUPPLIES



F SERIES

10 watts of high voltage power in a package just 6.4 cu. inc. These versatile DC to DC converters offer a high power to size ratio. The F-Series are rugged devices, featuring fully encapsulated all silicon circuitry that will perform over a wide range of environmental conditions. The output is floating and adjustable over a wide range by means of a screw driver adjustment or remotely controlled by means of an external resistance.

COMMON SPECIFICATIONS:

Input Voltage	25 to 31VDC 50V 1 sec. max.
Isolation	7000VDC
Input Current	590ma typical @ F.L.
Line Regulation	0.1%
Load Regulation	3.0% (½ F.L. to F.L.)
Temp Range	−55° to +100°C Case
Altitude	0-12,000 ft.
Efficiency	>60%
Minimum Load	None Required
M.T.B.F.	70,000 hours
Size	2" x 4" x 0.8"
Short Circuit & Reverse Polarity Protected	

MODEL	OUTPUT VOLTAGE RANGE	OUTPUT CURRENT	RIPPLE (P-P)	PRICE 1-9
F-6	600V to 300V	16ma	0.3%	$209.
F-12	1250V to 600V	8ma	0.3%	$235.
F-25	2500V to 1250V	4ma	0.3%	$260.
F-50	5000V to 2500V	2ma	0.4%	$285.

PHOTOMULTIPLIER POWER SUPPLIES

The K-Series high voltage power supplies offer extremely flexible operation in that the output is proportional to input voltage, and both input and output leads are floating. This permits operation from any desired combination of source and output polarities.

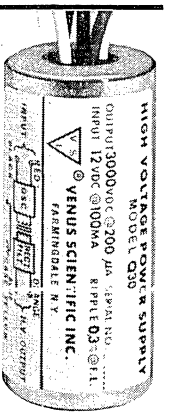
- **Small** — 1" Dia. x 2¼" long
- **Shielded** — Encapsulated
- **Qualified** per Mil-Std-810
- **Operates** from −55°C to +71°C
- **MTBF** >100,000 hrs. @ 71°C
- **Output Proportional to Input**
- **Fast Response**
- **Output Input Floating**
- **Short Circuit Protected**
- **Reverse Polarity Protected**

Photomultipliers / Flying Spot Scanners / Image Dissectors / Ionization Chambers / Scan Converters / CRT Bias and Focus Circuits / Scintillation Tubes / Geiger Counters

MODEL	INPUT	OUTPUT RANGE	RIPPLE (P-P)	EFFICIENCY @ FULL LOAD	PRICE 1-9
K-15	3V to 15V	300V to 1500V @ 1.0ma	0.1%	>50%	$149.
K-30	3V to 15V	600V to 3000V @ 0.5ma	0.5%	>50%	$158.
Q-30*	2V to 12V	500V to 3000V @ 0.2ma	0.25%	>60%	$168.
Q-15*	2V to 12V	250V to 1500V @ 0.4ma	0.5%	>60%	$168.

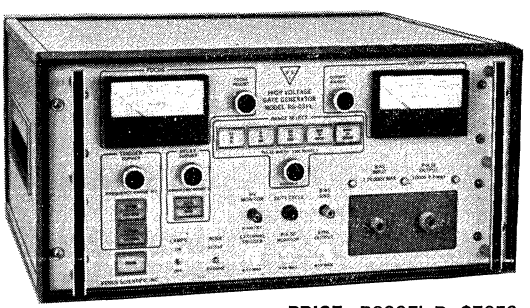
**The Models Q-30 and Q-15 utilizes highly efficient curcuitry which lends itself well to battery and other low power applications—Typical no load idling current is only 8ma.*

HIGH VACUUM ENVIRONMENT types are available. The K- and Q-Series power supplies will be supplied in 3" long cases with vacuum seal. To specify a high vacuum version add the suffix "Z" to the model number (i.e. K-30Z) and $30 additional to the unit price.



Q and K SERIES

HIGH VOLTAGE GENERATOR IMAGE INTENSIFIER TEST SET



R503FLC

PRICE: RS03FL R $7250
RS03FL C $7465

The RS03FL is a versatile laboratory and development instrument designed to provide the focus and cutoff potentials for image intensifier tubes. The 3KV gated output can be floated to ±25KV, and PRF to 10KHz is provided. Controls for focus voltage, cutoff voltage, PRF, pulse width and pulse delay are front panel mounted.

An option which permits reversing of the gating pulse direction to operate either MCP or conventional image intensifier tubes is also available.

APPLICATIONS

■ QC inspection/test ■ laboratory simulation ■ high speed shutter for image intensifier tube ■ automatic exposure control for intensifier tube or photomultiplier ■ LIDAR range gate ■ direct viewing image intensifiers ■ vidicon coupled image intensifiers

Venus Scientific Inc. manufactures special purpose "Gate" and "Zoom" power supplies for use in night vision and LLLTV equipment. These units are available as compact rectangular modules or in custom configurations.

SPECIFICATIONS

- **Pulse Amplitude (reference to photocathode bias level)**
  - **Focus (positive) Level**.....0 to 500VDC
  - **Cutoff (negative) Level**.....0 to −2500VDC
  - **Maximum Pulse Amplitude**....3000V peak-to-peak
- **Maximum Bias Voltage**.....±25KVDC
- **Rated Load** .....10^9 ohms shunted by 30pf
- **Pulse Repetition Rate**
  - **Internal Trigger**.....10 to 10,000Hz
  - **External Trigger**.....0 to 10,000Hz
    (+2 to +5v, 0.5 μsec. min. pulse width)
- **Dimensions:** 19 in. wide, 8¾ in. high, 14 in. deep
- **Color:** Gray with Black Trim
- **Weight:** 39 lbs.
- **Operating environment:** Laboratory conditions
- **Pulse Shape at Rated Load**
  - **Rise Time** .....55 nsec
  - **Fall Time** .....55 nec
  - **Flatness** .....±1%
  - **Overshoot & Noise** .....±3%
- **Pulse Width**.....0.5 μsec to 100 msec
- **Pulse Delay**.....0.3 to 50 μsec
- **Pulse Jitter**
  - **Width** 0.05%
  - **Delay** 0.05%
- **Power Source Required**
  115VAC 60CPS, 1 amp max.
- **Accessories supplied:** High voltage leads, bias ground strap, operator's guide
- **Case:** Model RS03FLR for rack mounting
  Model RS03FLC with cabinet

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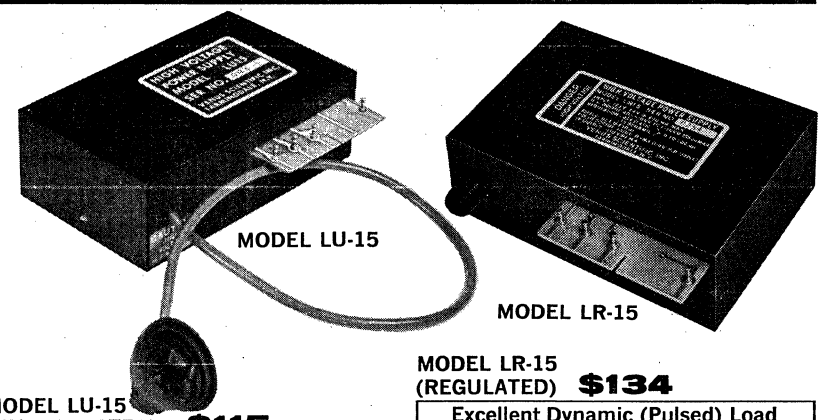
- Regulated and Unregulated Models Available
- Anode, G_1 and G_2 Outputs Provided
- Low Ripple, <0.05% P-P @ 250ua
- Short Circuit and Reverse Polarity Protected
- Fully Encapsulated Silicon Circuitry
- Acoustics — Inaudible >20Khz
- PC Connector and Turret Terminals Provided
- MTBF 52,000 Hours
- Off the Shelf Delivery



GENERAL SPECIFICATIONS:

Input Voltage	+3 to +15VDC (LU-15) +21 to +32VDC (LR-15)
Temperature Range:	0 to 60°C Operating
Terminations:	Anode—CRT Connector G_2, G_1 & Input—Card Edge & Terminals
Physical Dim.:	**LU-15** 3" x 5" x 1¾" **LR-15** 3¾" x 5" x 1¾"

MODEL LU-15 (UNREGULATED) $115

Outputs Proportional to Input Voltage		
Anode:	Voltage	+3KV to +15KV (Proportional to Input)
	Current	300ua (max.)
	Regulation	2%, ½ to Full Load
	Ripple	<.25% P-P @ 150ua Load
G_2:	Voltage	750VDC @ F.L.
	Current	1ma (max.)
	Ripple	.1% P-P @ F.L.
G_1:	Voltage*	0 to −150VDC
	Current	1ma (max.)
	Ripple	.25% P-P @ F.L.

MODEL LR-15 (REGULATED) $134

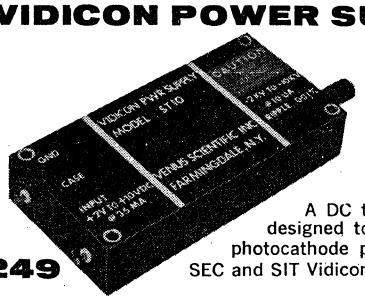
Excellent Dynamic (Pulsed) Load Regulation		
Anode:	Voltage	+10KV to +15V (Adjustable)
	Current	300ua (max.)
	Regulation (static) (Dynamic)	.03%, 0 to 250μa 10v/100μa load
	Ripple	.05% P-P @ 250ua load
G_2:	Voltage	750VDC @ F.L.
	Current	1ma (max.)
	Ripple	.05% P-P @ F.L.
G_1:	Voltage*	0 to −150VDC
	Current	1ma (max.)
	Ripple	.25% P-P @ F.L.

Determined by customer selected external zener diode

NEW PRODUCT — VIDICON POWER SUPPLY Model ST-10, -2KV to -10KV

- Output Proportional to Input
- May be Battery Operated
- Low Ripple only .001% P-P
- Short Circuit Protected
- Over Voltage Protected

$249



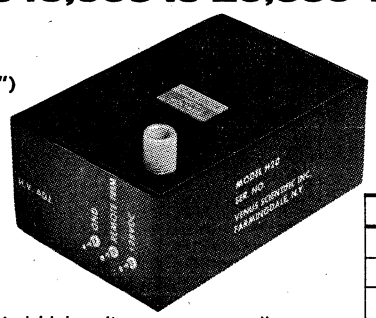
A DC to DC converter designed to provide photocathode potentials for SEC and SIT Vidicon tubes.

SPECIFICATIONS:

Output	−2 to −10 KVDC @ 10ua (Proportional to Input Voltage)
Input	+2 to +10VDC @ 35ma
Ripple	.001% P.P. @ Full Load
Frequency	40 to 50 KHZ
Size	2" x 4" x 0.8"
Weight	8 oz. approx.

COMPACT PRECISION REGULATED POWER SUPPLIES "H" Series 10,000 to 20,000 VDC (adjustable)

- Remotely Adjustable
- Compact—Just 30 cu. in. (4⅞" x 3⅛" x 2")
- High Efficiency >50%
- MTBF 58,200 hours
- Low Ripple, .05% Peak to Peak @ F.L.
- Short Circuit & Reverse Polarity Protected
- Mil-E-5400



Input Voltage	+28VDC
Regulation	.05%
Ripple	.05% P-P @ F.L.
Operating Temperature	−55°C to +71°C
Temp. Coefficient	100 PPM/°C

Model	Output Voltage & Current	Price
H-15	+10,000 to +15,000VDC @ 650ua	$560
H-15N*	−10,000 to −15,000VDC @ 500ua	$560
H-20	+10,000 to +20,000VDC @ 650ua	$680
H-20N*	−10,000 to −20,000VDC @ 500ua	$680

Negative versions are not remotely adjustable

The H Series precision regulated high voltage power supplies are mil type DC to DC converters featuring high efficiency and reliability in miniature packages. These units are particularly useful in airborne applications.

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Product Section	Volumes 1, 2, 3 Page	1973 Volume 4 Page	Products
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1200			Antennas & Accessories
1300	Vol.1•308	Vol.4•310	Audio Equipment & Accessories
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3100	Vol.3•1074		Insulators, Insulating Materials & Parts
3130	Vol.2•588	Vol.4•432	Integrated Circuits & Hybrid Microcircuits
3150	Vol.3•1089		Manufacturing, Subcontracting, Custom Fabrication
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3500	Vol.2•630	Vol.4•442	Motors, Rotating Components & Accessories
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3700	Vol.2•670	Vol.4•443	Photoelectric Equipment & Components
3800	Vol.2•680		Optical Equipment & Accessories
4000	Vol.1•571	Vol.4•444	Power Supplies, Converters, Inverters, Batteries, etc.
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4300	Vol.1•935		Recording Equipment (Non-Audio Types)
4500	Vol.2•683	Vol.4•472	Relays & Solenoids
4600			Research, Development, Engineering Services
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4800	Vol.2•896	Vol.4•504	Semiconductors & Devices, Rectifiers (Non-Tube Types)
4900	Vol.2•984		Servomechanisms & Components
5100	Vol.2•993	Vol.4•541	Switches, Circuit Breakers, Fuses, Protective Devices
5200	Vol.1•936		Telemetering Equipment
5300	Vol.2•1154		Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.
5400	Vol.3•1235	Vol.4•558	Tools (Hand & Power); Soldering Supplies
5500	Vol.2•1175		Transducers & Associated Equipment
5600	Vol.3•1244	Vol.4•561	Transformers
5700	Vol.2•1181		Tubes, Tube Parts, Shields, Inserts, etc.
5800	Vol.1•938		Ultrasonic, Sonic, Subsonic Equipment
5850			Vacuum Equipment & Accessories
5900			Vibrators, Choppers, etc.
6000	Vol.3•1311	Vol.4•566	Wire, Cable, Harnesses & Accessories

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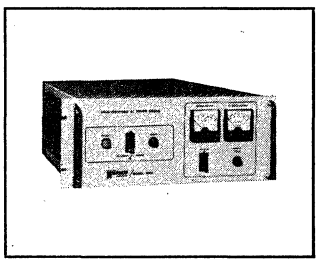
Division of Cox Broadcasting Corporation

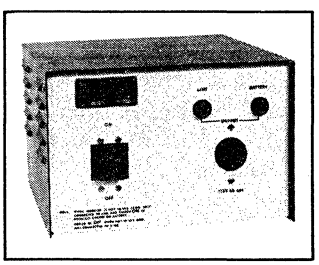
Wilmore Electronics Company, Inc.

SOLID-STATE POWER CONVERSION EQUIPMENT



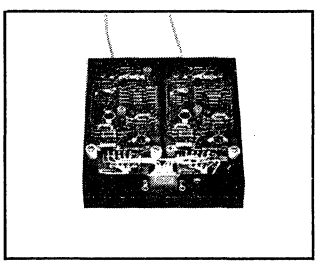
UNINTERRUPTIBLE AC POWER SOURCE (UPS)

Protects critical loads from temporary loss of commercial a-c power. True no-interruption performance. Well-regulated 115-V sine-wave output. Completely self contained. Built-in "float" battery charger and sealed long-life batteries. Electronic overload protection. MODEL 1202 is rated 250 VA. Depending upon load, reserve time for internal-battery operation varies from a minimum of 10 min. to more than one hour. 7″ x 19″ x 19″. 90 lbs. $975. Request Bulletin 3011.



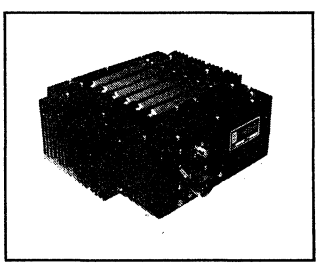
AUTOMATIC STANDBY AC POWER SOURCE

When commercial 115-Vac power is interrupted, unit switches to inverter operation, drawing power from external 12-V batteries. When commercial power is restored, internal battery charger recharges batteries. MODEL 1131-1057 with its internal precision 1057 inverter provides 250 VA for $525. MODEL 1131-1076 with its internal heavy-duty 1076 inverter provides 500 VA square-wave output for $510. Both are 7⅜″ x 11$\frac{1}{16}$″ x 15″ and 42 lbs. Request Bulletin 1031.



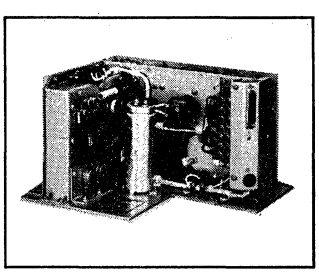
DC-TO-DC SPACECRAFT POWER CONVERTERS

Wilmore converters are being used in numerous unmanned spacecraft including OSO, IMP, LES-6, SAS and Pioneer F. Proven in-depth circuit-design, mechanical-design, quality-assurance and program-management experience is provided for such requirements. Example shown is a dual-output 10Vdc-to-2500Vdc flight unit providing better than 0.1% regulation against combined effects of line, load and temperature.



HIGH-VOLTAGE LASER POWER SUPPLIES

Pictured is a 300-joule/sec capacitor-charging converter for pulse-discharge applications. Particularly well suited for high-pulse-repetition-rate applications, it provides a regulated output voltage selectable from below 1000 to over 2500 Vdc. A wide range of lightweight high-efficiency converters for both pulsed and CW laser applications is available. Wilmore laser power-supply products range from inexpensive industrial items to fully-qualified military equipment.



INDUSTRIAL SOLID-STATE POWER CONVERTERS AND CONTROLLERS

Often extrapolating directly from design techniques derived from its aerospace activities, Wilmore designs and manufacturers a great variety of custom industrial power-processing equipment. Examples include custom d-c/a-c inverters, frequency changers, d-c/d-c converters, motor controls, nondissipative regulators, SCR controls of various types, special battery chargers, etc. Complete in-house design and manufacturing capability permits short delivery times and lower costs.

Wilmore Electronics Company, Inc.

SOLID-STATE POWER CONVERSION EQUIPMENT

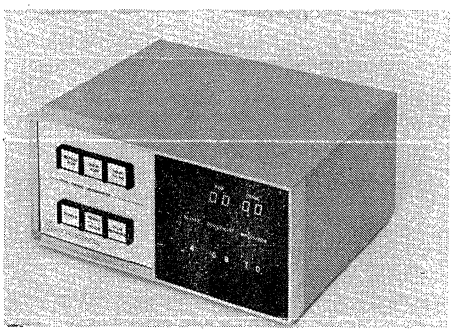
DC to AC INVERTERS

	INPUT		OUTPUT, 60 Hz					EFFICIENCY, HALF-TO-FULL LOAD	SIZE	WEIGHT
	BATTERY TYPE (voltage)	DC RANGE (volts)	PRICE	NOMINAL AC VOLTAGE	POWER RATING	FREQUENCY REGULATION	WAVE SHAPE	VOLTAGE REGULATION*		
MODEL 1124A **45 WATTS CONTINUOUS** ALL SILICON, INDUSTRIAL QUALITY, EXCELLENT FREQUENCY STABILITY, LIGHT-WEIGHT, RUGGEDLY DESIGNED, INCORPORATES PROTECTION NORMALLY MISSING IN OTHER INEXPENSIVE UNITS		1124A-12 12 v | 11-14.5	$95	115 volts	45 watts or volt-amps	±.15 Hz with line and load T.C. .01% per °F	Square	Proportional to d-c line	70%	4″h 5¼″w 6⅝″d	6 lbs
		1124A-24 24 v | 22-29	$95							
MODEL 1057 **290 WATTS CONTINUOUS** MODERATELY PRICED, IDEAL FOR INSTRUMENTS REQUIRING EXTREME FREQUENCY STABILITY AND NORMALLY REQUIRING A SINE WAVE; i.e., OSCILLOSCOPES, VIDEO TAPE SYSTEMS, ETC.		1057-12 12 v | 11-14.5	$260	115 volts	290 watts or volt-amps	±.15 Hz with line and load T.C. .01% per °F	3-level step approx. to sine wave	±1%	85% to 90%	8¼″h 11″w 8¾″d	25 lbs
		1057A-24 24 v | 22-29	$280							
		1057A-28 28 v | 24-32	$280							
MODEL 1081 **500 WATTS CONTINUOUS** FINE FREQUENCY STABILITY, GOOD VOLTAGE REGULATION. APPLICABLE WHEN A SINE WAVE VOLTAGE IS ESSENTIAL		1081-12 12 v | 11-14	$895	115 volts	500 watts or volt-amps	±.15 Hz with line and load T.C. .01% per °F	Sine	±2%	70% at full load	6¾″h 19″w 20½″d	105 lbs
		1081-24 24 v | 22-28	$895							95 lbs
		1081-48 48 v | 44-56	$895							95 lbs
		1081-120 120 v | 105-140	$895							85 lbs
MODEL 1076A **500 WATTS CONTINUOUS** **1000 WATTS SURGE** A WELL PROTECTED INVERTER SUITED FOR EXTREMELY SEVERE LOADS THAT REQUIRE BETTER THAN AVERAGE FREQUENCY STABILITY		1076A-12 12 v | 11-14.5	$215	115 volts	500 watts or volt-amps / 1000 watts surge	±.5 Hz	Square	Proportional to d-c line	80% to 90%	6⅞″h 7¼″w 12⅞″d	30 lbs
		1076A-24 24 v | 22-29	$271							
MODEL 1172 **500 WATTS CONTINUOUS** **1000 WATTS SURGE** INEXPENSIVE, WELL PROTECTED FOR SEVERE LOADS, MOTOR STARTING, COMPRESSORS, PORTABLE POWER TOOLS. TWO UNITS MAY BE PARALLELED FOR MORE POWER		1172-12 12 v | 11-14.5	$191	120 volts	500 watts or volt-amps / 1000 watts surge	±2 Hz	Square	Proportional to d-c line	80% to 90%	7″h 8½″w 11½″d	33 lbs
MODEL 1207 **1.5 KILOWATTS CONTINUOUS** HIGH POWER, FREQUENCY STABLE, GOOD VOLTAGE REGULATION, CURRENT LIMIT AND SHORT CIRCUIT PROTECTION, SINE WAVE VOLTAGE OUTPUT		1207-36 36 v | 33-45	$1750	115 volts or 230 volts	1500 watts or volt-amps	±.15 Hz with line and load T.C. .01% per °F	Sine	±2%	78% at full load	24½″h 22½″w 19″d	240 lbs
		1207-48 48 v | 44-56	$1750							
		1207-120 120 v | 105-140	$1750							

* Voltage regulation at fixed load due to input d-c line variation as read by conventional a-c voltmeter which responds to average voltage but is calibrated in rms volts.

W-F PRODUCTS INC.

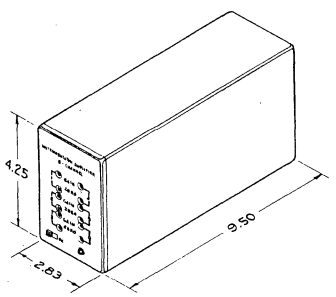
MICROFICHE MEMORY DEVICE AND CONTROLLER



FICHE FORMAT COORDINATOR is a combination memory device and controller designed for use with any conventional microfilm camera to produce microfiche by the strip-up method. Unit reduces operator error by automatically monitoring and controlling number of images per filmstrip. Digital thumb-wheel switches can be programmed for various microfiche formats — any combination of 1-99 rows and 1-99 images/row, plus 1-9 blank spaces as required for cutting into filmstrips for strip-up operations. From stock $1150.

INSTRUMENTATION AMPLIFIER

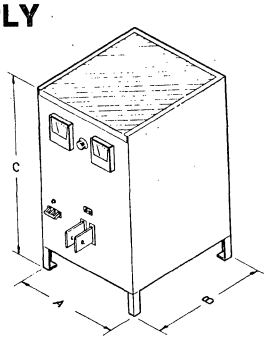
SIX CHANNELS



The W-F Products Model 400040 is a six-channel, solid-state, direct coupled, single-ended floating, instrumentation amplifier. Input impedance is 10 megohms. Gain is variable from 1 to 100 and is flat within 1% from DC to 3 KHz. Bipolar output of 0 to 2 volts at 0-100 ma. Available stock to 30 days. $475

POWER SUPPLY

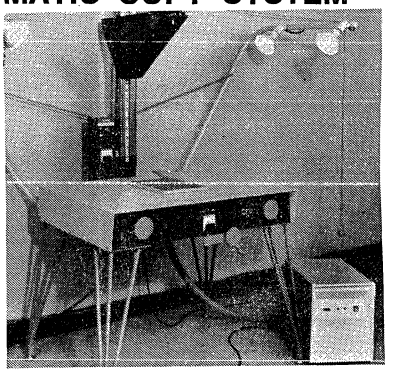
LOW VOLTAGE DC
HIGH CURRENT



Input 208-240 vac Regulated Output 0.2% Hum & Noise
Single or 3-Phase Remote Sensing 0.1% Regulation

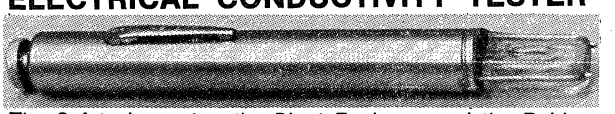
Model	Voltage	Amperes	A	B	C
452	0-4	0-500	20″	20″	36″
852	0-8	0-500	24″	24″	40″
413	0-4	0-1000	24″	24″	40″

AUTOMATIC COPY SYSTEM



This AUTOMATIC COPY SYSTEM consists of a table mounted perforated Platen connected by flexible tubing to a vacuum control cabinet. Copy is held perfectly flat without edge hold-downs. Vacuum is terminated immediately after shutter closure, allowing film pull-down time to be used for changing copy. The system paces the operator and results in improved production rates and higher quality microfilm. May be used with any conventional microfilm camera. $1275 plus copy platen and other options.

ELECTRICAL CONDUCTIVITY TESTER



The Safety Inspector, the Plant Engineer, and the Rubber Product Salesman will find this inexpensive, pocket-sized instrument useful.

FACT
Rubber belts and hose used in hazardous environments should be made from conductive rubber compounds to prevent accumulation of dangerous static electricity.

PROBLEM
Conductive Black Rubber and Nonconductive Black Rubber look alike.

SOLUTION
Press the Electrical Conductivity Tester Probe Tip against the rubber item and push the button. If the conductivity is high enough to be safe the Neon Bulb in the transparent probe tip will flash. Unsafe — No flash.

In many applications this tester will replace a bulky $500 Megohmmeter or Insulation Resistance Tester and is the ideal instrument where portability and economy are important. Private Branded Testers are available in quantity for use by Rubber Manufacturers' production Inspectors and Field Sales Engineers.

The Model 720 Electrical Conductivity Tester is available from stock, FOB Denver, at $29.95 Net each.

OTHER QUALITY PRODUCTS

MICROFORM READERS
Special readers for Quality Control and Editing of production Microfilm and Microfiche. Unique design reduces danger of damage to negative camera film.

PHOTOCOPY LAMP REGULATOR
Maintains constant light output, for systems up to 3000 watts, by compensating for the effects of line voltage changes and lamp aging.

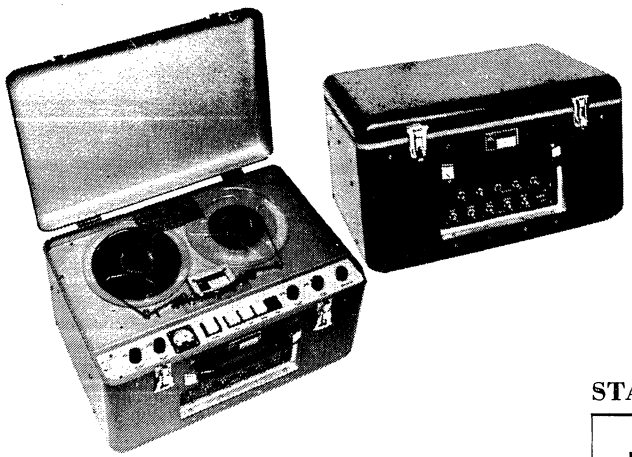
ELECTRONIC LOADS
A line of precision, constant current, dissipative loads used for performance testing of single cells, batteries, and power supplies.

W-F Products, Inc. will design, develop and produce electronic and optical components and systems to our customers' specific requirements.

1107 SOUTH PEARL STREET • DENVER, COLORADO 80210 • PHONE (303) 744-6097

Instrumentation Recorders

high accuracy data recording and reproduce electronics



Applications requiring extreme accuracies or environmental capabilities are expertly answered with these AC/DC or battery operated recorders. Data recorders, including standard FM 4-channel units, are manufactured in accordance with applicable instrumentation specifications.

features

- ☐ **All weather environment packaging or commercial enclosures.**
- ☐ **Speed accuracy 1% or less.**
- ☐ **Frequency ranges 50-12K Hz.**
- ☐ **FM or direct record capability.**

Convertible power mode (AC or battery) enables remote field use or conventional power sources. AGC input can be provided, and frequency response accuracy of ±3 db is standard on all models.

Complete operational manuals on above models, or others, are available upon request to qualified inquirers.

STANDARD IRIG SPEEDS

IPS	Direct Frequency Range (Hz)	Response Accuracy (db)	FM Frequency Range (Hz) (Low Band)	Response Accuracy (db)
15/16	50 - 1500 Hz	±3 db	DC - 312 Hz	±1 db
1 7/8	50 - 3K Hz	±3 db	DC - 625 Hz	±1 db
3 3/4	50 - 6K Hz	±3 db	DC - 1.25K Hz	±1 db
7 1/2	50 - 12K Hz	±3 db	DC - 2.5K Hz	±1 db

NOTE: 15 IPS available.

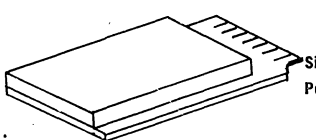
NEW PACKAGING FOR COMMUNICATIONS AND DATA PERIPHERALS

Standard 50-pin (25-pin double-sided) custom connections.

IRIG STANDARD*
**See Table Above*

FM RECORD/REPRODUCE AMPLIFIER MODULE

features E-E mode to allow by-passing of record/reproduce head for system calibration purposes. Squelch is available as optional feature.



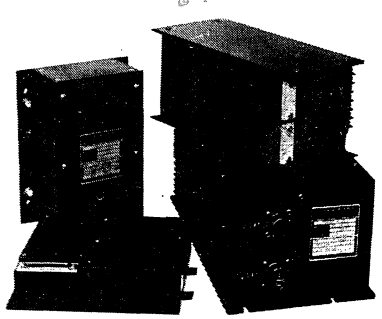
Size: 4" x 1.5" x 10.5"

Power Requirements:
+18 V ±1.5 V @ 100 ma max.
−18 V ±1.5 V @ 60 ma max.
+ 5 V ±0.1 V @ 150 ma max.

Record Level Input:
0 to ±2.5 Volts

Reproduce Level Output:
0 to ±2.5 Volts

High-accuracy, Modular Power Supplies



LIGHTWEIGHT — HIGH POWER — COMPACT

Multiple output units feature low-magnetic radiation and mil-approved environmental and performance specifications.

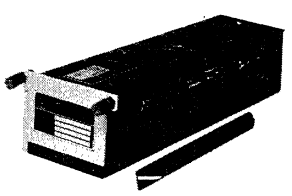
AC TO DC MODULAR POWER SUPPLIES

Optional Inputs: **115/220 V, single or three phase, 50 to 400 Hz.**

Outputs: **5-28 VDC in standard levels; 1-50 amps.**

Precision regulated output, low ripple, low TC.

Available models include performance characteristics to meet naval ordnance, aerospace, and MIL-S-901 shock specifications.



HIGHEST WATTS PER CUBIC INCH AVAILABLE IN POWER SYSTEMS

Modular power systems displaying up to 4 watts per cubic inch are available for applications requiring high-density packaging. Mixed power modules of varying voltage and current capacity may be packaged into one modular enclosure for easy installation.

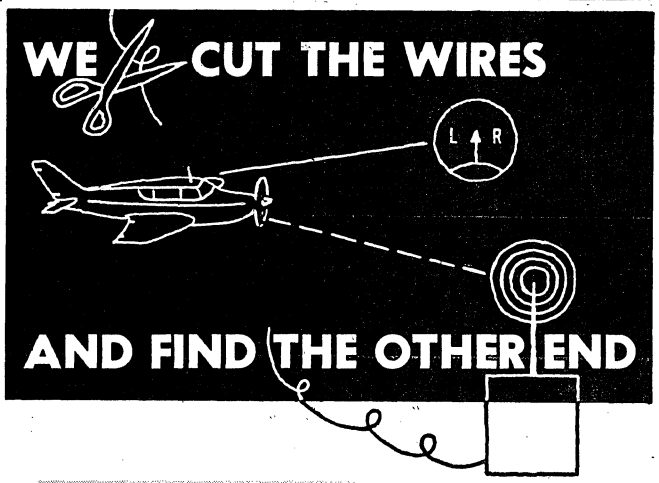
for immediate quotations on any of the above models or special applications, call factory direct.

ALMOND INSTRUMENTS CO., INC.

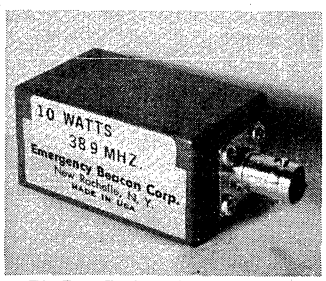
1223 EAST EDNA PLACE • COVINA, CALIFORNIA 91724 • TELEPHONE (213) 967-4151

Manufacturers of high-accuracy instrumentation in recording/reproduce equipment, power supplies and amplifiers for commercial or mil-approved applications.

AT ... emergency beacon corp.

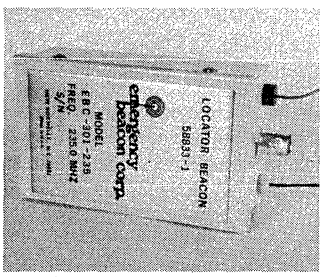


Special Purpose Telemetry Systems & Homers 2-1000 MHz



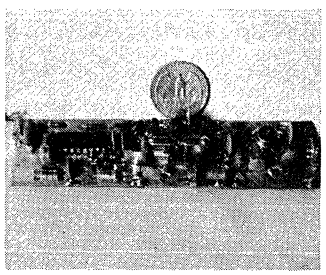
From micro watts to 100 watts.
From 2MHz to 1000 MHz.
Size from ½ cubic inch.
Frequency Synthesizers Available.
AM, FM and Pulse.
All solid state.

MINI TRANSMITTERS
$50.00 and Up



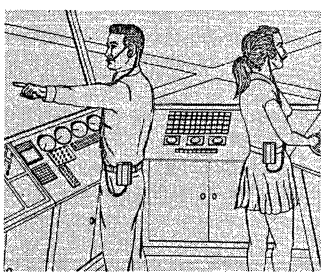
For Application in Aircraft, Drones, Missiles, Boats.
Shock to 1000 G's.
Wide Temperature −50°C to +81°C.
Power to 100 watts.
All solid state.

RECOVERY BEACONS
$99.00 and Up



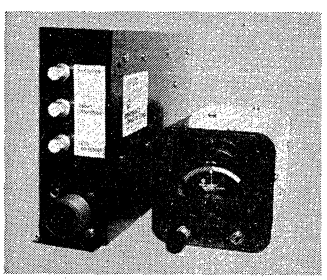
Sensitivities to .01μV
From 2 MHz to 1000 MHz.
Size from 1 cubic inch.
10,000 Frequency Synthesizers Available.
All solid state.

MINI RECEIVERS
$99.00 and Up



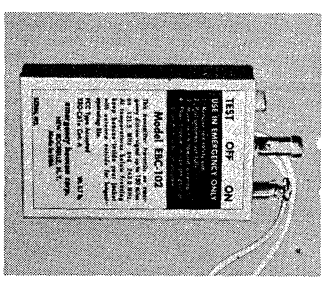
Featuring full duplex operation.
Ranges of up 2 miles.
300 foot Range.
Unlicensed Operation under FCC Part 15.

WIRELESS HEADSETS
$400.00 and Up



Accuracies of ±¼ degree.
10 to 1000 MHz.
Used by FAA, CAP, USAF, USCG, US Army.
All solid state.

VHF-UHF HOMERS
$230.00 and Up



Range to 300 miles.
8 days continuous operations.
1000 G's shock.
Available with built in voice transmitter or multi channel transceiver.

PERSONAL BEACONS
$50.00 and Up

TYPICAL APPLICATIONS

- Radio Control
- Medical Telemetry
- Personal Tracking and Location
- Wild Animal Tracking and Location
- Low Cost Navigation systems
- Anti-Hijacking Systems
- Wireless Computer Links
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SOLID STATE MODULES

VOLTAGE CONTROLLED OSCILLATORS • FREQUENCY MULTIPLEXERS
FM DISCRIMINATORS • FREQUENCY-TO-DC CONVERTERS • OSCILLATORS
AMPLIFIERS • PHASE DETECTORS • DC SIGNAL ISOLATORS • INDUSTRIAL
APPLICATIONS • ANALOG-TO-DIGITAL CONVERTERS • CHOPPERS & ANALOG
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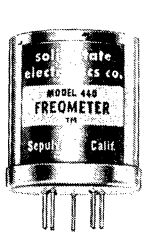

FIG. 1

FIG. 2

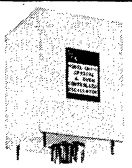
FIG. 5

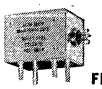
FIG. 7

FIG. 4

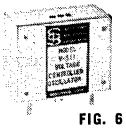
FIG. 6

FIG. 8

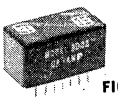
FIG. 9

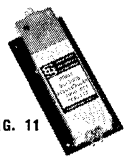
FIG. 11

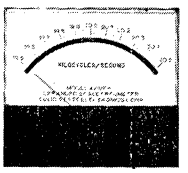

FIG. 3

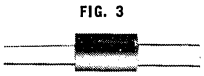
FIG. 10

FREQMETERS, DISCRIMINATORS, PHASEMETERS

Solid state frequency-to-dc converters and discriminators will linearly convert frequency or repetition rate of signals to a proportional dc output. Waveforms can be sine, square, sawtooth or triangular. Standard models are available to cover a wide range from zero to 300 kcps. Expanded scale, differential frequency, under/over frequency and phase detectors are available (meter, meter relay and relay types are also available).

Only the Models 400 to 440 Freqmeters are basic f-dc converters, the output being proportional to the product of frequency and peak input voltage. The 410KF to 440KF are solely frequency dependent (independent of peak input voltage). 450KF to 480KF units require lower drive (millivolts).

The 486E is an expanded scale Freqmeter while the 491ME is a mirrored-scale visual panel meter version. The 411 and 421 units are difference Freqmeters. The 401 series FM discriminators are for IRIG channel telemetering. The 471 is a Hi-Lo pass frequency sensitive relay suitable for under/over frequency and speed detection and control.

The 791 Phasemeter is a phase-to-voltage converter. These units have been designed for applications where stability, ruggedness, long life, efficiency and freedom from maintenance are prime requisites. Miniature, stable and rugged designs make these units ideal for military, aerospace, industrial and portable applications.

		INPUT			OUTPUT						SUPPLY		ENVIRONMENTAL				MECHANICAL		
Model	Type	Freq. kcps	Volts pk-pk	Z kΩ	Volts DC	Ripple %	Drift %/°C	Z kΩ	Resp. msec	Linear %	V Volt	I ma	°C Temp.	G Shock	G Vib.	G Acc.	Size inches	Wt. grams	Fig.
410	Basic Freqmeter	0-0.1	5-18	2	0-5	2	.01	10	500	0.5	−28	1	−55 to +85	5K	100	5K	2x.88 Dia.	60	1
420	Basic Freqmeter	0-1	5-18	2	0-5	2	.01	10	50	0.5	−28	1	−55 to +85	5K	100	5K	1.3x.88 Dia.	38	1
430	Basic Freqmeter	0-10	5-18	2	0-5	2	.01	10	5	0.5	−28	1	−55 to +85	5K	100	5K	1.3x.88 Dia.	38	1
440	Basic Freqmeter	0-100	5-18	2	0-5	2	.01	10	0.5	0.5	−28	1	−55 to +85	5K	100	5K	1x.88 Dia.	30	1
410KF	Normal Freqmeter	0-0.1	2-18	40	0-5	2	.01	10	500	1.0	+28	25	−55 to +80	1K	100	1K	.9x.9x1.3	100	2
420KF	Normal Freqmeter	0-1	2-18	40	0-5	2	.01	10	50	1.0	+28	25	−55 to +80	1K	100	1K	.9x.9x1.3	100	2
430KF	Normal Freqmeter	0-10	2-18	40	0-5	2	.01	10	5	1.0	+28	25	−55 to +80	1K	100	1K	.9x.9x1.3	100	2
440KF	Normal Freqmeter	0-100	2-18	40	0-5	2	.01	10	0.5	1.0	+28	25	−55 to +80	1K	100	1K	.9x.9x1.3	100	2
450KF	Hi Sens Freqmeter	0-0.1	.02-2	1 & 40	0-5	1	.01	10	500	1.0	+28	25	0 to +70	1K	100	1K	.9x.9x1.3	100	2
460KF	Hi Sens Freqmeter	0-1	.02-2	1 & 40	0-5	1	.01	10	50	1.0	+28	25	0 to +70	1K	100	1K	.9x.9x1.3	100	2
470KF	Hi Sens Freqmeter	0-10	.02-2	1 & 40	0-5	1	.01	10	5	1.0	+28	25	0 to +70	1K	100	1K	.9x.9x1.3	100	2
480KF	Hi Sens Freqmeter	0-100	.02-2	1 & 40	0-5	1	.01	10	0.5	1.0	+28	25	0 to +70	1K	100	1K	.9x.9x1.3	100	2
486E	Expanded Freqmeter	.01-300	5-10	40	±5	1	.01	0.1	—	1.0	±15	±25	0 to +70	100	30	200	2.8x2.4x3.8	500	5
490	Differential Freqmeter	0-100	1-20	40	±5	1	0.3	10	0.5	1.0	±15	±35	−20 to +70	50	10	100	2x2.3x3.1	500	5
491ME	Visual Discriminator	.01-300	5-10	40	±5	0	.05	—	—	1.0	+28	40	+10 to +40	—	—	—	4x4.6x4	450	3
411	Differential Freqmeter	.05-50	5-10	0.6	0-5	1	.01	—	500	1.0	±28	25	−55 to +80	50	25	100	1.3x1.3x1.8	115	8
421	Differential Freqmeter	.05-50	5-10	0.6	0-5	1	.01	—	50	1.0	±28	25	−55 to +80	50	25	100	1.3x1.3x1.8	115	8
401	IRIG Discriminator	0.4-80	8-28	50	±5	1	.05	0.1	—	0.5	±15	±75	−55 to +85	50	25	100	2.8x2.4x3.8	500	5
791	Phasemeter	0.3-20	0-10	0.5	±5	1	0.3	3	7	1.0	No	No	−55 to +85	1K	100	1K	.9x.9x1.3	100	2
801	Diff. Freq. Module	.05-50	1-10	0.6	±1	—	—	10	—	—	No	No	−55 to +85	5K	100	5K	.9x.9x1.3	100	2

OSCILLATORS, CONVERTERS, OP & LOG AMPS RELAYS, CHOPPERS, TRANSDUCERS, SUPPLIES

Solid state oscillators and converters are available in many types (MIL-SPEC too). S-100, S-200 are LC sine oscillators (rugged and stable). The S-310 is tuneable. Series 300VF Voltage-to-Frequency converters change analog signals to frequency and are matched to our Series 400KF Freqmeters. The V-511, MV-515 (20 millivolt input) Voltage Controlled Oscillators (VCO) are designed for IRIG FM telemetering. The V-521 is a micro-version of the V-511 (without bandpass filter). The PCXO-116 is crystal controlled and programmable to 13 frequencies. The 5021 TELEMOD combines a VCO and FM transmitter in a single micro-package. The Model 3002 op-amp is superlative in its capabilities, i.e. microvolt input, 0.6 microvolts/°C and 2 picoamps/°C drift, 300 megohm input impedance, short-circuit proof, no compensation required, no latch-up, zero offset adjustable, wide temperature range, microminiature, replaces chopper-stabilized amplifiers. Use the MA531 to mix several VCO channels. The AD6001 is a 10 bit successive approximation analog-to-digital converter. The DCI-177 isolates DC signals eliminating grounding or supply isolation problems.

		INPUT			OUTPUT						SUPPLY		ENVIRONMENTAL				MECHANICAL		
Model	Type	Volts	Z MΩ	Freq. kcps	Wave Form	Volts Min.	Load kΩ	Drift %/°C	Accuracy %		V Volt	I ma	Temp. °C	Shock G	Vib. G	Acc. G	Size inches	Wt. grams	Fig.
S-310	RC Fix Tuned Oscillator	—	—	.025-1000	sin/sq	1Vrms	100	0.01	0.25		28	7	−20 to +80	500	35	700	1.06x2.25x1.66	50	6
PCXO-116	Xtal Osc. Programmable	—	—	0-1000	square	+2.4	TTL	.001	.001		±5	±11	0 to +70	—	—	—	0.50x0.95x0.47	8	9
310VF	Volt-to-Freq. Converter	0-10	15	0-0.1	pulse	10Vp-p	10	0.05	1		±10	±20	0 to +50	250	25	500	1.31x1.31x1.75	100	5
320VF	Volt-to-Freq. Converter	0-10	15	0-1	pulse	10Vp-p	10	0.05	1		±10	±20	0 to +50	250	25	500	1.31x1.31x1.75	100	5
330VF	Volt-to-Freq. Converter	0-10	15	0-10	pulse	10Vp-p	10	0.05	1		±10	±20	0 to +50	250	25	500	1.31x1.31x1.75	100	5
340VF	Volt-to-Freq. Converter	0-10	15	0-100	pulse	10Vp-p	10	0.05	1		±10	±20	0 to +50	250	25	500	1.31x1.31x1.75	100	5
V-511	Volt Controlled Oscillator	0-5	0.1	0.3-1000	sine	2Vrms	100	0.003	0.25		+28	7	0 to +80	125	25	200	1.06x2.25x1.66	50	6
MV-515	Volt Controlled Oscillator	0-0.2	0.1	0.3-12	sine	2Vrms	100	0.003	1		±28	±25	0 to +85	125	25	200	1.06x2.25x1.66	50	6
V-521	Volt Controlled Oscillator	0-5	0.1	0.3-12	square	2Vp-p	10	0.003	0.50		+28	+10	0 to +71	500	50	1000	0.75x0.75x1.13	20	8
VCXO-541	Volt Cont. Xtal Oscillator	±5	0.01	150-4000	square	2Vp-p	10	0.1	3		±15	±15	0 to +75	15	5	20	1.31x1.31x1.75	100	8
5021	VCO-FM Transmitter	0-5	.005	88K-100K	sine	0.5Vrms	100	0.10	0.50		28	5	+10 to +40	500	50	1000	1.00x1.00x1.38	40	7
3002	Diff Op-Amp (Microvolt)	0 to ±.001	1000	2000	dc	±14	1	0.0006	0.1		±15	±20	−10 to +125	10000	100	5000	0.50x0.95x0.47	8	9
MA531	Mixer Amplifier	0 to 1	0.1	800	—	2	1	0.02	0.1		28	15	0 to +75	200	30	500	1.06x2.25x1.66	50	6
3076	Log Amplifier	.001-10	.01	0-10	—	±10	10	**0.02**	1		±15	±25	0 to +50	300	25	500	1.06x2.25x1.66	50	6
DCI-177	DC Signal Isolator	0 to ±5	5	0.5	dc	±10	10	0.01	1		28	50	55 to +85	1000	25	500	1.31x1.31x1.75	100	5
DC-2005	Pressure Transducer	PSI	—	—	—	5	10	.04	0.5		28	15	−55 to +100	300	15	300	1.71x2.63x5.25	680	11
11001	Dual Power Supply	115	—	—	—	±15	.15	.001	.01		115	—	−55 to +85	200	15	300	2.38x2.75x3.81	450	5
NS8000A	Chopper, Xfmr Drive	1-10	.0002	0-1500	square	±10	10	.0001	.001		—	—	−55 to +100	10000	100	5000	0.45x.325 Dia.	2	4
33	Chopper-Relay	±6 to ±15	10	0-3000	square	±5	10	.0001	.001		—	—	−65 to +175	1000	25	500	0.70x0.44 Dia.	2	10
98	Relay, Solid State	6-12	.0006	0-5	square	±20	10	.001	.01		—	—	−55 to +100	1000	25	500	**0.84x0.84x0.75**	12	9
8001	Relay, Reed	3	.0002	—	—	±28	56	—	—		—	—	−55 to +125	50	25	50	0.90x0.25 Dia.	2	10

Phone, wire or write for specifications and application literature describing above units or consult your microfilm files (VSMF or Thomas Supplementary)

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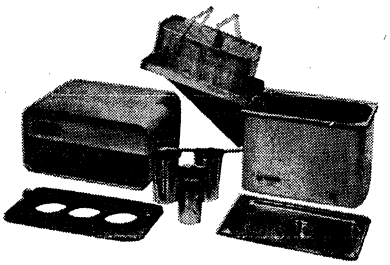
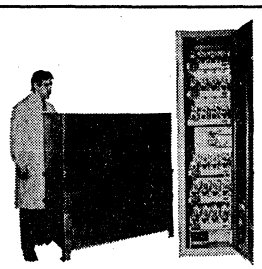
PREFERRED ALL OVER THE WORLD FOR THE ULTIMATE IN CLEANING PERFORMANCE



TWO-PIECE MEGASON® ULTRASONIC CLEANERS

IDEAL FREQUENCY — 80kc, for hi-speed precision cleaning. Intense, but safe . . . will not harm the most delicate components.

Group No.	Price of Generator and Tank Combined $	Generator Model	Generator Power Output Peak/Watts	Tank Model	Tank Capacity (Gals.)	Tank Inside Dimensions (Inches) L x W x D
60-1	124.95	G- 60-80	240	T- 60-80-1	¼	6 x 3⅜ x 4
80-1	159.95	G- 80-80	320	T- 80-80-1	½	5¾ x 5¼ x 4
80-2	169.95	G- 80-80	320	T- 80-80-2	¾	5¾ x 5¼ x 6
100-1	229.95	G-100-80	400	T-100-80-1	⅞	9½ x 5 x 4
100-2	239.95	G-100-80	400	T-100-80-2	1⅓	9½ x 5 x 6
120-1	269.95	G-120-80	480	T-120-80-1	1½	12 x 6 x 6
120-2	359.95	G-120-80	480	T-120-80-2	2	12 x 6 x 9
240-1	399.95	G-240-80	960	T-240-80-1	3	12 x 10 x 6
240-2	459.95	G-240-80	960	T-240-80-2	4	12 x 10 x 9
360-1	654.95	G-360-80	1440	T-360-80-1	5	14 x 10 x 9½
360-2	734.95	G-360-80	1440	T-360-80-2	7	14 x 10 x 12
360-3	734.95	G-360-80	1440	T-360-80-3	8	28 x 6 x 12
600-1	1089.95	G-600-80	2400	T-600-80-1	10	20 x 11½ x 11
600-2	1209.95	G-600-80	2400	T-600-80-2	12	20 x 12 x 14
600-3	1209.95	G-600-80	2400	T-600-80-3	15	52 x 6 x 14



LARGE CAPACITY MEGASON® ULTRASONIC CLEANERS

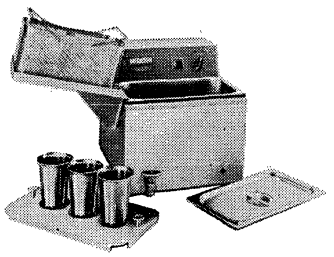
CONSTANT POWER — Modulated output insures no variation in cleaning intensity regardless of liquid level, load, or temperature.

Modular Generator Model	Price $	Total Output Avg.	Power (Watts) Peak	Tank Model	Tank Price $	Tank Interior Dimensions (Inches) L x W x D (See Note)	Capacity (Gals.)
G- 300-20-1	350.	300	600	T- 300-20-1	405.	14 x 10 x 12	7
G- 600-20-1	700.	600	1200	T- 600-20-1	735.	20 x 12 x 14	14
G- 900-20-1	1000.	900	1800	T- 900-20-1	1035.	20 x 16 x 14	18.5
G-1200-20-1	1275.	1200	2400	T-1200-20-1	1335.	24 x 20 x 16	36
G-1500-20-1	1530.	1500	3000	T-1500-20-1	1665.	28 x 20 x 18	44
G-1800-20-1	1780.	1800	3600	T-1800-20-1	1995.	30 x 22 x 18	54.5
G-2100-20-1	2030.	2100	4200	T-2100-20-1	2325.	34 x 24 x 20	75
G-2400-20-1	2275.	2400	4800	T-2400-20-1	2655.	48 x 24 x 24	100

100,000 ULTRASONIC CLEANERS, based on my design are installed in every corner of the world. The new Megason® Ultrasonic Cleaners represent the ultimate in cleaning performance and quality construction at prices less than or equal to competitive Ultrasonic Cleaners.

Paul M. Platzman

ONE-PIECE COMPACT MEGASON® ULTRASONIC CLEANERS

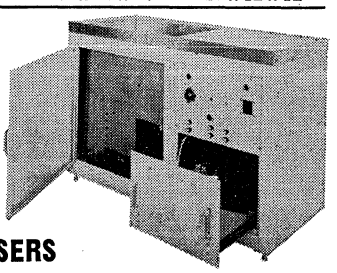


INSTANT START — Just press switch on . . . no waiting . . . no warm-up.

RUGGED COMPONENTS — Highest reliability and long life. No maintenance.

CONSOLETTE—One-Piece Console Generator and Tank incorporated in gleaming, solvent proof, rust-proof, stainfree, lifetime stainless steel cabinet with instrument style control panel.

Consolette Model	Complete Price $	Consolette Overall Dimensions (Inches) L x W x D	Tank Dimensions L x W x D (Inches)
CS- 80D	189.95	13 x 17 x 15	5¾ x 5¼ x 6
CS-100D	259.95	13 x 17 x 15	9½ x 5 x 6
CS-120D	299.95	13 x 17 x 15	12 x 6 x 6
CS-240D	399.95	13 x 21 x 15	12 x 10 x 6
CS-360D	699.95	16 x 26 x 20	14 x 10 x 9½
CS-600D	1099.95	22 x 28 x 24	20 x 12 x 12



MEGASON® ULTRASONIC VAPOR-DEGREASERS

HETEROSONIC FREQUENCY SWEEP — Absolute uniformity of cavitation effect throughout cleaning solution. No hot spots . . . no dead spots . . . no stripping . . . no banding . . . no transducer overloading.

Two Stage Model	Price $	Boil Sump Dimensions (Inches) L x W x D	Ultrasonic Sump Dimensions (Inches) L x W x D	Sump Capacity in Gals. (Each)
2UVD-120-80-1	1800.	12x 6x12	12x 6x 9	2
2UVD-360-80-1	2800.	14x10x14	14x10x12	7
2UVD-600-80-1	3600.	20x12x18	20x12x 4	12

Three Stage Model	Price $	Boil Sump Dimensions (Inches) L x W x D	Ultrasonic Sump Dimensions (Inches) L x W x D	Distillate Reservoir (Inches) L x W x D
3UVD-120-80-1	2000.	12x 6x 9	12x 6x 9	12x 6x 6
3UVD-360-80-1	3200.	14x10x14	14x10x12	14x10x 9
3UVD-600-80-1	3900.	20x12x18	20x12x14	20x12x10

*Add $795, for Self Contained Refrigeration System
Add $545, for Recirculating Filter System
Add $300, for Pressure Spray Lance and Pump (not appl. to Two Stage Models)

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165-EM MARINE STREET
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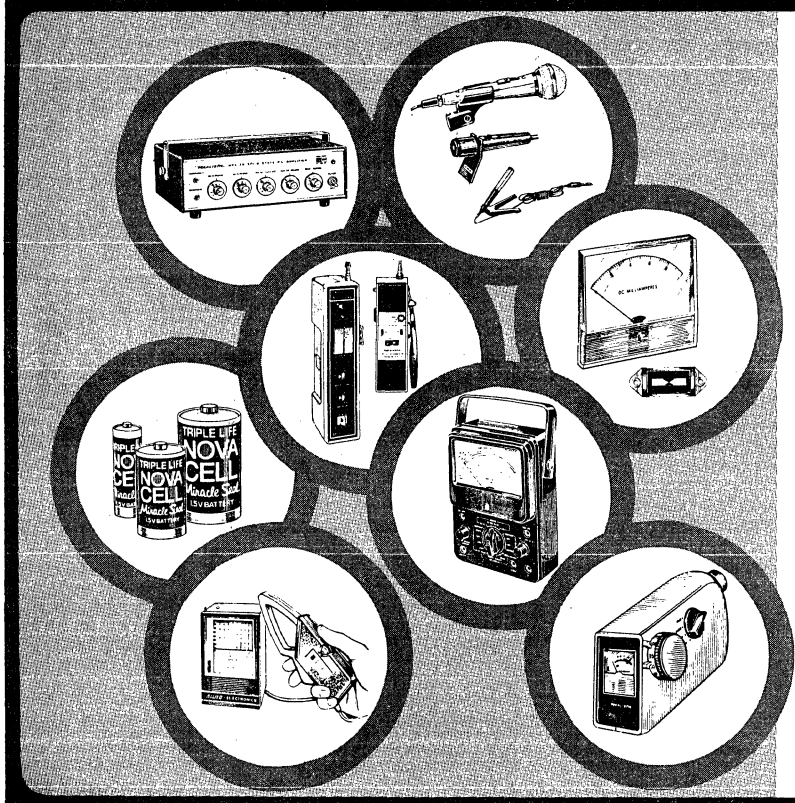

QUALITY
Allied components are made for us by the foremost manufacturers in the industry. They meet or exceed all the specifications demanded of standard types. You always are assured of getting top quality and the exact component you specify.

SELECTION
Our Merchandise Managers have chosen lines that are in high demand by our customers. We are able to keep large quantities of components in stock at all times to fill your needs. One or a thousand — Allied is ready.

PRICES
Our quantity pricing gives you the lowest OEM prices available.

SERVICE
We have sales offices throughout the country. Your order is shipped from one of our three warehouses — in Chicago, Fort Worth, or Garden Grove, California — to always assure prompt delivery of your requirements.

These Products (and more) Available Off-The-Shelf From Allied

AUDIO EQUIPMENT & ACCESSORIES
- Replacement Speakers
- Microphones
- Public Address Amplifier
- Weatherized Powerhorn Speakers
- Public Address System

COMMUNICATIONS EQUIPMENT
- Walkie-Talkies (CB)
- 2-Way Radios (CB)
- 3-Band VHF/UHF Monitor

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- Multitesters
- VOM's
- Signal Generator
- Signal Tracer
- Transistor Checker
- Sound Level Meter
- R/C Substitution Box
- Instrument Carrying Cart
- 2½", 3½", 4½" Panel Meters
- Rotary Cylinder Panel Meters

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- 2-Channel Chart Recorders
- 4-Channel Event Chart Recorders
- 8-Channel Event Chart Recorders
- Temperature Chart Recorders
- AC Chart Recorders

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Manufacturers and Sales Offices Directory

This is an alphabetical listing of more than 3,000 manufacturers supplying electronic equipment, instrumentation, components, materials and fabrication services. Included for each company are name, address, telephone number, name of the key sales executive and TWX numbers, where available. In addition, companies have provided the name or names of individuals who may be contacted by the EEM user for additional product information. Listings may also include names of certain distributors who have paid to be included as part of the manufacturer's listing. For complete alphabetical and geographical listings of all distributors, see the Distributors Directory, on page 1594, yellow section. **Bold face** listings indicate those manufacturers who have provided catalog data in the white pages. Page and volume numbers are indicated for these manufacturers. Sales office listings are provided for key electronic manufacturers.

This directory was completely revised and updated for this edition prior to publication. Thus the information is current as of Spring 1973. This same index appears in all three volumes of EEM.

AARON-DAVIS CO., 1720 22nd St., Santa Monica, Cal., 90404, Tel: 213-829-1834; Sls. Mgr: R.A. Walden Vol 4•444,445•

Local Sales Offices & Reps.

Ariz	Phoenix, Cleveland Entprs.	602-264-1969
Cal	San Diego, Rochette & Assocs.	714-282-4616
Cal	San Gabriel, Rochette & Assocs.	213-285-1251
Colo	Littleton, Cleveland Entprs.	303-771-6242
Md	Silver Spring, Rep-Tron	301-593-4844
NM	Albuquerque, Cleveland Entprs.	505-298-7671

ABA INDUSTRIES, INC., Box 517, Pinellas Pk., Fla., 33565, Tel: 813-546-3571; V.P. Eng: B. Harting; Dir. Mktg: D. Morrison

ABACUS ELCTRNS. CORP., 10 Hudson Terr., Dobbs Ferry, N.Y., 10522, Tel: 914-693-1450; Sls. Mgr: M. Meola

ABBOTT TRANSISTOR LABS., 5200 W. Jefferson Blvd., L.A., Cal., 90016, Tel: 213-936-8185; Mktg. Mgr: R. Baldarrama; Sls. Dir: A. Hilbert; Sls. Eng: W. Rodart Vol 1•581-593; Vol 3•1246,1247

Local Sales Offices & Reps.

NJ	Ft. Lee, Abbott Transistor Labs.	201-224-6900

ABRAMS INSTR., 606 E. Shiawassee St., Lansing, Mich., 48901, Tel: 517-484-9441, TWX: 810-251-0785; Sls. Mgr: M. Gates

ACCURATE ELCTRNS. CORP., Box 935J, Elyria, Ohio, 44035, Tel: 216-365-1211; Pres: J.F. Seybold; V.P: D.J. Seybold

ACCUTRONICS, A Hammond Corp., Co., 628 North St., Geneva, Ill., 60134, Tel: 312-232-2600, TWX: 910-237-1680; Sls. Eng: D.C. Griffin; Dir. of Sls: W.C. Benson ..... Vol 2•380-383

ACDC ELCTRNS., Oceanside Ind'l. Ctr., Oceanside, Cal., 92054, Tel: 714-757-1880, TWX: 910-322-1470; Nat'l. Sls. Mgr: R.E. Dietrich; Prod. Mgr: D.C. Gray; Mktg. Mgr. (Comps): F.W. Nusslock ..... Vol 1•571-575

Local Sales Offices & Reps.

Ariz	Scottsdale, O.E.M. Spec.	602-948-5565
Cal	Palo Alto, Elctrn. Mktg. Specialists	415-326-1710
Cal	San Diego, Elctrn. Mktg. Specialists	714-273-3773
Cal	Torrance, Miltronics Inds.	213-323-7934
Cal	Van Nuys, Elctrn. Mktg. Specialists	213-787-9050
Colo	Denver, PLS Assocs.	303-771-0140
Conn	Hamden, J. & J. Assocs.	203-624-7800
Fla	Maitland, Beacon Elctrn.	305-647-3498
Fla	Palm Beach Gardens, Beacon Elctrn. Assoc.	305-622-2770
Ga	Atlanta, Beacon Elctrn.	404-351-3654
Ill	Chicago, Data Elctrns. Co.	312-283-0300
Ind	Indianapolis, Data Elctrns. Co.	317-784-6360
Kans	Shawnee Mission, EIR Co.	913-362-0919
Md	Kensington, Electronic Mktg. Assocs., Inc.	301-744-7700
Mass	Burlington, J. & J. Assocs.	617-272-2606
Mich	Detroit, WKM Assocs., Inc.	313-892-2500
Minn	St. Paul, Northport Engrg., Inc.	612-698-3841
Mo	Hazelwood, EIR Co.	314-895-4100
NJ	Ridgewood, Hansen Assocs.	201-652-7055
NM	Albuquerque, PLS Assocs.	505-255-2330
NY	East Syracuse, Ossmann Instrs.	315-437-6666
NY	Huntington, Hansen Assocs.	212-947-0379
NY	Rochester, Ossmann Instrs.	716-328-2230
NY	Vestal, Ossmann Instrs.	607-785-9947
Ohio	Cleveland, WKM Assocs., Inc.	216-267-0445
Ohio	Dayton, WKM Assocs., Inc.	513-434-7500
Pa	King of Prussia, Electronic Mktg. Assocs., Inc.	215-265-1600
Pa	Pittsburgh, WKM Assocs., Inc.	412-892-2953
SC	Spartanburg, Beacon Elctrn. Assoc.	803-576-7462
Utah	Salt Lake City, PLS Assocs., Inc.	801-272-3681
For:	Can., Montreal, Que., Aeromotive Engrg. Prods.	514-695-6413
For:	Can., Toronto, Ont., Aeromotive Engrg. Prods., Ltd.	416-782-8835

ACE PLASTIC CO., INC., 91-54 Van Wyck Expwy., Jamacia, N.Y., 11435, Tel: 212-523-5500; Sls. Mgr: S. Seidman

ACKERMAN GOULD CO., INC., 10 Neil Ct., Box 188, Oceanside, N.Y., 11572, Tel: 516-678-4110; S.M: A.P. Fiorey; V.P: B. Gould

ACME BATTERY CORP., 700 Canal St., Stamford, Conn., 06904, Tel: 203-324-4125; Pres: L. Schub

ACME CHEMICAL & INSULATION CO., 166 Chapel St., New Haven, Conn., 06513, Tel: 203-562-2171, TWX: 710-465-0019; Sls. Mgr: R. Von Horn

ACME ELEC. CORP., 28 Water St., Cuba, N.Y., 14727, Tel: 716-968-2400, TWX: 510-245-2700; Sls. Mgr: R.D. Milne; Sls. Mgr: R.D. Milne; Asst. Mgr.-Distr. Sls: D.J. Dillenback

Local Sales Offices & Reps.

Ala	Birmingham, Hopper & McCoy	205-822-2536
Ariz	Phoenix, Abbott Sls.	602-252-6171
Cal	Oakland, Baxter Co.	415-654-3177
Fla	Jacksonville, J. Floyd	904-744-1247
Fla	Miami, Glenn Assocs., Inc.	305-633-4606
Fla	Orlando, Glenn Assocs., Inc.	305-293-7482
Ga	Atlanta, Hopper & McCoy	404-872-5802
Ill	Chicago, Weinstein & White, Inc.	312-243-1155
Ind	Indianapolis, Wilder,Klein,Mayhall & Logan,	317-632-9379
Iowa	Cedar Rapids, A. Sell & Assocs.	319-393-4225
Kans	Prairie Village, R.E. Gooley Co.	913-642-3233
Ky	Louisville, Wilder, Klein,Mayhall & Logan,	502-935-1937
La	New Orleans, Assoc. Manufacturers Agents	504-522-6287
Mich	Detroit, Buschegan, Geldersma, Cratch	313-535-6550
Mich	Grand Rapids, Buschagen, Geldersma & Crotch	616-361-5335
Minn	St. Paul, H. Cullen & Assocs.	612-646-7371
Miss	Jackson, R. Morrison & Assoc.	601-948-4415
Neb	Omaha, O.I. Wahl	402-451-4276
NH	Nashua, R. P. Reese	603-883-2407
NJ	Princeton, George Dannecker	609-799-0005
NY	Binghamton, W.J. Frey	607-748-8053
NY	Manlius, E.D. Sweeney	315-682-6915
NY	New York City, R.W. Noel & Co.	212-786-1919
NY	Rochester, G.N. Mergel	716-334-6909
NC	Greensboro, Barber-Ayers & Assocs.	919-273-3629
Ohio	Cleveland, Lusty-Thomson	216-621-6900
Ohio	Westerville, P. Collier	800-362-2279
Okla	Oklahoma City, J. Pitts	405-232-0011
Pa	Pittsburg, M.F. Smith Assoc.	412-276-5363
SC	Columbia, E. White	803-782-6325
Tenn	Memphis, B. Carson Co.	901-396-4553
Tenn	Nashville, Hopper & McCoy	615-883-7557
Tex	Dallas, Burrus & Matthews	214-741-6241
Tex	Houston, Burrus & Matthews	713-227-5205
Tex	Longview, J. Wallace	214-758-9841
Va	Richmond, Barber Ayers & Assoc.	703-288-7772
Wash	Seattle, H.M. Denny	206-282-7200
WVa	Pittsburg Area, M. F. Smith & Assoc.	412-276-5363
For:	Can., Ontario, John H. Mckechnie	416-465-5409

ACME MODEL ENGRG. CO., 654 Bergen Blvd., Ridgefield, N.J., 07657, Tel: 201-943-7650; Sls. Mgr: A. Asfar

ACMI IND'L. DIV., American Cystoscope Makers, 1500 Bassett Ave., Bronx, N.Y., 10461, Tel: 212-824-4600, TWX: 12-619 Cystmakers; Sls. Mgr: C.J. Hickis; Sls. Engr: V. Colton

ACOPIAN CORP., P.O. Box 585, Easton, Pa., 18042, Tel: 215-258-5441, TWX: 510-651-4919; Asst. Sls. Mgr: T.E. Skopal; Sls. Mgr: J.F. Whitaker

ACROMAG, INC., 30765 Wixom Rd., Wixom, Mich., 48096, Tel: 313-624-1541; Sls. Mgr: R.G. Hennings

Local Sales Offices & Reps.

Cal	Pacheco (Martinez), Campbell Engrg. Co.	415-687-6474
Cal	Santa Fe Springs, D.A. Matthews/Associates	213-693-5432
Colo	Denver, Control Equip. Corp.	303-399-6931
Fla	Ruskin, L. E. Rogers Co.	813-645-1453
Ga	Atlanta, R. Freeman Associates, Inc.	404-261-9065
Ill	Wheaton, D. Hausten Co.	312-668-7312
La	Baton Rouge, Petro-Chem. Equip. Co.	504-348-0593
Mass	Braintree, Bordewieck Engrg. Sls.	617-843-0845
Mich	Ann Arbor, H. C. Heym Associates	313-971-6552
Mich	Marquette, NWR Elctrns. Corp.	906-226-7578
Minn	Virginia, NWR Elctrns. Corp.	218-741-5080
Mo	St. Louis, Scherrer Instr., Inc.	314-644-5362
Neb	Omaha, Control Sls., Inc.	402-342-1717
NJ	Montclair, E.C. Smith & Assoc., Inc.	201-783-6668
NY	Buffalo, O.R. Lawrence Co.	716-839-4422
NY	New York, E.C. Smith & Assoc., Inc.	212-682-6890
NC	Matthews, W.K. Hile Co.	704-847-9125
Ohio	Chagrin Falls, J. Kilroy Corp.	216-247-8997
Okla	Tulsa, D. Allert Co.	918-743-7705
Ore	Portland, McLaren, Inc.	503-297-2248
Pa	Philadelphia, B & A Associates	215-688-5173
Tenn	Memphis, Mel Watson Co.	901-725-7088
Tex	Houston, Gay Engrg. & Sls.	713-869-3306
Utah	Salt Lake City, Specialty Sls. Co.	801-262-2979
Wash	Bellevue, McLaren, Inc.	206-454-3400
WVa	St. Albans, Instrument Services, Inc.	304-722-2953
Wisc	Oconomowoc, Booker Co.	414-873-4000

ACTIVE CONTROL INSTRUMENTATION, Box 194, E. Northport, NY, 11731, Tel: 516-864-2111; Sls. Mgr: J. Gordon ..... Vol 2•326,327

AD AUTOMATION, 830 Linden Ave., Rochester, N.Y., 16625, Tel: 716-381-2370; Pres: H. Turner; Sls. Mgr: R. Van Gelder ..... Vol 1•386

Local Sales Offices & Reps.

Cal	Van Nuys, Gordon Elliot	213-873-6862
Fla	Clearwater, Reynolds & Assocs.	813-726-2373
Fla	Melbourne, Reynolds & Assocs.	305-727-3205
Ga	Atlanta, Reynolds & Assocs.	404-252-5360
Md	Owings Mills, R. Higbee	301-833-6264
Mass	Chelmsford, S&S Elctrns.	617-256-8731
Mich	Farmington, Tallman Assoc.	313-477-6094
Mo	St. Louis, Data Technology	314-872-9167
NY	Binghamton, B. M. Segal	607-723-4121
NC	Greensboro, Reynolds & Assoc.	919-275-3725

A. D. DATA SYS., INC., 830 Linden Ave., Rochester, N.Y., 14625, Tel: 716-381-2370; Sls. Mgr: R. Van Gelder Vol 1•325

Local Sales Offices & Reps.

Cal	Van Nuys, Gordon Elliot	213-873-6862
Conn	Milford, S&S Elctrns.	203-877-1114
Fla	Clearwater, Reynolds & Assoc.	813-726-2373
Fla	Fort Lauderdale, Reynolds & Assoc.	305-581-6611
Fla	Hollywood, Reynolds & Assoc.	305-987-6720
Fla	Melbourne, Reynolds & Assoc.	305-727-3205
Fla	Palm Beach Gardens, Reynolds & Assoc.	305-622-6850
Fla	Palm Beach Gardens, Reynolds & Assoc.	305-987-6720
Ga	Atlanta, Reynolds & Assoc.	404-252-5360
Md	Owings Mills, R. Higbee	301-833-6264
Mass	Chelmsford, S&S Elctrns.	617-256-8731
Mich	Farmington, Tallman Assoc.	313-477-6094
Mo	Crece Coeur, Data Technology	314-872-9167
NY	Binghamton, B.M. Segal	607-723-4121
NC	Greensboro, Reynolds & Assoc.	919-275-3725

AD-VANCE MAGNETICS, 226 E. 7th St., Rochester, Ind., 46975, Tel: 219-223-3158, TWX: 810-290-0294; Sls. Mgr: J. Loebig ..... Vol 3•1006

Local Sales Offices & Reps.

Cal	Los Altos, Frauman Assocs.	415-941-0660
Cal	Pasadena, A-F Sls.	213-681-5631
Cal	San Diego, R Tauber	714-274-7242
Conn	Meriden, Abbott-Allison Co.	203-237-9232
Ill	Westchester, W.G.Brouillette Assocs.	312-345-6500
Md	Baltimore, D.K.Jones & Assocs.	301-752-0577
NJ	Cherry Hill, Shielding & Technology	609-424-2176
NJ	Fairlawn, G.D. Harris Co.	201-796-5200
Tex	Dallas, Techno Assocs.	214-357-9213

ADALET MFG., Div. Scott & Fetzer, 4801 West 150th St., Cleveland, Ohio, 44135, Tel: 216-267-9000; Sls. Mgr: J.L. Smelko; Mktg. Mgr: J.C.H. Larsen

ADAMS RITE MFG. CO., 540 W. Chevy Chase Dr., Glendale, Calif., 91209, Tel: 213-241-5121, TWX: 910-497-2276; Sls. Mgr: J. Smith

ADAMS-RUSSELL CO., INC., AR - WALTHAM DIV., 280 Bear Hill Rd., Waltham, Mass., 02154, Tel: 617-890-2540, TWX: 710-324-0618; Dir. Mktg: G.H. Sacra

ADAMS & WESTLAKE, 1025 N. Michigan St., Elkhart, Ind., 46514, Tel: 219-CO-4-1141; Sls. V.P: A.C. Johnson

Local Sales Offices & Reps.

Cal	Concord, P.W. Jasin Co.	415-935-6339
Cal	Downey, Sierra Pacific Engrg.	213-928-1815
Conn	Berlin, White Sls. Co.	203-224-0423
Fla	Hollywood, W.B. Wimberly Co.	305-961-0227
Fla	Orlando, W.B. Wimberly Co.	305-425-3083
Ill	Chicago, Adams & Westlake Co.	312-346-6232
Mass	Needham, White Sls. Co.	617-444-3676
Mich	Royal Oak, R.H. Jackson Co.	313-542-5059
Minn	Minneapolis, F.B. Hill Co.	612-941-5270
Mo	Independence, Wells-White Co.	816-SY-6-4333
Mo	St. Louis, Wells-White Co.	314-726-2511
NJ	Newark, Adams & Westlake Co.	201-623-6532
NY	Fayetteville, M.P. Andrews, Inc.	315-637-3144
Ohio	Cincinnati, Beedle Equip. Co.	513-793-0140
Pa	Pittsburgh, R.F. Clark Co.	412-242-9500
Pa	Radnor, W. Henry Cordray Sls.	215-687-1366
Tex	Addison, Southland Engrg.	214-233-0603
Tex	Houston, Southland Engrg.	713-782-4575
Wash	Seattle, Eicher-Richards Co.	206-523-7888
For:	Can., Toronto 15, Ont., Lisle Instr. Sys., Ltd.	416-249-9151

ADAR ASSOCS., 85 Bolton St., Cambridge, Mass., 02140, Tel: 617-492-7110, TWX: 710-320-0368; Mktg. Mgr: F. Bigda

Local Sales Offices & Reps.

Cal	Sunnyvale, ADAR Assocs., Inc.	408-734-3937
Cal	Thousand Oaks, Systems Marketing Co.	805-492-1929
Ill	Chicago, P. Lind Elctrns. Co., Inc.	312-774-1246
Mass	Stoneham, K & D Elctrns.	617-438-3121
Minn	Circle Pines, P. Lind Elctrns. Co., Inc.	612-786-5770
NJ	Wayne, K & J Assocs.	201-694-3334
NY	E. Setauket, K & J Assocs.	516-751-8686

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ADC PRODS., 4900 W. 78th St., Minneapolis, Minn., 55435, Tel: 612-835-6800, TWX: 910-576-2832; Dir. OEM Sls: M.G. Langer; Prod. Mgr. C.C: G.E. Rue Vol 3•544-551,1244,1245; Vol 4•356*

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg.	205-772-9237
Cal	Burbank, ADC	213-849-5821
Cal	Burbank, ADC	213-849-5821
Colo	Denver, Parker Webster	303-770-1972
Conn	Bloomfield, Zaslow Sls.	203-242-7781
Conn	Fairfield, ADC	203-366-8754
Conn	Milford, Zaslow Sls.	203-878-1094
Fla	Sanford, ADC	305-322-5422
Ill	Chicago, J. Angel	312-878-0653
Mass	Lowell, Zaslow Sls.	617-458-8452
Mass	Northboro, Zaslow Sls.	617-393-8150
Mich	Southfield, Sterling-Lowell	313-352-8881
Minn	St. Paul, R. Ragon	612-488-0201
NM	Albuquerque, A. Q. Elctrns.	505-255-8701
NY	Great Neck, E.R.A.	516-482-9320
Ohio	Cincinnati, J. Murray	513-662-1616
Ohio	Cleveland, C. Robinson	216-381-9049
Pa	Fairview Village, Danco Corp.	215-539-9300
Tex	Dallas	214-241-6783
Wash	Seattle, J.B. Jolly	206-938-4166
For:	Can., Montreal, Que., Willer Engrg.	514-747-9316
For:	Can, Toronto, Ont., Willer Engrg.	416-783-3373

ADC Local Distributors

Ariz	Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway	
Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ill	Chicago, Newark Elctrns, 500 N. Pulaski Rd.	312-638-4411
Ind	Indianapolis, Ra-Dis-Co., Inc., 814 N. Senate Ave., Box 1064	317-637-5571
Mass	Newton, Cramer Elctrn. Inc., 85 Wells Avenue	617-969-7700
Neb	Omaha, J-B Distributing Co., 1616 Cass St	402-341-5525
NY	New York, Harvey Radio Co. Inc., 2 W. 45th St.	212-582-1500
NY	New York, Terminal-Hudson, 236 W. 17th St.	
NY	Woodbury, Harvey Radio, 60 Crossways Park W.	516-921-8700
Ohio	Dayton, ESCO, 221 Crane St.	513-224-9192
Pa	Philadelphia, Phila Electronics Inc., 1225 Vine St.	215-568-7444
Tex	Houston, Gulf Tele & Elctrns. Inc., 3718 Art Dale	713-781-3066

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

ADDINGTON LABS., INC., Microwave Comps. Div., 1043 DiGiulio Ave., Santa Clara, Calif., 95050, Tel: 408-248-5511, TWX: 910-338-0138; Sls. Mgr: M.L. Jaggars

Local Sales Offices & Reps.

Ariz	Phoenix, Elctrn. Enterprises	602-946-9860
Cal	Los Altos, Stout Assoc.	415-948-3265
Cal	Los Angeles, Interstate Mktg. Assoc.	213-883-7606
Cal	Palo Alto, Calif. Internat'l. Trade	415-328-1460
Colo	Boulder, H. Bass Assoc.	303-499-7509
DC	Washington, Applied Eng. Consultants	202-783-7319
Ga	Atlanta, Deltech Assoc.	404-766-8822
Ill	Chicago, Midwest Microwave	312-283-4900
Kans	Wichita, G. Carbiener Assoc.	316-682-5782
Md	Ellicott City, Applied Engrg. Consultants	301-465-1272
Mass	Wellesley, Reptron, Inc.	617-449-4141
NJ	Westfield, Gray & Reed Assoc.	201-233-6116
NM	Las Cruces, Elctrn. Enterprises	505-524-0126
NY	Huntington, Gray & Reed Assoc.	516-433-3333
NY	Syracuse, Lightstone Corp.	315-454-3209
Pa	Newtown Square, SWR Assoc.	215-356-8550
Tex	Dallas, Texas Avionics	214-368-3566

ADDINGTON LABS., INC., Solid State Prods. Div., 680 W. Maude Ave., Sunnyvale, Cal., 94086, Tel: 408-245-6810, TWX: 910-339-9230; Sls. Mgr: D. Wyand

Refer to Addington Labs., Microwave Comps. Div. for sales office information

ADHESIVE PRODS. CORP., 1660 Boone Ave., Bronx, N.Y., 10460, Tel: 212-542-4600; Sls. Mgr: M.S. Peters

ADTROL DIV., Electro-Tel Corp., 1600 N. Main St., Blackburg, Va., 24060, Tel: 703-552-2111, TWX: 710-875-3698; Sls. Mgr: J.J. Daly

ADVANCE INSTR. CORP., 1707 F. St., Belmar, N. J., 07719, Tel: 201-681-2700; Sls. Mgr: M. Tepper

ADVANCE ROSS ELCTRNS. CORP., 135 S. La Salle St., Chicago, Ill., 60603, Tel: 312-KI-3-660; Pres: H.C. Buckingham

ADVANCED CIRCUITRY DIV., Litton Inds., 4811 W. Kearney St., Springfield, Mo., 65803, Tel: 417-862-0751, TWX: 910-775-4705; Mktg: N. Hales; SM: J. Kleier; GM: W.C. Guyette

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ADVANCED ENERGY CONVERSION, 1502 Old County Rd., Belmont, Cal., 94002, Tel: 415-591-4400; Pres: R. Kaylor; V.P: L.L. Rickard

ADVANCED HIGH VOLTAGE INC., 14532 Arminta St., Van Nuys, Cal., 91402, Tel: 213-997-7222; Pres: M.J. Alexander; Mrkt. Mgr: W.B. Williamson Vol 1•594,595

Local Sales Offices & Reps.

Ariz	Scottsdale, J. Smith & Assoc.	602-943-4131
Cal	Los Altos, Westec	415-948-8880
Mass	Burlington, Burlington Sls. Co.	617-272-7655
Minn	Minneapolis, Revere Assocs.	612-781-2615, 935-4274
NM	Albuquerque, J. Smith & Assoc.	505-255-2111
NY	Cazenovia, P. DeCew Assoc.	315-655-8602
Pa	Norristown, Dacom	215-277-5358
Tex	Dallas, Bouco Sls. Assocs.	214-247-6708
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Cal	Mtn. View, Trident Assocs.	415-967-7031
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Mass	Medfield, H. A. Cohen Assoc.	617-359-2618
Mass	Randolph, Advanced Memory Sys.	617-828-2182
Minn	St. Paul, Cahill Assocs. Inc.	612-739-8445
NJ	Livingston, Varrelman-Gorman Co.	201-992-2505
NY	Plainview, Central Assocs.	516-433-0808
Ohio	Dayton, D. Steffer & Assoc. Inc.	
Ohio	Wickliffe, D. Steffer & Assoc. Inc.	
Tex	Dallas, Norvell Assocs., Inc.	214-350-6771
Tex	Houston, Norvell Assocs., Inc.	713-774-2568
Va	Arlington, H. J. Heffernan Co.	703-522-6666

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Kans	Wichita, D & O Engrg. Co.	316-264-7358
Md	Lutherville, Phil Knox & Co.	301-252-1288
Mass	Woburn, All Star Engrg. Co.	617-449-2634
Mich	Southfield, Sterling-Lowell Co.	313-352-8881
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NJ	Somerville, J & L Assocs.	201-722-0682
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Ohio	Cleveland, Tech. Assocs. Inc.	216-333-0035
Ohio	Fairborne, Tech. Assocs. Inc.	513-878-2484
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For:	Can., Montreal, Que., White Radio Ltd.	514-482-8091

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Fla	Ft. Lauderdale, Snow Co.	305-563-2448
Ga	Chamblee, E. G. Holmes & Assocs.	404-451-6161
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Kans	Shawnee Mission, Tech. Sls. Assocs.	913-888-3330
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NY	Jericho, Dal-Tech Devices	516-433-7449
NY	Syracuse, Syracuse Tech Reps.	315-488-0222
Tex	Richardson, Lear Assocs.	214-231-7696
Wash	Seattle, Delcom Sls. Co.	206-248-0090

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Ga	Roswell, Electro Rep Assocs.	404-993-1332
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NM	Albuquerque, TOLTEC Corp.	505-268-4366
NY	Syracuse, Mr. J. V. Costello	315-472-0322
NC	Charlotte, Electro Rep Assocs.	704-527-2530
Ohio	Medina, McShane	216-725-4568
Tex	Dallas, PESO	214-369-3181
Wisc	Brookfield, D. R. Manecke Co.	414-782-2525
Exp:	Hallandale, Florida, EMEC, Inc.	305-925-6366
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ALLEN AVIONICS, Div. A. K. Allen Co., 224 East 2nd St., Mineola, N.Y., 11501, Tel: 516-248-8080; Sls. Mgr: L. Jacobson ..... Vol 2•544,545; Vol 3•978-981

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Ala Birmingham, F. C. Nickerson Co. 205-853-2852
Cal Los Angeles, E.V. Roberts & Assoc. 213-870-9561
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Colo Golden, J. Hurlbut 303-279-7138
Fla Oldsmar, F. C. Nickerson Co. 813-855-4209
Ga Decatur, F. C. Nickerson Co. 404-377-1575
Ill Chicago, Electro-Tech Mktg. Assoc. 312-588-4535
Kans Wichita, E. Carbiener Assoc. 316-682-5782
Md Baltimore, D. Jones 301-752-0577
Mass Wayland, Wayland Engrg. Sls. 617-655-6080
Minn Anoka, K. Haugen & Assoc. 612-421-3395
NY Woodbury, J. Sweeney 516-692-4222
NC Kannapolis, F. C. Nickerson Co. 704-932-6772
Pa Phila., Mid-Eastern Assocs. 215-842-2810
Tex Dallas, Texas Avionics 214-368-3566
Wash Seattle, Underwood & Underwood Inc. 206-243-2133
Exp: Stamford, Ct., Dage Corp. 203-324-3123
For: Can., Don Mill, Ont., Tech Assoc. 416-445-7490

ALLEN-BRADLEY CO., 1201 S. 2nd St., Milwaukee, Wisc., 53204, Tel: 414-671-2000, TWX: 910-262-3451; Sls. Mgr: C. Ryder ..... Vol 3•1093-1098

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Cal San Francisco, Hunter 415-626-8576
Colo Denver, Allen-Bradley Co. 303-936-7303
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Fla Jacksonville, Van & Smith 904-384-2376
Fla Miami, C. Lee & Assocs. 305-444-7414
Fla Orlando, Van & Smith 305-425-7026
Fla Tampa, Van & Smith 813-877-8393
Ga Atlanta, R. E. Wilson Co. 404-876-8833
Haw Honolulu, R. J. Austin & Assoc. 808-395-4011
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Md Baltimore, Allen-Bradley 301-265-5600
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Ohio Dayton, Allen-Bradley 513-298-6121
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Tenn Memphis, C. H. Stout of Tenn. 901-362-1616
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Va Richmond, Allen-Bradley 703-282-4285
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Wisc Milwaukee, Allen-Bradley Co. 414-671-2000
Exp: N.J., Bloomfield, Allen-Bradley 201-338-6262
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For: Can., Edmonton, Alberta, R. L. Brews & Son, Ltd. 403-452-3732

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Cal Irvine, Cramer/L. A., 17201 Daimler St. 714-979-3000
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Fla Hollywood, Cramer/Ew Hollywood, 4035 North 29th Avenue 305-923-8181
Fla Hollywood, Schweber Elctrns. 305-927-0511
Ga Atlanta, Schweber Elctrns. 404-449-9170
Ill Chicago, Schweber Elctrns. 312-593-2740
Ill Mt Prospect, Cramer/Chicago, 1911 South Busse Road 312-593-8230
Md Gaithersburg, Cramer/Ew Washington, 16021 Industrial Drive 301-948-0110
Md Rockville, Schweber Elctrns. 301-881-2970
Mass Newton, Cramer Elctrn. Inc., 85 Wells Avenue 617-969-7700
Mass Newton, Cramer/International, 85 Wells Ave. 617-969-7700
Mass Waltham, Schweber Elctrns. 617-890-8484
Mich Detroit, Schweber Elctrns. 313-583-9242
NJ Somerset, Schweber Elctrns. 201-469-6008
NY Rochester, Cramer/Rochester, 3259 Winton Road South 716-275-0300
NY Rochester, Schweber Elctrns. 716-328-4180
NY Westbury, Schweber Elctrns., Jericho Tpke 516-334-7474
NC Raleigh, Schweber Elctrns. 919-832-8881
Ohio Beachwood, Schweber Elctrns. 216-464-2970
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131

ALLEN-BRADLEY, Systems Div., 747 Alpha Dr., Highland Hgts., Ohio, 44143, Tel: 216-449-6700, TWX: 810-427-2975; Mktg. Mgr: R.J. Fredrickson

ALLEN ELCTRNS. DIV., Allen Organ Co., Macungie, Pa., 18062, Tel: 215-965-9801; Mgr: M.F. Nelson

ALLEN MFG. CO., Drawer 570, Hartford, Conn., 06101, Tel: 203-242-8511, TWX: 710-425-0099; Sls. Mgr: L. G. Ullring

ALLIANCE MFG. CO., North American Philips Co., Alliance, Ohio, 44601, Tel: 216-821-5360, TWX: 216 823 8100; Dist. Sls. Mgr: H.F. Cockrill; OEM Sls: J. Beettura

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Ill Chicago, Matthews-Midwest Co. 283-5333
Ill Chicago, T.B. Hunter SP 7-2500
Ind Columbus, A.J. Bolenbaugh 812-372-3960
Kans Des Plaines, Mathews & Co. 312-298-3600
Mich Grand Rapids, J.J. Orr Co. LE 4-4029
Minn Minneapolis, H.M. Richardson Co. 335-7734
Mo St. Louis, T.L. Dowell & Co. VI 2-1588
NY Flushing, Bettan Sls. 212-969-7600
NY Pittsford, Dynatherm, Inc. 716-586-0080
NC Charlotte, Hollingsworth & Still 704-536-7047
Ohio Cincinnati, F.J. Campisano 662-1616
Tenn Nashville, J. Cottrell CY 2-8997
Tex Dallas, Lund & Co. RI 8-8839
Exp: NY, New York, J. Plasencia Co.
For: Can., Oakville, Ont., H. Daymond Sales, Ltd. 844-6721

ALLIANCE Local Distributors
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040

ALLIED CHEMICAL CORP., Specialty Chemicals Div., Box 1087R, Morristown, N.J., 07960, Tel: 201-455-2000, TWX: (201) 538-6655; Sls. Mgr: D.L. Ousterling

ALLIED CONTROL CO., 100 Relay Rd., Plantsville, Conn., 06479, Tel: 203-628-9654, TWX: 710-473-0079 Vol 2•683-687

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Cal Los Angeles, El-Com Inc.
Colo Denver, Electronic Sls.
Fla Maimi Beach, Geartner Assocs.
Fla Orlando, Geartner Assocs.
Ga Chamblee, O'Hara Assocs.
Ill Chicago, D. Dolin Sls. Co.
Kans Overland Park, Penzner-Mankus Assocs.
Kans Wichita, Penxner-Mankus Assocs.
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NC Burlington, P.J. Nahser Co.
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Ohio Centerville, E.M.A., Inc.
Ohio Dayton, G. P. Lessis Assoc.
Pa Pittsburgh, Gene S. Root & Co.
Pa Willow Grove, J. R. Daniel & Co.
Tex Dallas, Ammon & Rizos
Tex Houston, Ammon & Rizos
Wash Seattle, D. Smith Sls. Co.
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Cal South Gate, Moltronics, Inc., 5610 E. Imperial Hwy. 213-773-6521
Minn Minneapolis, ICI-Industrial Comps. Inc., 612-927-9991 91
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Tenn Nashville, Electra Distributing, 1914 W. End Ave. 615-329-3971
Tex Houston, Geophysical Supply Co., Box 52230 713-224-0621

ALLIED ELCTRNS., Div. of Tandy Corp., 2400 W. Washington Blvd., Chicago, Ill., 60612, Tel: 312-421-2400; V.P. Sls: D. Yaniko; Nat'l. Mktg. Mgr: J.C. Harvey .....Vol 1•387; Vol 2•688,689; Vol 3•1250,1251

Local Sales Offices & Reps.
Cal Garden Grove, Allied Elctrns./Div. of Tandy Corp. 213-598-6605
Fla Fort Lauderdale, Allied Elctrns./Div. of Tandy Corp. 305-772-6404
Md College Park, Allied Elctrns./Div. of Tandy Corp. 301-345-4600
Mass Braintree, Allied Elctrns./Div. of Tandy Corp. 617-848-4150

ALLIED SYSTEMS CORP., Box 11005, Greensboro, N.C., 27409, Tel: 919-299-2294; V.P: E.V. Saude Vol 3•553

Local Sales Offices & Reps.
Ala Huntsville, Tech-Rep Assocs., Inc. 205-881-5925
Cal Long Beach, Cairns Engrg. Sls. Corp. 213-432-7444
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Fla Indian Rocks Beach, Tech-Rep Assocs., Inc. 813-595-2834
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Md Arlington, H. J. Heffernan Co. 703-522-6666
Mass Waltham, ICM Co. 617-891-8059
NY Hyde Park, R. P. Kennedy Co. 914-229-2269
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ALLIS-CHALMERS, Box 512, Milwaukee, Wisc., 53201, Tel: 414-475-2000, TWX: 910-262-3445; Switchgear Div: D. Gibson; Ind. Controls Div: D. Smith; Motor & Gen. Div: J.W. Donnelly

ALLIS, LOUIS DIV., Litton Industrial Prods., Inc., 427 E. Stewart St., Milwaukee, Wisc., 53201, Tel: 414-481-6000, TWX: 910-161-3160

ALLISON LABS., INC., Box 9849, Austin, Tex., 78766, Tel: 512-836-5160; Sls. Mgr: E.U. Parsons

Local Sales Offices & Reps.
Mass Waltham, Tech. Enterprises 617-891-5300
Exp: N.Y., New York, B. Freudenberg, Inc. 212-PL-7-9130

ALMOND INSTRS. CO., 1060 E. Cypress St., Covina, Cal, 91722, Tel: 213-967-4151; Sls. Mgr: G.A. Almond Vol 1•935

ALNOR INSTR. CO., 420 N. LaSalle St., Chicago, Ill., 60610, Tel: 312-467-1331; Asst. Sls Mgr: J.J. Kuska; Sls: W.J. Bailey

ALPHA COMPONENTS CORP., 115 Eucalyptus Dr., El Segundo, Cal., 90245, Tel: 213-322-7780; Pres: J.T. Cataldo; VP: J.D. Vickrey

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NY Brooklyn, I. Brown Co. 212-493-1379
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ALPHA INSTR. INC., 20 Sylvan Rd., Woburn, Mass., 01801, Tel: 617-935-5150, TWX: 710-393-1236; Mktg. Svcs. Mgr: R.B. Moffett

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ALPHA METALS Local Distributors
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Tex Houston, Texport Co. 713-464-2020
Wash Seattle, Earl & Brown 206-284-1121
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Cal San Diego, Moltronics, Inc., 7969 Engineer Rd. 714-278-5020
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Cal Santa Clara, Moltronics, Inc., 337 Mathews St. 408-244-7600
Cal South Gate, Moltronics, Inc., 5610 E. Imperial Hwy. 213-773-6521
Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
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Conn Hamden, Connecticut Electro Sls., 1601 Dixwell Ave. 203-288-8266
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La Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094 318-423-6131
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Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200

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Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
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NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
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Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
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Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Pattison Supply Co., 4550 Willow Pkwy. 216-441-3000
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
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Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
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Wisc Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave. 414-228-8100

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ALTHOR PRODS., 2260 Benson Ave., Brooklyn, N.Y., 11214, Tel: 212-373-7444; Sls. Mgr: J. Kessler

AMCO ENGRG. CO., 7333 W. Ainslie St., Chicago, Ill., 60656, Tel: 312-867-8500, TWX: 910-221-5192; Sls. Mgr: F.A. Johnson; Dir. of Mktg: R.C. Komarek

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Cal Los Angeles, Ed Landa Co. 213-879-0770
Cal San Francisco, Hunter Assocs. 415-626-8576
Colo Denver, Williams Assocs. 303-343-2911
Conn West Hartford, Instrument Dynamics, Inc. 203-233-5503
Fla Altamonte Springs, WMM Assocs. 305-831-4645
Fla Clearwater, WMM Assocs., Inc. 813-726-8871
Fla Pompano Beach, WMM Assocs. 305-943-3091
Ga Tucker, Ridge Instr. Co. 404-939-1554
Ill Chicago, R. L. Lang & Assocs. 312-867-4241
Ind Ft. Wayne, McDonald Sls. Co. 219-745-9214
La Kenner, D. Bellew Sls., Inc. 504-729-4550
Md Silver Spring, L. G. White & Co. 301-585-3141
Mass Wakefield, Instrument Dynamics, Inc. 617-245-5100
Mich Detroit, WKM Assocs. 313-892-2500
Minn St. Paul, Bonament Heyda Co. 612-484-8531
Mo Kansas City, Forristal-Young Sls. Co. 816-358-6771
Mo St. Louis, Forristal-Young Sls. Co. 314-645-2360
NJ Woodcliff Lake, F&F Assocs. 201-778-6767
NM Albuquerque, Williams Assocs. 505-255-1638
NY Flushing, F&F Assocs. 516-334-1160
NY North Syracuse, NACO Elctrns. 315-699-2651
NC Winston Salem, L. G. White & Co. 919-725-3612
Ohio Cleveland, WKM Assocs. 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Okla Tulsa, D. Shuhart Co. 918-747-4136
Ore Portland, Arva, Inc. 503-292-8762
Pa King of Prussia, White-Keystone Inc. 215-265-1817
Pa Pittsburgh, WKM Assocs. 412-892-2953
Tenn Oak Ridge, Ridge Instr. Co. 615-483-1311
Tex Bellaire, Brice Co. 713-666-1788
Tex Dallas, D. Shuhart Co. 214-239-0185
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Kans Mission, Mesa, Inc. 913-262-6565
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NY Syracuse, R.F. Lamb Co., Inc. 315-454-2469
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Ore Portland, C.K. Shanks & Assocs. 503-292-5656
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NJ Willingboro, B.P. Kulwin 609-877-2358
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Va Alexandria, AMP Inc. 703-931-0660
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Pa Berwyn 215-647-6060
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Cal San Diego, No. American Philips Elec. Comp. Corp. 714-453-9250
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Fla Winter Park, No. American Philips Elec. Comp. Corp. 305-678-2522
Ill Elk Grove Village, No. American Philips Elec. Comp. Corp. 312-593-8220
Mass Needham Heights, North American Philips Elec. Comp. Corp. 617-449-1406
Mich Southfield, No. American Philips Elec. Comp. Corp. 313-357-4288
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Colo Denver 303-922-8434
Conn Shelton, Comark Assocs. 203-929-4884
Fla Ft. Lauderdale 305-772-2840
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Ill Chicago, Berndt Assocs. 312-283-0713
Ill Elk Grove Village, No. Amer. Philips Elec. Comp. Corp. 312-593-8220
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Kans Andover, Palatine Engineering Sales 316-683-7512
Kans Overland Park, Palatine Engrg. Sls. 913-262-5643/6820
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NC Winston-Salem, Candor Co. 919-924-1480
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Pa Harrisburg, Beil & Whitaker 717-652-0184
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Pa Reading, Beil & Whitaker 215-779-2610
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Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
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Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
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Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Paterson, United-Page, Inc, 481 Getty Ave 201-279-7500
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
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Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971

Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
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Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801

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Ga Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW 404-355-2223
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Iowa Cedar Rapids, Iowa Radio Supply Co. Inc., 719 Center Point Rd. NE 319-364-6154
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Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NY Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave. 212-492-9590
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
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Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801
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Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801

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(Refer to Amphenol Sales Div for sales office information)

AMPHENOL CANADA LTD., 44 Metropolitan Rd., Scarborough, (Ont.), Can., Tel: 416-291-1621, TWX: 06-217-676; Mktg. Mgr: J. Perna; Mktg. Mgr: R. Newbold
Vol 3•648
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AMPHENOL COMPS. GRP. MKTG., Bunker Ramo Corp., 1 Oakbrook N., Oak Brook, Ill., 60521, Tel: 312-325-8180, TWX: 910-651-3053; V.P. Mtg: R.E. Hall
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AMPHENOL CONNECTOR DIV., Bunker Ramo Corp., 2801 S. 25th Ave., Broadview, Ill., 60153, Tel: 312-261-2000, TWX: 910-226-1974; Sales Prom. Mgr: D.A. Holt
Vol 3•559,560-567,570-583,585,587-594,595-627
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AMPHENOL RF DIV., Bunker Ramo Corp., 33 E. Franklin St., Danbury, Conn., 06810, Tel: 203-743-9272, TWX: 710-456-0281; V.P. Mktg: S.G. Woodward
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AMPHENOL SALES DIV., Bunker Ramo Corp., 2875 S. 25th Ave., Broadview, Ill., 60153, Tel: 312-261-2020, TWX: 910-226-1961; VP Sls: D. O'Connell
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Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Cal San Diego, Moltronics, Inc., 7969 Engineer Rd. 714-278-5020
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Cal Santa Clara, Moltronics, Inc., 337 Mathews St. 408-244-7600
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Colo Denver, Newark-Denver Elctrns., 2170 So. Grape St. 303-757-3351
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AUDIO EQUIP. CO., INC., Div. W. Kidde & Co., Inc., 706 Forrest St., Charlottesville, Va., 22901, Tel: 804-293-5148, TWX: 510-587-5461; V.P. Mtg: L.D. Armentrout; Pres: W.L. Stowers

AUDIOTRONICS, 7428 Bellaire Ave., N. Hollywood, Cal., 91605, Tel: 213-877-1308; Video AM: L. Aron; Mktg. Svcs. Mgr: J. Steorts

AUGAT INC., 33 Perry Ave., Attleboro, Mass., 02703, Tel: 617-222-2202, TWX: 710-391-0644; Sls. Mgr: E. Redgate

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Cal	San Carlos, D. Ross	415-591-4411
Colo	Littleton, Simpson	303-798-8439
Conn	New Canaan, S. Pierce	203-966-4630
Fla	Clearwater, H.R. Gross & Co.	813-446-6649
Ga	Atlanta, Cartwright & Bean	404-237-2273
Ill	Chicago, R. Krueger	312-282-8444
Ind	Fort Wayne, Ryan Sls. Co.	219-745-7334
Kans	Overland Park, Lowell-Kangas & Assocs., Inc.	913-888-3200
La	Chalmette, Cartwright & Bean, Inc.	504-279-4598
Mass	Norwood, S. Pierce, Inc.	617-762-3164
Mich	Detroit, Hilltronics, Inc.	313-398-5556
Minn	Edina, M. Foster Co.	612-835-2252
Mo	St. Louis, Lowell-Kangas & Associates, Inc.	314-821-4050
NJ	Cherry Hill, Trinkle Sls., Inc.	609-667-3500
NY	Mt. Vernon, D. Sonkin Assocs.	914-668-9809
NY	N. Syracuse, L. D. Allen, Inc.	315-458-7470
NC	Charlotte, Cartwright & Bean Inc.	704-333-6457
NC	Raleigh, Cartwright & Bean, Inc.	919-832-7128
Ohio	Brecksville, A. Nace Co., Inc.	216-526-4323
Ohio	Dayton, A. Nace Co., Inc.	513-836-7548
Ore	Portland, C.K. Shanks	503-292-5656
Pa	Pittsburgh, A. Nace Co.	412-922-7225
Tenn	Memphis, Cartwright & Bean	901-276-4442
Tex	Dallas, J.B. Guenther	214-528-6286
Tex	Houston, J.B. Guenther, Inc.	713-468-0232
Utah	Salt Lake City, Simpson Assocs., Inc.	801-521-3622
For:	Can., Ottawa, Ont. K2E625, Whittaker Elctrns., Ltd.	613-224-1221

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Cal	Irvine, Cramer/L. A., 17201 Daimler St.	714-979-3000

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Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Semiconductor Specialists, Inc. 312-279-1000
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Md Hanover, Hamilton/Avnet Elctrns. 301-796-5000
Md Hyattsville, Milgray/Washington, 5405 Lafayette Pl. 301-864-1111
Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Newton, Cramer/International, 85 Wells Ave. 617-969-7700
Minn Minneapolis, Hamilton/Avnet Elctrns. 612-854-8400
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-239-0800
NJ Cherry Hill, Hamilton/Avnet Elctrns. 609-662-9337
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY East Syracuse, Cramer/Syracuse, 6716 Joy Road 315-437-6671
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NY Westbury, Hamilton-Avnet Electrns., 70 State St.
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Ohio Cleveland, Milgray/Cleveland, 1821 E. 40th ST. 216-881-8800
Ohio Cleveland, Pattison Supply Co., 4550 Willow Pkwy. 216-441-3000
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Utah Salt Lake City, Cramer/Utah, 391 West 2500 South 801-487-3681
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
For: Can., Montreal, Hamilton/Avnet Elctrns. 514-735-6393
For: Can., Ottawa, Ont., Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl.
For: Can., Toronto, Ont., Hamilton/Avnet Elctrns. 416-789-1838

AUL INSTRS., INC., 139-30 34th Rd., Flushng, N.Y., 11354, Tel: 212-886-0600; Sls. Mgr: E. Saul

AUSTIN ELCTRNS., 450 W. First Ave., Roselle, N.J., 07023, Tel: 201-241-3300, TWX: 710-996-5981; Asst./Dv. Mgr: K.F. O'Connor

AUSTRON, INC., 1915 Kramer Lane, Austin, Tex., 78758, Tel: 512-836-3523, TWX: 910-874-1356; Sls. Mgr: R. Malone; Cust. Svcs: V. Bode .... Vol 1•391; Vol 2•385

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Md Rockville, T.E. Corp. 301-340-0303
Mass Waltham, Technical Entprs. 617-890-5300
NJ Haddonfield, Brisco 215-923-1075
NC Winston-Salem, W.A. Brown Instrs. Co. 919-768-3600
Ohio Dayton, L.D. Bruno Co. 513-434-1847
Tex Austin, Austron, Inc. 512-836-3523
Tex Houston, Pan-Tech Engrg. Co. 713-623-0640

AUTOCON INDS., INC., Sub. Control Data, 2300 Berkshire La. N., Minneapolis, Minn., 55441, Tel: 612-545-2851; Mktg. Mgr: J.S. Tart

AUTOMATED MEAS., Div. E.H. Research Labs, Box 1289, Oakland, Calif., 94604, Tel: 415-834-3030, Ext. 319, TWX: 910-366-7258; Sls. Mgr: R.L. Aston
(Refer to E-H Resch. Labs. for sales office information)

AUTOMATIC COIL, Div. Designatronics Inc., 55 S. Denton Ave., New Hyde Pk., N.Y., 11040, Tel: 516-328-3300, TWX: 510-223-0642; Gen. Mgr: J. Keith

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Ill Chicago, Solid State Elec. 312-889-8033
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Tex Dallas, Data Marketing Assoc. 214-358-4643

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Colo Denver, Electronic Sls., Inc. 303-771-6300
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Mich Brighton, H. H. Barnum Co. 313-229-2961
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Ohio Cleveland, Anderson-Bolds, Inc. 216-229-4700
Ohio Worthington, Anderson-Bolds, Inc. 614-885-3933
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Utah Salt Lake City, Control Equip. Co. of Salt Lake 801-487-7741
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Wash Spokane, J. A. Tudor & Assoc. 509-FA-7-3328
Wisc Cedarburg, Automation Engrg. Co. 414-377-7500

AUTOMATION DEVICES, INC., Box A.D., Automation Pk., Fairview, Pa., 16415, Tel: 814-474-5561; Pres: F.E. Smith; V.P: L.V. Smith; Sec: D.G. Buseck

AUTOMATION DYNAMICS, Div. Resalab, Inc., 35 Industrial Pkwy., Northvale, N.J., 07647, Tel: 201-768-9200; Sls. Mgr: C.E. Barlow

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Conn Glastonbury, Automation Industries, Inc., Sperry Div. 203-633-5248
Ga Atlanta, Automation Industries, Inc., Sperry Div. 404-636-0155
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Tex Houston, Automation Industries, Inc., Sperry Div. 713-774-9650
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Wash Renton, Automation Industries, Inc., Sperry Div. 206-228-3170
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AUTOMATION SERVICES DIV., The Union Corp., 10 Industrial Park, Windsor, N.Y., 13865, Tel: 607-775-2740, TWX: 510-252-1930; Exec. V.P: H. Callaway

AUTOMEDIA, INC., 154 San Lazaro Ave., Sunnyvale, Cal., 94086, Tel: 408-732-0461; Gen. Mgr: W.J. Smith; Pres: W.J. Smith

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Tenn Nashville, Electra Distributing, 1914 W. End Ave. 615-329-3971

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Colo Denver, Thorson Co. 303-355-3521
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NM Albuquerque, Thorson Co. 505-265-5655
NY New Hyde Pk., R. P. Luce & Co 516-437-4550
Pa Phila., R. P. Luce & Co. 215-884-8365
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Tex Houston, Thorson Co. 713-771-3504
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NY Woodbury, Harvey Radio, 60 Crossways Park W. 516-921-8700

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Cal Palo Alto, The Thorson Co. 415-321-2414
Cal San Diego, The Thorson Co. 714-298-8385
Cal Tustin, The Thorson Co. 714-544-5121
Colo Denver, The Thorson Co. 303-355-3521
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Kans Shawnee Mission, E.I.R. Co. 913-362-0919
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Minn Minneapolis, Cozzens/Cudahy, Inc. 612-884-4336/4337
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AVIBANK MFG. INC., 210 S. Victory Blvd., Burbank, Calif., 91503, Tel: 213-843-4330, TWX: 910-498-2215; Sls. Off. Mgr: D. Ladin

Local Sales Offices & Reps.

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Ariz	Phoenix, Zeus, Inc.	602-253-6104
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Kans	Leavenworth, Mid-West Mktg. Assoc.	913-651-2929
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Mass	Holbrook, McLellan	617-963-8812
Mich	Detroit, WKM Assocs.	313-892-2500
Mo	Florissant, Mid-West Mktg. Assocs.	314-831-0342
NJ	Livingston, G & A Sls.	201-992-3087
NM	Albuquerque, Zeus, Inc.	505-268-3941
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Pa	Ambler, W.M. Assocs.	215-643-4119
Pa	Pittsburgh, Frame Elec.	412-322-1500
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Tex	Houston, Data Aids Assocs.	713-785-0581
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Wash	Seattle, Instrument Lab. Inc.	206-283-5850

AVTRON MFG., INC., 10409 Meech Ave., Cleveland, Ohio, 44105, Tel: 216-641-8310, TWX: 810-421-8435; Sls. Mgr: J.R. O'Lenick

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Cal	San Diego, Interstate Mktg. Assocs.	714-278-0870
Cal	Woodland Hills, Interstate Mktg. Assocs.	213-883-7606
Colo	Denver, Elcom Div. of Zeus	303-771-6200
Conn	West Haven, Nannis Assocs.	203-932-5656
Fla	Oviedo, Conley & Assocs.	305-365-3283
Ill	Chicago, T.B. Hunter Assocs.	312-777-2500
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Mich	Southfield, Carrier & Gable	313-444-8980
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Tex	Houston, Ammon & Rizos	713-729-1233
Utah	Salt Lake City, Elcom Div. of Zeus	801-486-2317
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For:	Can., Downsview, Ont., Kaytronics Ltd.	416-638-5511
For:	Can., Montreal, Que., Kaytronics Ltd.	514-487-3434

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Cal	San Diego, Cramer/San Diego, 8975 Complex Drive	714-565-1881
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Ill	Palatine, Ohm/Elctrns, 645 Vermont Ave	312-359-5500
Md	Gaithersburg, Cramer/Ew Washington, 16021 Industrial Drive	301-948-0110
Mass	Newton, Cramer Elctrn. Inc., 85 Wells Avenue	617-969-7700
Mass	Newton, Cramer/International, 85 Wells Ave.	617-969-7700
NY	Lynbrook, Peerless Radio, 19 Wilbur St.	516-593-2121

B & B MOTOR & CONTROL, 96 Spring St., New York, NY, 10012, Tel: 212-966-5777; Pres: P. Berson; Sls. Mgr: P. McLaughlin; Chf. Engr: D. Shaw

Local Sales Offices & Reps.

NY	Rochester, B & B Motor & Control Corp.	716-473-6640

B & F INSTRS., INC., Cornwells Hgts., Pa., 19020, Tel: 215-639-7100, TWX: 510-667-1516; Sls. Mgr: B. Pogach

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Kans	Andover, Palatine Engrg. Sls.	316-683-7512
Kans	Overland Park, Palatine Engrg. Sls.	913-262-5643
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Mich	Plymouth, Measurement Instrs.	313-352-2144
Mo	St. Louis, Palatine Engrg. Sls.	314-426-7055
NM	Albuquerque, Cleveland Entprs., Inc.	505-298-7671
NY	Melville, Astrorep Incorp.	516-423-2266
NC	Charlotte, Systems Svc. Corp.	704-377-3407
Ohio	Cincinnati, Measurement Instrs.	513-531-2729
Ohio	Columbus, Measurement Instrs.	614-488-9753
Pa	Jenkintown, PDC Corp.	215-887-9610
Pa	Monroeville, Measurement Instrs.	412-366-1906
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Tex	Richardson, Palatine Engrg. Sls.	214-231-9489
Wash	Seattle, Brett Assocs., Inc.	206-935-8054

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Cal	San Mateo, B & K Instrs., Inc.	415-948-9519
Colo	Denver, Barnhill Three, Inc.	303-934-5505
Conn	Hamden, Equipment Sls. Co.	203-248-5581
Fla	Orlando, Lee Assocs., Inc.	305-241-4445
Ga	Chamblee, Lee Assocs., Inc.	404-457-7117
Ill	Chicago, Carter Elctrns., Inc.	312-585-5485
Ind	Indianapolis, Carter Elctrns., Inc.	317-293-0696
Md	Rockville, Farrell Assocs.	301-424-9460
Mass	Chelmsford, Equipment Sls. Co.	617-256-8547
Mich	Detroit, Electro Sls. Assocs.	313-526-8800
Minn	Minneapolis, Carter Elctrns., Inc.	612-544-9393
Mo	Hazelwood, Carter Elctrns., Inc.	314-731-2237
NM	Albuquerque, Barnhill Three, Inc.	505-299-7658
NY	DeWitt, DB Assocs.	315-446-0220
NY	Great Neck, Measurement Tech., Inc.	212-895-7177
NC	Raleigh, Lee Assocs., Inc.	919-787-5818
Ohio	Cleveland, Electro Sls. Assocs.	216-261-5440
Ohio	Dayton, Electro Sls. Assocs.	513-426-5551
Pa	King of Prussia, LeTronix Inc.	215-242-6223
Pa	Pittsburgh, Electro Sls. Assocs.	412-371-9449
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Tex	Richardson, Barnhill Two, Inc.	214-231-2573
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Pa	Reading, Barbey Elctrn., 333 N. 4th St.	

BABCOCK CONTROL PRODS., Babcock Elctrn. Sub. Esterline Corp., 3501 Harbor Blvd., Costa Mesa, Calif., 92626, Tel: 714-540-1234, TWX: 910-595-1517; Dir. of Mktg: E.F. Bryant ..... Vol 2*700,701

Local Sales Offices & Reps.

Cal	L A, E. Landa Co.	213-879-0770
Cal	Los Altos, E. Landa	415-948-0788
Colo	Denver, Checkmate Sls.	303-771-4920
Conn	Haven, Kitchen & Kutchin	203-239-0212
Fla	Ft. Lauderdale, G. Bohman	305-564-3081
Fla	Orlando, G. Bohman	305-855-0274
Ill	Chicago, Carlson Elctrn.	312-774-4812
Ind	Greenwood, Valentine/Schillinger & Assoc.	317-888-2260
Ind	South Bend, Valentine/Schillinger & Assoc.	219-291-6258
Kans	Overland Park, Ensco Rep. Inc.	913-381-7557
Md	Bethesda, W. Mount	301-657-9312
Mass	Lexington, Kitchen & Kutchin	617-862-8230
Minn	Minneapolis, J-EX Electra Sls.	612-566-5340
NJ	Teaneck, R. T. Reid	201-692-0200
NM	Albuquerque, Data Handling	505-268-0928
NY	Cicero, Advanced Comps.	
NY	Endicott, Advanced Comps.	607-785-3191
NY	No. Syracuse, Advanced Comps.	315-699-2671
NY	Poughkeepsie, Advanced Comps.	914-471-1623
NY	Scottsville, Advanced Comps.	716-889-1429
NC	Winston Salem, Ensco Rep. Inc.	314-567-3935
Ohio	Cincinnati, Giesting Assocs.	513-931-0812
Ohio	Dayton, Giesting Assocs.	513-293-4044
Ore	Beaverton, Arneson	503-646-3416
Pa	Glenside, Precision Elctrns.	215-646-8383
Pa	Jenkintown, W. Mount	215-886-0383
SC	Greenville, Elctrn. Mktg. Assocs.	803-268-1125
Tex	Houston, Aid Elctrns.	713-777-3882
Tex	Irving, Aid Elec.	214-259-4761
Wash	Seattle, Arneson	206-762-7664
Wisc	Milwaukee, Carlson Electronic Sales	414-476-2790

BABCOCK Local Distributors

Ala	Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr.	205-539-2731
Ariz	Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave.	602-269-1391
Cal	Hollywood, Hamilton/Avnet Elctrncs.	305-925-5401
Cal	Mt. View, Hamilton/Avnet Corp., 340 Middlefield Rd.	415-961-7000
Cal	Mt. View, Powell Elctrns/California, Box 997, 411 Fairchild Dr.	415-964-0820
Cal	San Diego, Hamilton/Avnet Corp., 5569 Kearny Villa Rd.	714-279-1550, 279-2421
Colo	Denver, Hamilton/Avnet Electronics	303-534-1212
Conn	Hamden, Arrow Elctrncs., 295 Treadwell St.	203-248-3801
Fla	Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave	305-885-8761
Fla	Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way	305-859-1450
Ga	Atlanta, Hamilton/Avnet Elctrncs., 6700 1-85 Access Rd.	404-448-0800
Ill	Schiller Park, Hamilton-Avnet Elctrs., 3900 N. 25th Ave.	
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Kans	Prairie Village, Hamilton/Avnet Elctrncs., 3300 W. 75th St.	913-362-3250
Md	Baltimore, Arrow Elctrns., 5207 E. Drive	301-247-5200
Md	Beltsville, Powell Elctrns/Washington, 10728 Hanna St.	301-937-4030
Md	Hanover, Hamilton/Avnet Elctrns.	301-796-5000
Mass	Burlington, Arrow Elctrns., 15 A Street	617-273-0100
Mass	Burlington, Hamilton/Avnet Elctrns.	617-273-2120
Mich	Livonia, Hamilton/Avnet Elctrns.	313-522-4700
Minn	Minneapolis, Hamilton/Avnet Elctrns.	612-854-8400
Mo	Hazelwood, Hamilton/Avnet Electronics	314-731-1144
NJ	Cedar Grove, Hamilton/Avnet Elctrns.	201-239-0800
NJ	Cherry Hill, Hamilton/Avnet Elctrns.	609-662-9337
NJ	Moorestown, Arrow Elctrns., Pleasant Valley Rd.	609-235-1900
NJ	Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave.	201-797-5800
NY	Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110	516-694-6800
NY	Syracuse, Hamilton/Avnet Elctrns.	315-437-2642
NY	Westbury, Hamilton-Avnet Electrns., 70 State St.	
Ohio	Cleveland, Arrow Elctrns., 23945 Merchantile Rd.	216-464-2000
Ohio	Dayton, Arrow Elctrns., 3100 Plainfield Rd.	513-253-9176
Pa	Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave	215-365-1900
Tex	Dallas, Hamilton/Avnet Elctrns., 2403 Farrington	
Tex	Houston, Hamilton/Avnet Elctrns., 1216 W. Clay	
Utah	Salt Lake City, Hamilton/Avnet Elctrns.	801-262-8451
Wash	Seattle, Hamilton/Avnet Elctrncs., 2320 6th Ave.	206-624-5930
For:	Can., Montreal, Hamilton/Avnet Elctrns.	514-735-6393
For:	Can., Ottawa, Ont., Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl.	
For:	Can., Toronto, Ont., Hamilton/Avnet Elctrns.	416-789-1838

BABCOCK & WILCOX CO., Tubular Prods. Div., Box 401, Beaver Falls, Pa., 15010, Tel: 412-846-0100

BACHARACH INSTR. CO., Div. AMBAC Inds., Inc., 625 Alpha Dr., Pittsburgh, Pa., 15238, Tel: 412-782-3500, TWX: 710-664-2085; Gen. Sls. Mgr: J.N. Durham

BACON INDS., 192 Pleasant St., Watertown, Mass., 02172, Tel: 617-926-2550; Sls. Mgr: R.S. Cass

BAFCO, INC., 717 Mearns Rd., Warminster, Pa., 18974, Tel: 215-674-1700, TWX: 510-665-6860; Pres: J.C. Boonshaft; V.P: A.M. Fuchs .....Vol 1•393

Local Sales Offices & Reps.

Cal	Carson, ABCO Co.	213-537-5152
Cal	Palo Alto, Mauldin	415-326-5291
Conn	Newtown, Daner-Hayes Inc.	203-426-9094
Fla	Orlando, Truex	305-859-2160
Mass	Newton Centre, Daner-Hayes Inc.	617-969-4650
NY	Rochester, Daner-Hayes Inc.	716-467-5100
Ohio	Dayton, P. Glavinos	513-433-1010
Pa	Melrose Park, R. Meyers Assoc.	215-224-1663

BAGANOFF ASSOCS., INC., 6809 W. Florissant, St. Louis, Mo., 63136, Tel: 314-383-2432; Pres: F. Baganoff

BAILEY INSTRS., INC., 515 Victor St., Saddle Brook, N.J., 07662, Tel: 201-845-7252; Sls. Mgr: R.J Bailey; Applications Mgr: R.H. Mossip

BAILEY METER CO., Sub. Babcock & Wilcox, Wickliffe, Ohio, 44092, Tel: 216-943-5500, TWX: 216-944-4160; Sls. Mgr: C.E. Bergman

BAKER CO., INC., Drawer E - Sanford Airport, Sanford, Me., 04073, Tel: 207-324-8773

BAKER, J.T. CHEMICAL CO., Phillipsburg, N.J., 08865, Tel: 201-859-2151, TWX: 510-235-2924; Mgr.-Tech. Svc.-Ind'l. Prods: D.A. Duffy

BALCO CAPACITORS, Div. Balco Elctrns., Inc., 307 Washington St., Orange, N.J., 07050, Tel: 201-677-1200, TWX: 710-994-5812; Sls. Mgr: R.W. Hagerty; Sls. Ass't: R. Koch ..... Vol 3•362,363,1100,1101

Local Sales Offices & Reps.

Ariz	Scottsdale, F. Schoeffler Assocs.	
Cal	Culver City , Sodaro Co.	213-478-7733
Conn	Meriden, Abbitt-Allison	203-237-9232
Ill	Northbrook, R.T. Howlett & Assocs.	312-498-5444
Kans	Overland Park, Bob Rush Assocs.	913-831-4259
Md	Gaithersburg, Wright Co.	301-948-5588
NJ	Harrington Pk., Metro Tech. Sls.	201-768-8495
NJ	Moorestown, A.A. Foley Assoc.	609-663-4545
NY	Jericho, Metro Tech. Sls.	516-935-3330
Ohio	Columbus, McFadden Sls.	614-221-3363
Wash	Seattle, J.B. Jolly	206-938-4166
Wisc	Milwaukee, Gentron Corp.	414-543-8110
Exp:	New York, Multiparts Corp.	212-944-4372
For:	Can., Montreal, Electro Design	514-389-5914
For:	Can., Ottowa, Electro Design	613-745-0541
For:	Can., Toronto, Ont., Electrodesign Ltd.	416-787-0991
For:	Can., Ville Lasalle, Que., Electrodesign Ltd.	514-363-5120

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Tex	Houston, Lenert Co., Box 2184	713-225-1465

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Local Sales Offices & Reps.

Ark	Little Rock, Baldwin Elctrns., Inc.	501-375-7351
Cal	Granada Hills, Baldwin Elctrns., Inc.	213-368-1716
Cal	Palo Alto, Baldwin Elctrns., Inc.	415-321-7840
Fla	Oviedo, Conley Associates	305-365-3283
Ill	Chicago, Carlson Elctrns. Sls. Co.	312-774-0277
Md	Arnold, S. Jordan, Reg. Sls. Mgr.	301-757-5904
Mass	Needham Heights, Northeast Representatives, Inc.	617-449-3034
Minn	Minneapolis, J-Ex Elctrn. Sls. Co.	612-566-5340
NJ	Ridgewood, Instrumentation Sls. Co.	201-445-5210
NM	Albuquerque, R.A. Mayes Co.	505-265-7989
NY	Rochester, H.C. Johnson Agencies	716-482-3000
Ohio	Cincinnati, Baldwin Elctrns., Inc.	513-231-1786
Ore	Portland, Brett Associates, Inc.	503-232-4184
Tex	Fort Worth/Dallas, Carey, Wolf & Associates	817-738-1996
Wash	Seattle, Brett Associates, Inc.	206-935-8054

BALLANTINE LABORATORIES, INC., Box 97, Boonton,, N. J., 07005, Tel: 201-335-0900, TWX: 710-987-8380; V.P. Mkgt: M.J. Lichenstein; Mktg. Svcs. Mgr: R.A. Stagnol

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Ala	Huntsville, Gentry Assoc. Inc.	205-536-5306
Ariz	Scottsdale, Williams Assoc.	602-947-4297
Cal	Irvine, Moxon Elctrns.	714-833-2000
Cal	San Diego, Moxon Elctrns.	714-292-4820
Cal	Sunnyvale, Moxon Elctrns.	408-734-4352
Colo	Denver, Williams Assocs.	303-343-2911
Fla	Melbourne, Gentry Assocs.	305-773-3411
Fla	Orlando, Gentry Assocs.	305-894-4401
Fla	St. Petersburg, Gentry Assocs.	813-867-7820
Ill	Chicago, Scientific Sls.	312-775-7594
Ind	Indianapolis, Scientific Sls.	317-253-4606
Kans	Shawnee Mission, Eir Co.	913-362-0919
Mass	Newtonville, H. J. Schuft	617-527-5304
Mich	Royal Oak, Satullo Co.	313-549-3910
Minn	Bloomington, Scientific Sls.	612-881-3300
Mo	Hazelwood, Eir Co.	314-895-4100
NJ	Bordentown, Dyna Rep Co.	609-298-6700
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Mt. Vernon, Q.E.D. Elctrns.	914-664-0080
NY	North Syracuse, NACO Elctrns.	315-699-2651
NY	Schenectady, NACO Elctrns.	518-244-4720
NY	Utica, NACO Elctrns.	315-732-1801
NC	Burlington, Gentry Assocs.	919-227-3639
Ohio	Cleveland, Satullo Co.	216-486-2800
Ohio	Dayton, Satullo Co.	513-293-7061
Okla	Norman, Data Mktg. Assoc. Inc.	405-364-8320
Tex	Dallas, Data Mktg. Assocs.	214-358-4643
Tex	Houston, Data Mktg. Assocs.	713-686-9627
Tex	San Antonio, Data Mktg. Assoc. Inc.	512-828-0937
Va	Springfield, Dyna Rep Co.	703-321-8630

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BARBER-COLMAN CO., Motor Div., Dept. S, 12116 Rock St., Rockford, Ill., 61101, Tel: 815-877-0241, TWX: 815-398-0341; Sls. Mgr: M. Scheider ..... Vol 2•632,633

Local Sales Offices & Reps.

Ala	Huntsville, Candor Co.	205-539-6575
Cal	Menlo Park, Long & Assocs., Inc.	415-327-1300
Cal	Sherman Oaks, R. Meussdorffer & Assoc.	213-788-0771
Colo	Denver, Todd & Assocs., Inc.	303-744-2313
Conn	Berlin, White Sls. Co.	203-224-0423
Ill	Chicago, Newman-Krause Co.	312-736-6800
Ind	Ft. Wayne, Menze Sls.	219-747-5616
Kans	Overland Park, Penzner-Mankus Assocs.	913-381-0004
Md	Baltimore, Machinery & Equip. Sls. Inc.	301-889-2070
Mass	Needham, White Sls. Co.	617-444-3676
Minn	St. Paul, Northport Engrg.	612-698-3841
Mo	Hazelwood, Penzner-Mankus Assocs.	314-731-4334
NJ	Mt. Laurel, Naudain Assocs.	609-235-1801
NJ	Springfield, P. H. Werner, Inc.	201-376-9440
NY	East Aurora, Harries & Hershaw	716-652-1221
NC	Winston-Salem, Candor Co.	919-924-1480
SC	Myrtle Beach, Candor Co.	803-448-5213
Tex	Ft. Worth, Barber-Colman Co.	817-732-2818
Va	Lynchburg, Candor Co.	703-239-5265
Wisc	Milwaukee, Barber-Colman Co.	414-464-5900
Exp:	Milwaukee, Wis., Dummann World Trade Co.	414-464-0100

BARBER-COLMAN CO., Industrial Instrs. Div., 1300 Rock St., Rockford, Ill., 61101, Tel: 815-877-0241, TWX: 815-398-0341; Dir. Mktg. W.F. Paetz

Local Sales Offices & Reps.

Ala	Birmingham, Control Equip. Co.	205-879-8211
Ala	Huntsville, Control Equip. Co.	205-883-1330
Cal	Monterey Park, Barber-Colman Co., Industrial Instrs. Div.	213-268-8422
Cal	Redwood City, CB Controls	415-364-2313
Cal	San Diego, R. Brainard Co.	714-274-1333
Colo	Denver, Technical Engrg. Sls.-Svc. (TESSCO)	303-744-1119
Conn	Hamden, Barber-Colman Co., Industrial Instrs. Div.	203-288-2644
Fla	Miami, G. Brophy Assoc.	305-444-6253
Fla	Winter Park, Control Equip. Co.	305-647-4496
Ga	Atlanta, Barber-Colman Co., Industrial Instrs. Div.	404-633-2566
Ill	Lincolnwood, Barber-Colman Co., Industrial Instrs. Div.	312-673-4550
Ill	Loves Park, Barber-Colman Co., Industrial Instrs. Div.	815-633-9585
Ill	Rock Island, Barber-Colman Co., Industrial Instrs. Div.	309-786-3351
Ind	Indianapolis, Barber-Colman Co., Industrial Instrs. Div.	317-293-4700
Ind	Lanesville, Barber-Colman Co., Industrial Instrs. Div.	502-585-4027
Kans	Prairie Village, Parker & Foster, Inc.	913-381-9330
La	Baton Rouge, Allen Assocs.	504-926-4687
La	Shreveport, JDJ Sls. Co.	318-865-2393
Md	Laurel, Barber-Colman Co., Industrial Instrs. Div.	301-742-7377
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Mich	Grand Rapids, Barber-Colman Co., Industrial Instrs. Div.	616-245-9217
Mich	Southfield, Barber-Colman Co., Industrial Instrs. Div.	313-358-4210
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NY	Buffalo, Barber-Colman Co., Industrial Instr. Div.	716-875-4413
NC	Charlotte, Barber-Colman Co., Industrial Instrs. Div.	704-372-5492
Ohio	Cincinnati, Barber-Colman Co., Industrial Instrs. Div.	513-281-0360
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Ohio	Highland Hgts., Barber-Colman Co., Industrial Instrs. Div.	216-461-2480
Ohio	Toledo, Barber-Colman Co., Industrial Instrs. Div.	419-472-1157
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Pa	Frazer, Barber-Colman Co., Industrial Instrs. Div.	215-647-4650
Pa	Pittsburgh, Barber-Colman Co., Industrial Instrs. Div.	412-885-2200
Tenn	Memphis, Combustion & Controls Co.	901-525-7402
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Tex	Pasadena, ASKCO Instr. Co.	713-472-3688
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Wisc	Brookfield, Pyro-Matic Industrials, Inc.	414-781-2222
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Mass Waltham, Schweber Elctrns. 617-890-8484
Mich Detroit, Schweber Elctrns. 313-583-9242
NJ Somerset, Schweber Elctrns. 201-469-6008
NY Rochester, Schweber Elctrns. 716-328-4180
NC Raleigh, Schweber Elctrns. 919-832-8881
Ohio Beachwood, Schweber Elctrns. 216-464-2970

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Pa Wayne, R. Williams 215-688-2807
RI Warwick, Schumacher-Yarrington 401-884-5671

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BAUSCH & LOMB, 87973 Bausch St., Rochester, N.Y., 14602, Tel: 716-232-6000, TWX: 716-97-8231; Mgr.-Mktg. Comm: H. Lettau

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Cal San Diego, SABER Entprs., Inc. 714-272-5743
Mich Detroit, WKM Assoc., Inc. 313-892-2500
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Ohio Cleveland, WKM, Assoc., Inc. 216-267-0445
Ohio Dayton, WKM, Assoc., Inc. 513-434-7500
Pa Pittsburgh, WKM, Assoc., Inc. 412-892-2953

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Conn Vernon, Manu-Rep
Fla Volcrening/Southeast, Voickening/Southeast 305-584-9390
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Minn St. Paul, Ed Melius & Assocs., Inc. 612-854-4270
Mo Kirkwood, Mr. Tim W. Miller 314-821-5500
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NY Webster, Krone & Rubin Assocs., Inc. 716-671-6709
Va Williamsburg, Dyneers, Inc. 703-229-3612
Wash Seattle, F.W. Aurich & Co. 206-284-5561

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BECKMAN INSTRS., (AISSD), 2500 Harbor Blvd., Fullerton, Cal., 92634, Tel: 714-871-4848, TWX: 910-592-1260; Sls. Mgr: H. Peper

BECKMAN INSTRS., Cedar Grove Opers., 89 Commerce Rd., Cedar Grove, N.J., 07009, Tel: 201-239-6200, TWX: 710-994-5781; Adv. Mgr: N. Uptegrove

Local Sales Offices & Reps.
Cal Fullerton, Kendall Co. 714-870-4110
Cal Palo Alto, Kendall Co. 415-322-6338
Colo Denver, Williams-Assocs. 303-388-4391
Fla Miami, Brinkley-Pallatz 305-238-0864
Ill Chicago, Megatek, Inc. 312-889-1277
Kans Mission, Mid-America Elctrns. 913-432-8678
Md Silver Spring, Gawler-Knoop 301-589-4406
Mass Newtonville, H. Schuft 617-527-5304
NJ Roseland, Gawler-Knoop 201-226-4545
NY Cortland, RJC Assocs. 607-753-3909
Ore Portland, R. Legg 503-292-8824
Pa Doylestown, Gawler-Knoope 215-348-4646
Pa Pittsburgh, K. J. Lesker 412-892-2996
Tex Dallas, Crockett Engrg. Co. 214-637-6120

BECKMAN INSTRS., Ectrn. Instrs. Div. Ectrn. Instrumentation, 3900 N. River Rd., Schiller Park, Ill., 60176, Tel: 312-671-3300, TWX: 910-253-1820; Prod. Line Mgr: D. Levingston

BECKMAN INSTRS., Helipot Div., 2500 Harbor Blvd., Fullerton, Cal., 92634, Tel: 714-871-4848, TWX: 910-592-1260; Adv. Mgr: H.D. Frazier
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Local Sales Offices & Reps.
Ala Huntsville, Murphy & Cota 205-539-8476
Ariz Scottsdale, Barnhill Five 602-947-7841
Cal El Monte, G.S. Marshall 213-686-0141
Cal Palo Alto, Beckman Instrs. 415-326-1970
Cal San Diego, G.S. Marshall 714-278-6350
Cal Sunnyvale, G.S. Marshall 408-732-1100
Colo Denver, Barnhill Five 303-934-5505
Conn Hamden, Compar New Eng. 203-288-9276
Fla St. Petersburg, Lynch-Gentry Assocs. 813-347-5131
Fla Winter Park, Lynch-Gentry Assocs. 305-671-7649
Ga Atlanta, Murphy & Cota 404-875-2525
Ill Mt. Prospect, Magnuson 312-956-0700
Md Beltsville, Angus 301-792-4743
Md Silver Spring, Beckman 301-622-2500
Mass Newton Highlands, Compar New Eng. 617-969-7140
Mass Newton Highlands, Helipot 617-969-7357
Mich Farmington, Sheridan Assocs. 313-477-3800
Minn St. Paul, Magnuson 612-227-8495
NJ Clifton, Beckman 201-778-8888
NJ Moorestown, Angus 609-235-1900
NJ Moorestown, Helipot 609-235-3314
NJ Rutherford, Kierulff/Schley 201 935-2120
NM Albuquerque, Barnhill Five 505-299-7658
NY Kingston, Ossmann Comp. 914-338-5505
NY Rochester, Ossmann 716-442-3290
NY Syracuse, Ossmann 315-454-4477
NY Vestal, Ossmann 607-785-9949
NC Winston-Salem, Murphy & Cota 919-723-1001
Ohio Cincinnati, Sheridan Assocs. 513-761-5432
Ohio Cleveland, Sheridan Assocs. 216-524-8120
Ohio Dayton, Sheridan Assocs., Inc. 513-277-8911
Ohio Florissant, Sheridan 314-837-5200
Ore Portland, Almac/Stroum 503-292-3534
Pa Monroeville, Sheridan 412-373-1070
Tex Dallas, Norvell 214-350-6771
Tex Houston, Norvell 713-774-2568
Wash Seattle, Almac/Stroum 206-763-2300
For: Can., Toronto, Ont., Beckman 416-251-5251

BECKMAN Local Distributors
Ala Huntsville, M & C Sales, Inc., 904 Bob Wallace Ave. 205-539-8476
Ariz Scottsdale, Barnhill Five, Inc., 7329 E. Stetson Dr. 602-947-7841
Cal El Monte, Marshall Co., G.S., 9674 Telstar Ave 213-686-0141
Cal San Diego, Marshall Co., G.S., 7990 Engineer Rd 714-278-6350
Cal Sunnyvale, Marshall Co., G.S., 732 N. Pastoria Ave 408-732-1100
Colo Denver, Barnhill Five, Inc., 1107 S. Sheridan Blvd. 303-934-5505
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Conn Hamden, Compar New England, 2531 Whitney Ave. 203-288-9276
Fla St. Petersburg, Lynch-Gentry Assocs., 6731 First Ave. 813-347-5131
Fla Winter Park, Lynch-Gentry Assocs., 3470 Bowman Dr. 303-671-7649
Ga Atlanta, M & C Sales, Inc., 500 Plasamour Dr. NE 404-875-2525
Ill Mt. Prospect, Magnuson Elctrns., 2420 Oakden St. 312-956-0700
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Newton Highlands, Compar New England, 88 Needham St. 617-696-7140
Minn St. Paul, Magnuson Elctrns, 1246 W. 7th St. 612-227-8495
Mo Florissant, Shoridan Sales Co., 110 South Hwy 140 314-837-5200
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Rutherford, Kierulff-N.J., 5 Industrial Dr. 201-935-2120
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NM Albuquerque, Barnhill Five Inc., 1410-D Wyoming, N.E. 505-299-7658
NY Buffalo, Ossmann Comp. Sls., 395 Cleveland Dr. 716-832-4271
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Hicksville, Kierulff - Hicksville, 49 Bethpage Rd. 516-433-5530
NY Kingston, Ossmann Comp. Sls., 411 Washington Ave. 914-338-5505
NY Rochester, Ossmann Comp. Sls., 280 Metro Park 716-442-3290
NY Syracuse, Ossmann Comp. Sls., 132 Pickard Bldg. 315-454-4477
NY Vestal, Ossmann Comp. Sls., 1911 Vestal Pkwy E. 607-785-9949
NC Winston-Salem, M & C Sales, Inc., 1106 Burke St. 919-723-1001
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Okla Tulsa, Norvell Elctrns. Inc., 3340 So. Memorial Dr. 918-663-1247
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Tex Dallas, Norvell Elctrns. Inc., 10210 Monroe 214-350-6771
Tex Houston, Norvell Elctrns. Inc., 5440 Hillcroft 713-774-2568
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300

BECO, INC., 740 Kesler Mill Rd., Salem, Va., 24153, Tel: 703-389-3053; Sls. Mgr: A.T. Ball

BEECHWOOD MFG., 360 S. Downey Ave., Indpls., Ind., 46219, Tel: 317-356-2493; G.M: R.E. Cox

BEEDE ELECTRICAL INSTR. CO., INC., S. Main St., Penacook, N.H., 03301, Tel: 603-753-6362, TWX: 710-364-6977; Mkt. Mgr: L.H. Issel ..... Vol 1•394,395

Local Sales Offices & Reps.
Ala Huntsville, Components Sls. 205-883-7794
Ariz Phoenix, M. Richardson Assoc. Inc. 602-278-6296
Cal LA, Universal Comp. 213-474-1537
Cal San Carlos, Elctrn. Engrg. 415-593-2189
Colo Denver, Electronic Sls. Inc. 303-771-6300
Conn Farmington, R. Perron 203-673-4825
Conn Trumbull, R. Perron 203-268-9631
Fla Indialantic, Comps. Sls. Corp. 305-727-2681
Fla Terra Ceia, Components Sls. Corp. 813-722-6376
Ill Skokie, Saffro & Assoc. 312-588-0905
Iowa Marion, Thomas & Modrcin 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assoc., Inc. 913-HE-2-2131
Mass Norwood, R. Perron 617-762-8114
Mich Detroit, Burcaw 313-533-7700
Minn Mpls, Wenco Sls. 612-866-3639
Mo Hazelwood, Thomas & Modrcin 314-838-6446
NH Dover, R. Perron & Co., Inc. 603-742-2321
NJ Ridgewood, Ballou Inc. 201-444-6990
NY Buffalo, Ossmann Comp. Sls. Corp. 716-832-4271
NY Kingston, Ossmann Component Sls. 914-338-5505
NY Rochester, Osmann Comp. 716-442-3290
NY Syracuse, Ossmann Comp. 315-454-4477
NY Vestal, Ossman Comp. 607-785-9949
NC Raleigh, Comp. 919-832-1897
Ohio Cleveland, D. Steffen & Assoc. 216-461-8333
Ohio Dayton, D. Steffen & Assoc. 513-293-3146
Pa Devon, B & A Assoc. 215-688-5173
Tex Dallas, Southwest Elctrn. Inds. 214-233-9816
Tex Houston, Southwest Elctrn. Inds. 713-621-3760
Wash Mercer Island, J.H. Andersen, Assoc. 206-232-0484
Exp: Brampton, Ont., Can., Mod Tronic Instrus. Ltd. 416-457-6322

BEHLMAN DIV., CALIFORNIA INSTRS., Div. Aiken Ind., 5150 Convoy St., San Diego, Cal, 92111, Tel: 714-279-8620; Product Appl. Eng: W.W. Hanford

Local Sales Offices & Reps.
Ala Huntsville, Currie Aerospace 205-536-5650
Ariz Scottsdale, Williams Assocs. Inc. 602-947-4297
Cal Cupertino, T. L. Snitzer Co. 408-257-8333
Cal Los Angeles, T. L. Snitzer Co. 213-836-6170
Colo Denver, Williams Assocs. Inc. 303-343-2911
Fla Orlando, Currie Aerospace 305-855-0843
Haw Honolulu, Aloha Assocs. 808-941-1574
Ill Chicago, Megatek, Inc. 312-889-1277
Iowa Cedar Rapids, Palatine Engrg. Sls. Co. 319-365-8071
Kans Andover, Palatine Engrg. Sls. Co. 316-683-7512
Kans Overland Pk., Palatine Engrg. Sls. Co. 913-262-5643
La Baton Rouge, SESCO 504-927-7574
Mass Needham, Addelco Corp. 617-444-4754
Mich Detroit, Hocker Assocs. 313-531-1403
Minn Minneapolis, Megatek, Inc. 612-925-4242
Mo St. Louis, Palatine Engrg. Sls. 314-426-7055
NJ Fairfield, KLS Assocs. 201-227-2900
NJ Hazlet, Mer Mon (2M) Elctrn. Instru. 201-264-1851
NM Albuquerque, Williams Assocs. Inc. 505-255-1638

NY Depew, Labtronics, Inc. 716-685-4111
NY Endicott, Labtronics, Inc. 607-748-0509
NY Syracuse, Labtronics 315-454-9314
NY Ulster Pk., Labtronics, Inc. 914-883-6279
NC Greensboro, Currie Aerospace Assocs. 919-273-3040
Ohio Cleveland, Hocker Assocs. 216-734-4433
Ohio Dayton, Hocker Assocs. 513-298-8638
Pa Mt. Penn, Mer-Mon (2M) Elctrn. Instr. 215-779-1640
Tex Houston, Sesco 713-668-7840
Tex Richardson, Sesco 214-231-9364
Va Annandale, Nine Assocs. 703-256-9105
Wash Seattle, Datacom Assocs. 206-329-2989

BEHLMAN ENGRG. CORP., Box 4518, 427 N. Nopal St., Santa Barbara, Cal., 93103, Tel: 805-963-9019; Sls. Mgr: J. Behlman ..... Vol 1•616,617

Local Sales Offices & Reps.
Ariz Phoenix, R. L. Davis Co. 602-955-2266
Cal Glendale, Instrument Specialists Inc. 213-245-9404
Fla Melbourne, Reynolds & Assocs., Inc. 305-727-3205
Ga Atlanta, Reynolds & Assocs., Inc. 404-252-5360
Md Rockville, Farrell Assocs. 301-424-9460
NJ Hackensack, SJS Assocs. 201-488-2444
Pa King of Prussia, Letronix 215-265-1020
For: Canada, West Hill, Ont., Electromechanical Prods. 416-282-3870

BEL FUSE, INC., 203 Van Vorst St., Jersey City, N.J., 07302, Tel: 201-432-0463, TWX: 710-730-5301; Sls. Mgr: A.L. Sutta; V.P: H. Bernstein; Engr: R. King Vol 3•986-991

Local Sales Offices & Reps.
Cal Burlingame, Leddy 415-347-5247
Cal Escondido, Andrew Elctrn. Sls. 714-743-3015
Cal Los Angeles, Universal Comp. Co. 213-641-4255
Colo Littleton, Alden Sls. 303-794-1531
Colo Littleton, Leddy Assoc. 303-795-1973
Conn Norwalk, Eastern Tech. Sls. 203-853-8350
Fla Clearwater, Southeastern Compt. Sls. 813-531-8324
Ill Chicago, Memac Sls. 312-545-1033
Mass Newton, QRC Co. 617-332-9600
Minn Hopkins, Beta Engrg. 612-925-4422
NY Hempstead, Kahgan Sls. 516-538-2300
NY Pompey, S. Foster 315-677-3333
Pa Bala Cynwyd, M. Friedman 215-839-3450
Tex Addison, Parvin Sls. Co. 214-239-9148
Utah Salt Lake City, Leddy Assoc. 801-299-4382
BELDEN CORP. ELCTRN. DIV., Box 1100, Richmond, Ind., 47374, Tel: 317-966-6681, TWX: 810-345-1393; Gen. Mgr; J.F. Wohlhueter; Sls. Svc. Mgr: G.T. Novak
BELDEN Local Distributors
Ala Birmingham, J.W. Clary Co., 1713 Second Ave. S. 205-322-2488
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Goleta, Radio Prods. Sls., 350 S. Kellogg Ave 805-964-6823
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave. 415-961-1500
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Colo Denver, Burstein-Applebee 303-244-3336
Ill Chicago, Burstein-Applebee 312-763-4848
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Kans Kansas City, Burstein-Applebee 816-561-5460
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
La Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094 318-423-6131
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
Mich Muskegon, Western Elctrn Supply, 1781 5th St 616-722-7628
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Minn Minneapolis, Elctrn Center Inc., 127 3rd Ave. N. 612-338-5881
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Ann, Interstate Ind Elctrn, 10525 St. Charles Rock Rd 314-428-8522
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Lincoln, Scott Elctrn Supply Corp., 4040 Adams St 403-434-8308
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
NY Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave. 212-492-9590
NY Buffalo, Genesee Radio & Parts Co., 2550 Delaware Ave. 716-873-9661
NY Buffalo, Radio Equip. Corp., 196 Vulcan St 716-874-2690
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Elmsford, Melville Radio, 1 Nepperham Ave. 914-592-7100
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Farr Elctrns, 5403 Prospect Ave. 216-881-7403
Ohio Cleveland, Pattison Supply Co., 4550 Willow Pkwy. 216-441-3000
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tenn Chattanooga, Curle Elctrns., 1813-S. Market
Tenn Nashville, Electra Distributing, 1914 W. End Ave. 615-329-3971
Tex Dallas, Hamilton/Avnet Elctrns., 2403 Farrington
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Geophysical Supply Co., Box 52230 713-224-0621
Tex Houston, Hamilton/Avnet Elctrns., 1216 W. Clay
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Tex Houston, Lenert Co., Box 2184 713-225-1465
Tex Lubbock, R & R Elctrn Supply Co, 1607 Ave. G, Box 1860 806-765-7727
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500
BELL CO., INC., 106 Morrow Ave., Trussville, Ala., 35173, Tel: 205-655-2135; V.P: N.H. Bell; V.P: H.C. Bell; Pres: R.C. Bell
BELL & HOWELL, 706 Bostwick Ave., Bridgeport, Conn., 06605, Tel: 203-368-6751, TWX: (710) 453-2997; Prod. Sls. Mgr: I. Isdale; Prod. Sls. Mgr: T. Tomasko
BELL & HOWELL CO., Elctrns. & Instr. Grp., 360 Sierra Madre Villa, Pasadena, Calif., 91109, Tel: 213-796-9381, TWX: 213-577-0067
BELL INDUSTRIES, ELECTRONIC COMPONENTS DIV., 150 W. Cypress Ave., Burbank, Cal., 91502, Tel: 213-846-9302, TWX: 910-498-2207; Sls. Mgr: J. Cammiso

BELL INDUSTRIES, J.W. Miller Div., 19070 Reyes Ave., Compton, Cal., 90221, Tel: 213-537-5200, TWX: 910-346-6740; Sls Mgr: G.E. Hall; Indul Sls Mgr: J. Johnson; Distr. Sls. Mgr: A. Bufford .... Vol 3•528-532

Local Sales Offices & Reps.
Ariz Phoenix, H.A. Moore 602-274-0060
Ark El Dorado, D. Bellew 501-863-8325
Cal Gardena, Bidwell Sls. 213-770-0300
Cal Redwood City, Logan 415-369-6726
Colo Denver, R. Bowen 303-722-4641
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-2474
Fla Pompano Bch., Hutto-Hawkins-Peregoy 305-943-9593
Ga Atlanta, Millar Elctrns. 404-261-6160
Ill Chicago, Markal 312-282-5800
Ind Indianapolis, J. Merritt 317-291-9674
Iowa Cedar Rapids, Palatine Sls. Inc. 319-365-6071
Kans Andover, Palatine Sls., Inc. 316-683-7512
Kans Overland Park, Palatine Sls. Inc. 913-262-5643
La Kenner, D. Bellew 504-729-4550
Md Baltimore, Par-Nell Sls. 301-655-2944
Mass N. Scituate, W. Hendrickson 617-545-0652
Mich Detroit, Markal Sls. Corp. 313-341-1000
Minn Minneapolis, C.R. Gibb 612-377-1200
Mo St. Louis, Palatine Sls. Inc. 314-426-7055
NJ Englewood, J.J. Bressler 201-569-7600
NM Albuquerque, C. Carlberg 505-265-1579
NC Raleigh, Millar Elctrns., Inc. 919-787-9564
Ohio St. Marys, T. Shelby 419-394-3377
Ore Portland, Earl & Brown 503-292-9145
Pa Holland, Par-Nell Sls. Co. 215-355-9330
Tex Addison, Campion Sls. 214-239-9196
Wash Seattle, Earl & Brown 206-284-1121
Exp: N.Y., N.Y., Roburn Agencies 212-989-5939
For: Can., Montreal, Que., Atlas Radio 514-489-8495
For: Can., Toronto, Ont., Atlas Radio 416-781-6174
BELL Local Distributors
Ala Birmingham, J.W. Clary Co., 1713 Second Ave. S. 205-322-2488
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave. 415-961-1500
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
BELL P/A PRODS. CORP., 1200 N. Fifth St., Columbus, Ohio, 43201, Tel: 614-299-1487; Sls. Mgr: P. Cartmille
BELTONE ELECTRONICS CORP., 4201 W. Victoria, Chicago, Ill., 60646, Tel: 312-583-3600; Sls. Mgr: S. Lebow

BEMAN MFG., INC., New Cumberland, Pa., 17070, Tel: 717-938-1451, TWX: 510-650-3539; Sls. Mgr: R.J. Behney ..... Vol 3•649

BEMCO, INC., 9908 San Fernando Rd., Pacoima, Cal., 91331, Tel: 213-899-5296, TWX: 910-496-1520; Mktg. Mgr: J. Riddle; Applications Engr: F. Garacci
BENDIX AEROSPACE-ELCTRNS., Navigation & Control, Teterboro, N.J., 07608, Tel: 201-288-2000, TWX: 710-990-6136; Sls. Dir: E. Metzler
BENDIX CORP., Aerospace Sys. Div., 3300 Plymouth Rd., Ann Arbor, Mich., 48107, Tel: 313-665-7766, TWX: 810-223-6041; S/M: W. Wilson

BENDIX CORP., Avionics Div, Box 9414, Ft. Lauderdale, Fla., 33310, Tel: 305-776-4100, TWX: 510-955-9884; Dir. Mktg: R.M. Winston; Program Mgr.-Trophy Prod: W.H. Greene; Dir. Mktg. Adm: F.C. Gebhardt

BENDIX CORP, Communications Div, East Joppa Rd., Towson, Md., 21204, Tel: 301-823-2200, TWX: 710-232-1824; Dir. of Mktg: J.H. Murphy; Mktg. Mgr. Communs: A. Bikis; Mktg. Mgr. Radar: W.B. Edwards

BENDIX, Elec. Power, Hwy. 35, Eatontown, N.J., 07724, Tel: 201-542-2000, TWX: 710-722-6686; S/M: G.P. Clericuzio; Dir./Mktg: H.I. Nadler; A/M: S.R. Chase

BENDIX CORP., Elec. Comp. Div., Sidney, N.Y., 13838, Tel: 607-563-9511, TWX: 510-261-7550; Adv. & Pub. Mgr: D.W. Radley

Local Sales Offices & Reps.

Cal	Lakewood, The Bendix Corp., Electrical Components Div.	213-920-1711
Cal	Palo Alto, The Bendix Corp., Electrical Components Div.	415-327-4511
Fla	Orlando, The Bendix Corp., Electrical Components Div.	305-894-6932
Ill	Des Plaines, The Bendix Corp., Electrical Components Div.	312-296-7791
Mass	Lexington, The Bendix Corp., Electrical Components Div.	617-861-8900
NJ	Teterboro, The Bendix Corp., Electrical Components Div.	201-288-1710
Ohio	Dayton, The Bendix Corp., Electrical Components Div.	513-224-9211
Tex	Dallas, The Bendix Corp., Electrical Components Div.	214-243-4394
Wash	Tukwila, The Bendix Corp., Electrical Components Div.	206-246-8100

BENDIX ELEC. COMP. DIV. Local Distributors

Ala	Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr.	205-539-2731
Ariz	Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave.	602-269-1391
Cal	Hollywood, Hamilton/Avnet Elctrncs.	305-925-5401
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Mich	Flint, Linder Assoc.	313-789-1275
Mich	Lansing, Linder	517-489-0292
Mich	Southfield, Linder	313-353-4334
Minn	Mpls., Lee-Noonan Co.	612-920-7851
Miss	Jackson, Strickland	601-366-6195
Mo	Kirkwood, Martin Elec.	314-966-8659
Mo	Raytown, Arehart-Barnds Sls.	816-356-3488
Neb	Lincoln, E. Taber & Sons	402-423-4420
NJ	Berkeley Hgts.	201-464-0334
NM	Albuquerque, T. Deskin	505-242-3581
NY	Buffalo, A.C. Schultz Co.	716-839-1010
NY	Manhasset, G. Gavalakis	516-869-8113
NC	Matthews, C.C. Niedringhaus	704-847-9288
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Ohio	Cleveland, V. O'Neill	216-331-4273
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Tenn	Memphis, H. Beard	901-274-1744
Tex	Dallas, J.E. Morton	214-341-1414
Tex	Houston, McIver & Slavin Co.	713-861-3888
Utah	Salt Lake City, B.E. Blomquist	801-359-7074
Wash	Seattle, Tal Agencies, Inc.	206-624-3355
Wisc	Milwaukee, Andersen Elec. Sls.	414-332-2948

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NJ	Union, Larry Bourdeau	201-289-8200

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Cal	San Jose, Buckbee Mears Co. Sls. Office	408-248-2750
Colo	Lakewood, Buckbee Mears Co. Sls. Office	303-534-7858
Ill	Elk Grove Village, Buckbee Mears Co. Sls. Office	312-439-6433
Ind	Indianapolis, Buckbee Mears Co. Sls. Office	317-255-5501
NH	Nashua, Buckbee Mears Co. Sls. Office	603-883-0316
NJ	East Windsor, Buckbee Mears Co. Sls. Office	609-443-3340
NY	Manlius, Buckbee Mears Co. Sls. Office	315-469-7394
Ohio	Sylvania, Buckbee Mears Co. Sls. Office	419-882-6918
Pa	Huntington Valley, Buckbee Mears Co. Sls. Office	215-525-3000
Tex	Richardson, Buckbee Mears Co. Sls. Office	214-231-7401

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Ill	Chicago, W.J. Doyle Co.	312-BR-4-6685
Mass	Belmont, Elctrn. Comps. & Svc.	617-484-8680
Mich	Lathrup Village, R.C. Nordstrom Co.	313-444-4417
Minn	Minneapolis, A.J. Warner Co.	612-729-7371
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Ohio	Columbus, Elctrns. Mktg.	614-299-4161
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Cal	Inglewood, Jack Berman Co., Inc.	213-678-1281
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Ind	Angola, Southern Sls. Co.	219-665-3691
Ind	Indianapolis, Southern Sls. Co.	317-257-7575
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NM Albuquerque, Lindberg Co. 505-345-2489
NY Rochester, Marsey Sls., Inc. 716-442-9700
NY Rockville Centre, Willgold Elctrn. Sls. Corp. 516-764-4022
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NY Rochester, H.C. Johnson Agencies, Inc. 716-482-3000
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For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

CHERRY RIVET & BOOTS NUT DIVS., Townsend Co., P.O. Box 2157, Santa Ana, Calif., 92707, Tel: 714-545-5511, TWX: 910-595-1500; Sls. Mgr: D.J. Sauser

CHESAPEAKE INSTR. CORP., Shadyside, Md., 20867, Tel: 301-867-2151; Mktg. Mgr: J.F. Luckey

CHESTERFIELD PRODS. INC., 511A Victor St., Saddle Brook, N. J., 07662, Tel: 201-845-6886; Pres: M. Silver; Chf. Elec. Engr: A. Spencer .....Vol 2•555

Local Sales Offices & Reps.

Colo	Golden, Comm-well Sls. & Engrg.	303-277-0807
Ill	Chicago, K. W. Meyers Co.	312-774-6440
Ind	Indianapolis, K. W. Meyers Co.	317-243-6681
Md	Edgewater, Commart, Inc.	301-798-0607
Mass	Acton, E.E. Specialists, Inc.	617-259-9200
Minn	Minneapolis, K. W. Meyers Co.	612-920-7080
NJ	Saddle Brook, L&M Assocs.	201-843-8700
NY	Brentwood, L & M Assocs.	516-231-8363
NY	New York City, L & M Assocs.	212-675-7486
Pa	Andalusia, L & M Assocs.	215-639-3100
Tex	Dallas, Bradenco	214-358-3278
Tex	Houston, Bradenco	713-529-9881
Wisc	Milwaukee, K. W. Meyers Co.	414-482-1313

CHICAGO CONDENSER CORP., 3255 W. Armitage Ave., Chicago, Ill., 60647, Tel: 312-227-7070; Sls. Mgr: P. Philips

CHICAGO DYNAMIC INDS., Precision Prods. Div., 1725 W. Diversey Blvd., Chicago, Ill., 60614, Tel: 312-935-4600; Sls Mgr: J.M. Early .....Vol 2•1028

Local Sales Offices & Reps.

Ala	Huntsville, Craft Assocs.	205-837-0221
Cal	Menlo Pk., West Engrg. Sls.	415-325-2885
Cal	Sun Valley, Weightman	213-768-5750
Colo	Denver, TESSCO	303-744-1119
Conn	Waterbury, Coakley, Boyd & Abbett	203-756-8766
Fla	Maitland, Craft Assoc.	305-645-2242
Ga	Atlanta, Craft Assoc.	404-237-2282
Ill	Rolling Meadows, Sumer	312-394-4900
Ind	Ft. Wayne, Temple Eng.	219-744-4331
Md	Glen Arm, Billis Sls. Co.	301-592-7047
Mass	Needham, Coakley, Boyd & Abbett	617-444-5470
Mich	Deroit, L. Dickelman	313-255-3300
Minn	Edina, M. Foster	612-941-7600
Mo	Kansas City, Harris-Hanson Co	816-HI-4-9494
Mo	St. Louis, Harris-Hanson	314-962-0111
NJ	Cherry Hill, J. Billis Sls.	609-HA-8-3651
NM	Albuquerque, TESSCO	505-298-0024
NY	Albany, Compar-Albany	518-489-4777
NY	Jamaica, S.A.M. Assocs.	212-OL-8-8881
NC	Greensboro, L & D, Inc.	919-292-3201
Ohio	Cleveland, L. Dickelman	216-831-1039
Tex	Dallas, Glidden Electro Equip.	214-EM-3-6539
Tex	Houston, Glidden Electro Equip.	713-681-1415
Exp:	N.Y., Westbury, Minthorne Int'l. Co.	212-895-3120
For:	Ville Lasalle 650, Que., Electrodesign, Ltd.	514-363-5120

CHICAGO LOCK CO., 4275 W. Belmont Ave., Chicago, Ill., 60641, Tel: 312-282-7177; Pres: L.B. Shinn, Jr.; Dir. Tech. Engrg: W.S. Christopher .....Vol 2•1037

Local Sales Offices & Reps.

NY	New Rochelle	914-636-1311

CHICAGO MINIATURE LAMP WORKS, 4433 N. Ravenswood Ave., Chicago, Ill., 60640, Tel: 312-784-1020, TWX: 910-221-5445; Sls. Mgr: R. Galarneau .....Vol 2•464-475

Local Sales Offices & Reps.

Ariz	Phoenix, Howe & Howe Sls.	602-264-7971
Cal	Freemont, CMLC	415-391-1098
Cal	No. Hollywood, CMLC	213-877-0158
Colo	Denver, Lindberg Co.	303-758-9033
Conn	New Haven, Gerber Sls.	203-777-6279
Fla	N. Miami Bch., Cartwright & Bean	305-945-2962
Fla	Orlando, Cartwright & Bean	305-896-2031
Ga	Atlanta, Cartwright & Bean	404-237-3108
Ill	Chicago, CMLW	312-784-1020
Ind	Indianapolis, L. M. DeVoe Co.	317-257-1227
Iowa	Cedar Rapids, J. G. Twist Co.	319-365-1401
Kans	Prairie Village, J. G. Twist Co.	913-236-4646
La	Chalmette, Cartwright & Bean	504-279-4598
Mass	E. Longmeadow, Gerber Sls.	413-525-3059
Mass	Waltham, Gerber Sls.	617-890-8040
Mich	Detroit, R.C. Merchant	313-535-6000
Mich	St. Joseph, R.C. Merchant	616-983-7378
Minn	Edina, M. Foster Co.	612-835-2252
Mo	St. Louis, J. G. Twist Co.	314-432-2830
NJ	Cherry Hill, Trinkle Sls.	609-667-3500
NY	Pt. Washington, T.M.A., Inc.	516-883-2432
NY	Syracuse, L. D. Allen, Inc.	315-458-7470
NC	Charlotte, Cartwright & Bean	704-333-6457
Ohio	St. Marys	419-394-3377
Tenn	Memphis, Cartwright & Bean	901-276-4442
Tex	Dallas, Techno	214-357-9213
Utah	Salt Lake City, Lindberg Co.	801-364-6409
Wash	Seattle, J.J. Backer Co.	206-285-1300
Exp:	Ill., Chicago, E.D. Magnus & Assoc. Inc.	312-334-1503
For:	Can., Toronto, Ont., General Instr. Can.	416-763-4133

CHICAGO MINIATURE Local Distributors

Ala	Birmingham, J.W. Clary Co., 1713 Second Ave. S.	205-322-2488
Ariz	Phoenix, Liberty Electrns., 3612 N. 16th St.	602-264-4438
Cal	Garden Grove, Allied Elctrns., 12311 Industry St.	213-598-6605
Cal	Goleta, Radio Prods. Sls., 350 S. Kellogg Ave	805-964-6823
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave.	415-961-1500
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Cal	San Diego, Shanks and Wright Inc., 2045 Kettner Blvd.	714-239-0176
Colo	Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave.	303-287-9611
Conn	Fairfield, Utronic Inc., 273 Linwood Ave.	203-255-4521
Conn	Hamden, Arrow Elctrncs., 295 Treadwell St.	203-248-3801
Ga	Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW	404-355-2223
Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ill	Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.	
Ill	Palatine, Ohm/Elctrns, 645 Vermont Ave	312-359-5500
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Iowa	Cedar Rapids, Iowa Radio Supply Co. Inc., 719 Center Point Rd. NE	319-364-6154
Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
La	Baton Rouge, Ralph's, Inc., 1732 Plank Rd.	504-344-3761
La	Lafayette, Ralph's Inc., 3004 Cameron St.	318-234-4507
La	New Orleans, Ralph's, Inc., 4334 Stemway Dr.	504-242-2731
La	Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094	318-423-6131
Md	Baltimore, Arrow Elctrns., 5207 E. Drive	301-247-5200
Md	Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd.	301-823-0070
Mass	Burlington, Arrow Elctrns., 15 A Street	617-273-0100
Mass	Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy.	617-491-3300
Mass	Woburn, Abbott Elctrn., 902 Main St.	617-935-2040
Mich	Muskegon, Western Elctrn Supply, 1781 5th St	616-722-7628
Minn	Minneapolis, Elctrn Center Inc., 127 3rd Ave. N.	612-338-5881
Mo	St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave	314-MA-1-5000
Neb	Lincoln, Scott Elctrn Supply Corp., 4040 Adams St	403-434-8308
Neb	Omaha, J-B Distributing Co., 1616 Cass St	402-341-5525
Neb	Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St.	402-341-7700
NJ	Moorestown, Arrow Elctrns., Pleasant Valley Rd.	609-235-1900
NJ	Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys.	609-662-4000
NJ	Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave.	201-797-5800
NJ	Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22	201-376-8900
NY	Binghamton, Wilshire Elctrns., 617 Main St., Westover Plaza	607-797-1236
NY	Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110	516-694-6800
NY	Farmingdale, Harrison Elctnc., 20 Smith St.	516-293-7990
NY	Lynbrook, Peerless Radio, 19 Wilbur St.	516-593-2121
NY	New York, Midway Ind'l. Elec., 38 E. 29th St.	212-889-0370
NY	Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd.	716-328-3230
Ohio	Akron, Akron Elctrn. Supply, 107 S. Arlington St	216-762-8818
Ohio	Akron, Sun Radio Co., 110 E. Market St.	216-HE-4-2171
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080
Ohio	Cleveland, Arrow Elctrns., 23945 Merchantile Rd.	216-464-2000
Ohio	Cleveland, Farr Elctrns, 5403 Prospect Ave.	216-881-7403
Ohio	Dayton, Arrow Elctrns., 3100 Plainfield Rd.	513-253-9176
Ohio	Solon, REPCO, 6835 Cochran Rd.	216-248-8900
Okla	Tulsa, Oil Capitol Elec., 708 S. Sheridan	918-836-2541
Ore	Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd	503-292-3534
Pa	Erie, Mace Elctrn., 2631 W. 8th St.	814-838-3544
Pa	Philadelphia, Simco Inc., 3907-11 N. Broad St.	215-BA-9-1880
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	
Tenn	Chattanooga, Curle Elctrns., 1813-S. Market	
Tenn	Nashville, Electra Distributing, 1914 W. End Ave.	615-329-3971
Tex	Beaumont, Ralph's, Inc., 1270 Broadway	713-833-9443
Tex	Ft. Worth, Allied Elctrns., 401 E. 8th St.	817-336-5401
Tex	Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St	817-335-6521
Tex	Houston, Harrison Equip. Co. Inc., 1616 McGowen St.	713-224-9131
Utah	Salt Lake City, Standard Supply Co., 225 E. 6th So.	801-355-2971
Va	Norfolk, Priest Elctrn., 6431 Tidewater Dr.	703-855-2021
Wash	Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S.	206-763-2300
Wash	Seattle, Liberty Elctrns., 5303 2nd Ave. S.	206-763-8200
Wisc	Madison, Satterfield Elctrn., 1900 S.Park St.	608-257-4801
Wisc	Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave.	414-228-8100
Wisc	Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd.	414-545-6500

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CHICAGO SWITCH, 2035 W. Wabansia Ave., Chicago, Ill., 60647, Tel: 312-489-5500; Sls. Mgr: M. Podgorski Vol 2•476,477,1038-1045

Local Sales Offices & Reps.

Cal	San Marino, Van Gott & Assoc.	213-282-1125
Fla	Indian Rocks Bch., Tech-Rep.	813-595-2834
Fla	Melbourne, Tech-Rep.	305-723-9140
Ga	Atlanta, Tech Rep.	404-963-8651
Mass	Newton Upper Falls, Brookdale/Richter Engrg.	617-244-6969
Mich	Southfield, J. Montgomery	313-358-2616
NJ	River Edge, MEG Elctrn. Sls.	201-265-9887
NY	Syracuse, Nycom	315-437-8343
Ohio	Chagrin Falls, Elctrn. Salesmasters	216-247-8201
Ore	Beaverton, N. R. Schultz Co.	503-646-1345
Tex	Addison, Campion Sls.	214-239-9196
Wash	Bellevue, N. Schultz	206-GL-4-5224

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CHOMERICS, INC., 77 Dragon Ct., Woburn, Mass., 01801, Tel: 617-935-4850, TWX: 710-393-0173; Sls. Mgr: K. Dunne; Sls. Engr: A. Benoit; Sls. Engr: R. Stahl

CHRISTIANSEN RADIO INC., 3034 Nestall, Laguna Beach, Cal., 92651, Tel: 714-497-1506 .....Vol 2•323

CHRISTIE ELEC., 3404A W. 67th St., Los Angeles, Cal., 90060, Tel: 213-750-1151, TWX: 910-321-3867; V.P: F. Benjamin; Applications Engr: Herm Rudman Vol 1•648,649

Local Sales Offices & Reps.

Ala	Huntsville, Ridge Instr.	205-837-3211
Ariz	Phoenix, R.A. Mayes	602-279-5243
Cal	Los Angeles, Halbar Assocs.	213-387-8283
Cal	Santa Clara, Thomas-Hartman Assoc.	408-247-1252
Colo	Broomfield, R.A. Mayes Co.	303-466-6311
Fla	Winter Park, Ridge Instr. Co.	305-239-4711
Ga	Tucker, Ridge Instr.	404-939-1554
Haw	Honolulu, Victor Kim Elctrns.	507-132
Kans	Prairie Vlg., Engrg. Svcs.	913-649-4000
Md	Silver Spg., L. White	301-585-3141
Mass	Burlington, W.M. Hague Co.	617-273-2450
Mich	Farmington, Carter, McCormic & Pierce	313-477-7700
Mo	Dayton, Carter, McCormic & Pierce	513-278-5873
Mo	St. Louis, Engrg. Svcs.	314-726-2233
NJ	Ridgewood, Instr. Sls. Co.	201-445-5210
NM	Albuquerque, R. Mayes	505-265-7989
NY	Syracuse, Rep. Tech., Inc.	315-437-2845
NC	Winston-Salem, L. White & Co.	919-725-3612
Ohio	Cleveland, Carter, McCormic & Pierce	216-333-5650
Ohio	Worthington, Carter, McCormic & Pierce, Inc.	614-888-4466
Pa	King of Prussia, L. White-Keystone	215-265-1817

Pa Pittsburgh, Carter, McCormic & Pierce 412-824-3760
Tenn Oak Ridge, Ridge Instr. 615-483-1311
Tex Richardson, C. Tinch 214-231-1322
Wash Bellevue, A. Smith Co. 206-746-6770
Exp: Cal., L.A., Trans-World Trade 213-472-0444

CHROMALLOY-ALCON INC., 1750 N Kimball Ave., Chicago, Ill., 60647, Tel: 312-BE-5-5030 .....Vol 3•552

Local Sales Offices & Reps.
Cal Reseda, M. J. Cozzi 213-DI-2-7383
Fla St. Petersburg, Comps. Sls. 813-360-7460
Ill Chicago, Alcon Metal Prods. 312-BE-5-5030
Ill Rolling Meadows, Sumer, Inc. 312-394-4900
Ind Indianapolis, Marquart & Assocs. 317-253-3997
Mass Acton, G Dick Assocs. 617-899-2364
Minn Minneapolis, Siedare Assocs. 612-533-2294
NJ Englewood Cliffs, Sprung-Nussbaum 201-947-6767
NY Brockport, G. J. Gay, Inc. 716-637-2846
Pa Philadelphia, Paragon Sls. Co. 215-LO-3-7060
Tex Richardson, Corwin Assocs. 214-424-8333
Va Lynchburg, J. A. Griffin 703-384-5236

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CHRONETICS, INC., 500 Nuber Ave., Mt. Vernon, N.Y., 10550, Tel: 914-699-4400, TWX: 710-560-0014; Sls. Mgr: S. Gordon .....Vol 1•410

Local Sales Offices & Reps.
Cal Sherman Oaks, Windsor Dynamics 213-989-3631
Cal Woodside, Windsor Dynamics 415-854-4870
Colo Arvado, Technology Mktg. Assoc. 303-322-6844
Fla Clearwater, Brennan Assocs., Inc. 813-446-5006
Ill Chicago, L.F. Green & Assocs. 312-286-6824
Ill Mt. Prospect, Contemporary Science 312-255-3793
Ind Indianapolis, L.F. Green & Assocs. 317-253-2087
Md Bethesda, Powell-Pendergraph, Inc. 301-656-4535
Mass Waltham, McBar Assocs. 617-890-0233
Minn Minneapolis, L.F. Green & Assocs. 612-781-1611
NM Albuquerque, Technology Mktg. Assoc. 505-298-4321
NY Dewitt, DB Assocs. 315-446-0220
NY Mt. Vernon, Q.E.D. Elctrns., Inc. 914-664-0080
Ohio Dayton, Rixan Assocs. 513-278-4216
Pa King of Prussia, Letronix 215-265-1020
Tenn Knoxville, Pulcir, Inc. 615-693-3641
Tex Dallas, R. Martin Assocs, Inc. 214-358-3704
Tex Houston, R. Martin Assocs., Inc. 713-462-4077
Va Richmond, Powell-Pendergraph, Inc. 703-264-2341
Wash Seattle, H. Levinson Co. 206-EA-3-5100

CHRONO-LOG CORP., 2583 W. Chester Pike, Broomall, Pa., 19008, Tel: 215-EL-6-6771; Sls. Mgr: D. Biberman Vol 1•333

Local Sales Offices & Reps.
Cal Los Angeles, Thorson Co. 213-WE-7-0790
Cal Palo Alto, Thorson Co. 415-DA-1-2414
Cal San Diego, Thorson Co. 714-CY-8-8385
Cal Tustin, Thorson Co. 714-544-5121
Colo Broomfield, R. A. Mayes Co. 303-466-6311
Mass Needham, Wild & Assocs. 617-HI-4-2366
NJ Mendham, J. J. Wild, Inc. 201-543-4782
NM Albuquerque, R.A. Mayes Co. 505-265-7989
NY Hastings on Hudson, Wild & Assocs. 914-963-3803
NY Jericho, J. J. Wild, Inc. 516-963-6600
Ohio Worthington, Ohio Instr. Co. 614-885-0743
Pa Southampton, Wild & Assocs. 215-EL-7-6645
Tex Houston, R. A. Mayes Co. 713-466-8325
Tex Richardson, R. A. Mayes Co. 214-235-3043
Va Arlington, H.J. Heffernan Co. 703-JA-2-6666
Wash Seattle, Thorson Co. 206-ME-2-0710
For: Can., Don Mills, Ont., York Instrs. 416-445-1255

CIMCO WIRE & CABLE, 250 W. Crescent Ave., Allendale, N.J., 07401, Tel: 201-327-2522; Sls. Mgr: J.B. Monaghan; Asst. Sls. Mgr: J. Ryan .....Vol 3•1347

Local Sales Offices & Reps.
Ariz Phoenix, Electrical Specialty 602-275-5736
Cal Chatsworth, Cal-Ward Sls. Co. 213-885-1771
Cal Palo Alto, Lockwood Assocs/No. 415-328-3999
Colo Denver, Electrical Specialty 303-321-0226
Fla Orlando, Royce Elctrn. Sls., Inc. 305-843-6030
Ill Chicago, Kennedy Engrg. 312-631-8283
Ind Ft. Wayne, Component/Insulation Corp. 219-485-7114
Mass Weston, F.C. Talbot Co. 617-893-6877
Mich Birmingham, Comp./Insulation 313-644-0087
Mo Springfield, Del-Tech Assocs. 417-881-3667
NY Mineola, R.A. Colucci Co. 516-746-0397
NY Rochester, Simcona Elctrns. 716-328-3230
Ohio Cleveland, Component/Insulation Corp. 216-521-3570
Pa Bala Cynwyd, Vantage Sls. Co. 215-667-0990
Pa Pittsburgh, J.W. Kight Co. 412-781-8303
Tex Dallas, R.E. Nesbitt Co. 214-357-4601
Va McLean, Paragram Sls. Co. 703-356-0808
For: Can., Montreal, Que., Allied Elctrn. Sls. 514-488-5547

CIMCO Local Distributors
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230

CINCH CONNECTORS, OPER OF TRW ELCTRN. COMPS., 1501 Morse Ave., Elk Grove Village, Ill., 60007, Tel: 312-439-8800, TWX: 910-222-1796; Sls. Mgr: K.E. Meyers .....Vol 3•854-924

Local Sales Offices & Reps.
Ala Huntsville 205-772-9656
Cal Cerritos 213-924-5711
Cal Mountain View 415-969-2252
Fla Orlando 305-894-6881
Ill Elk Grove Village 312-437-5110
Ind Indianapolis 317-547-9411
Mass Reading 617-944-3020
Mich Detroit 313-873-1150
Minn Minneapolis 612-835-5454
Mo St. Louis 314-727-7370
NJ Clifton 201-545-0990
NY Melville 516-293-9000
NY Rochester 716-461-3070
Ohio Dayton 513-298-9862
Pa Glenside 215-887-7520
Tex Dallas 214-637-6650
Wash Seattle 206-633-3160

CINCH Local Distributors
Ariz Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd. 602-273-7331
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Garden Grove, Allied Elctrns., 12311 Industry St. 213-598-6605
Cal Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way 213-685-5511
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal Palo Alto, Kierulff-Palo Alto, 3969 E. Bayshore Rd. 415-968-6292
Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal Woodland Hill, Rampart Components, 21201 Oxnard St. 213-887-7260
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Colo Denver, Burstein-Applebee 303-244-3336
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Burstein-Applebee 312-763-4848
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ill Skokie, Bell Inds. Elctrn. Distr. Div., 7701 N. Austin Ave. 312-282-5400
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Kans Kansas City, Burstein-Applebee 816-561-5460
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
La Baton Rouge, Ralph's, Inc., 1732 Plank Rd. 504-344-3761
La Lafayette, Ralph's Inc., 3004 Cameron St. 318-234-4507
La New Orleans, Ralph's, Inc., 4334 Stemway Dr. 504-242-2731
La Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094 318-423-6131
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Minn Minneapolis, Hall-Mark Elctrns., 4555 W. 77th St. 612-925-2944
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Ann, Interstate Ind Elctrn, 10525 St. Charles Rock Rd 314-428-8522
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Lincoln, Scott Elctrn Supply Corp., 4040 Adams St 403-434-8308
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Clifton, Eastern Radio, 312 Clifton Ave. 201-471-6600
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NM Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E. 505-247-1055
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Hauppauge, Rampart Components, Engineers Rd. 516-273-1111
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Pattison Supply Co., 4550 Willow Pkwy. 216-441-3000
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tenn Nashville, Electra Distributing, 1914 W. End Ave. 615-329-3971
Tex Beaumont, Ralph's, Inc., 1270 Broadway 713-833-9443
Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Tex Lubbock, R & R Elctrn Supply Co, 1607 Ave. G, Box 1860 806-765-7727
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Va Roanoke, Peoples Radio & Tv Supply Co., 1015 Moorman Rd
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200
Wisc Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave. 414-228-8100
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

CINCH-GRAPHIK, OPER. OF TRW ELCTRN. COMPS., Div. TRW INC., 200 S. Turnbull Canyon Rd., City of Industry, Cal., 91744, Tel: 213-333-1201, TWX: 910-584-1861; Sls. Mgr: G. Holmes .....Vol 2•325

(Refer to Cinch Connectors for Sales Office Information)

CINCH-MONADNOCK, OPER. OF TRW ELCTRN. COMPS., Div. TRW INC., 18300 E. Valley Blvd., Box 1222, City of Industry, Cal., 91747, Tel: 213-964-6581, TWX: 910-584-1303; Sls. Mgr: G. Holmes

CINCINNATI DEV. & MFG. CO., 5614 Wooster Pike, Cincinnati, Ohio, 45227, Tel: 513-271-7280; Sls. Mgr: E. Mooney

CINCINNATI ELCTRNS. CORP., 2630 Glendale Milford Rd., Cincinnati, Ohio, 45241, Tel: 513-563-6000, TWX: 810 464-8151; Mktg. Mgr. - Commun: F.G. Biscardi; Mktg. Mgr. - EW: J.H. Newman; Mktg. Mgr. - IR: D.F. Coates

CINCINNATI MILACRON, Process Controls Div., Lebanon, Ohio, 45036, Tel: 513-494-5444, TWX: (810) 460-8761; Sls. Mgr: M. Radeke

Local Sales Offices & Reps.

Cal	Los Angeles, Cincinnati Milacron	213-582-8361
Cal	San Francisco, Cincinnati Milacron	408-735-0701
Ga	Atlanta, Cincinnati Milacron	404-634-6312
Ill	Chicago, Cincinnati Milacron	312-439-5726
Mich	Detroit, Cincinnati Milacron	313-557-2700
NY	New York, Cincinnati Milacron	201-687-4500
Tex	Houston, Cincinnati Milacron	713-622-4620

CINCINNATI SUB-ZERO PRODS., 2612 Gilbert Ave., Cincinnati, Ohio, 45206, Tel: 513-751-8810; Chief Engr: T.J. Frederick .....Vol 1•383

CINEFOT INTERNATIONAL CORP., One Park Ave., New York, N.Y., 10016, Tel: 212-532-2323; Sls. Mgr: W.S. Victor

CIR-Q-TEL, 10504 Wheatley St., Kensington, Md., 20795, Tel: 301-946-1800; Sls. Mgr: R. Wainwright Vol 2•556,557

CIRCON CORP., 749 Ward Drive, Santa Barbara, Ca., 93111, Tel: 805-967-0404

Local Sales Offices & Reps.

Ariz	Phoenix, Jensen Tools & Alloys	
Cal	Alta Loma, Metro-Line Western	714-987-4112
Cal	Palo Alto, Andot Tech. Sls.	415-325-0058
Fla	Miami, Elctrn. Equip.	
Mass	Boston, Ind'l. Equip. & Sls.	617-227-8112
NJ	Saddle River, B. Most Assocs.	201-825-0033
NY	Binghamton, Stack Ind'l. Elctrns.	607-723-6326
NY	Hempstead, Davis Elctrns.	516-483-9200
NY	New York, Terminal-Hudson Elctrns.	212-243-5200
Pa	Cornwells Heights, H. Mann	215-639-6200
Pa	Phila., Techni-Tool	212-569-4457
Tex	Dallas, Metron Central	214-234-1411

CIRCUIT ASSEMBLY CORP., 3025 S. Kilson Dr., Santa Ana, Cal., 92707, Tel: 714-540-5490

CIRCUIT POWER, INC., 227 Main St., Portland, Conn., 06480, Tel: 203-342-2520; Sls. Mgr: P.C. Hooper

Local Sales Offices & Reps.

Cal	Los Altos, Cain & Co.	415-948-6533
Cal	Los Angeles, Cain & Co.	213-476-2251
Conn	Milford, Westwood Assocs.	203-878-8528
Ill	Mt. Prospect, Cain	312-253-3578
Mass	Reading, Geder	617-944-3105
NJ	Montville, G & A Sls.	201-227-3926
NY	Cortland, RJC Assocs.	607-753-3909
Ohio	Reynoldsburg, Cain	614-861-2119
Pa	Lafryette Hill, M. Lader	215-825-3177
Tex	Dallas, Cain	214-369-2897
Va	Woodbridge, M. Lader	202-296-2497

CIRCUIT-STIK, INC., 24015 Garnier St., Torrance, Cal., 90510, Tel: 213-530-5530; Sls. Mgr: D. Harper; Pres: N.R. Levesque; Operations Mgr: G.L. McCray

Local Sales Offices & Reps.

Ariz	Scottsdale, F. Board Assocs.	602-949-9561
Cal	Burlingame, W.J. Purdy Co.	415-347-7701
Cal	Los Angeles, W. B. Knight, Inc.	213-678-4711
Colo	Littleton, W.J. Purdy Co.	303-794-4225
Fla	Miami, Cartwright & Bean, Inc.	305-945-2962
Ga	Atlanta, Cartwright & Bean	404-237-2273
Ill	Hinsdale, Hill-Gray Assoc.	312-325-4810
Kans	Overland Pk., T.L. Dowell	913-649-6069
Mass	Babson Park, P.R. Sturgeon Co.	617-237-3506
Mich	Detroit, R.C. Merchant Co.	313-535-6000
NJ	Teaneck, Steve Fisher Sls. Corp.	201-836-6661
NM	Albuquerque, C.T. Carlberg & Assocs.	505-265-1579
NY	Syracuse, Mar-Com Assocs.	415-437-2843
Ohio	St. Marys, Thomas Shelby & Co.	419-394-3377
Tenn	Memphis, Cartwright & Bean	901-276-4442
Tex	Dallas, J.Y. Schoonmaker Co.	214-357-8481
Wash	Seattle, Earl & Brown Co.	206-284-1121

CIRCUIT-STIK, Local Distributors

Ariz	Phoenix, Liberty Electrns., 3612 N. 16th St.	602-264-4438
Cal	San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.	
Md	Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd.	301-823-0070
Ohio	Akron, Sun Radio Co., 110 E. Market St.	216-HE-4-2171
Ore	Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd	503-292-3534
Pa	Erie, Mace Elctrn., 2631 W. 8th St.	814-838-3544
Tex	Houston, Harrison Equip. Co. Inc., 1616 McGowen St.	713-224-9131
Utah	Salt Lake City, Standard Supply Co., 225 E. 6th So.	801-355-2971
Va	Norfolk, Priest Elctrn., 6431 Tidewater Dr.	703-855-2021
Wash	Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S.	206-763-2300
Wash	Seattle, Liberty Elctrns., 5303 2nd Ave. S.	206-763-8200

CIRCUIT STRUCTURES LAB., Div. Lincoln Instr. Co., Inc., 3200 N. San Fernando Blvd., Burbank, Calif., 91504, Tel: 213-849-6341; Pres: E.L. Deatrick; V.P: F.V. Criswell; Sales: G. Vogel

CIRCUIT TECHNOLOGY, 160 Smith St., Farmingdale, N.Y., 11735, Tel: 516-293-8686, TWX: 510 224 6555; Mkt. Mgr: M. Spitz

Local Sales Offices & Reps.

Cal	Manhattan Beach, Circuit Technology Inc.	213-374-7446

CIRCUITS, INC., 59 Deming Rd., Berlin, Conn., 06037, Tel: 203-828-3526; Sls. Mgr: R.E. Johnson; Pres: G.A. Johnson

CIRTECH CORP., 3802 W. 95th St., Leawood, Kans., 66206, Tel: 913-649-2800, TWX: 910-749-6806; Pres: M. Vlamis .....Vol 2•402

Local Sales Offices & Reps.

Ariz	Phoenix, Runyon Co.	602-959-6060
Cal	Los Angeles, Westaironics, Inc.	213-466-6201
Fla	Clearwater, WMM Assoc., Inc.	813-446-0075
Mass	Braintree, Bordewieck Eng. Sales	617-843-0845
NY	Buffalo, Telesco Assoc., Inc.	716-834-1026
NY	New York, F & F Assoc.	516-ED-4-1160
Ohio	Dayton, Berberich & Assoc.	513-252-9981
Tex	Dallas, Tinch Sls. Co.	214-231-1322

CITIES SVC. CO., Chester Cable Opers., Oakland Ave., Chester, N.Y., 10918, Tel: 914-469-2141, TWX: 510-249-4813; Sls. Mgr: H.J. Coffey; Mktg. Mgr: G.L. Jacobson; Engrg. Mgr: B. Levinson

Local Sales Offices & Reps.

Ariz	Scottsdale, Inter-Mountain Engrg.	602-947-7379
Cal	Chatsworth, Cal-Ward Sls. Co.	213-885-1771
Fla	Orlando, Fausett of Florida	305-894-6071
Ill	Elk Grove Vill., Knoblock & Assocs.	312-593-5940
Ind	So. Whitley, Warner, Kesler & Assocs.	219-723-5353
Kans	Shawnee Mission, Kathrinus, Kelly, & Co.	913-722-0000
Ky	Ft. Mitchell, G. W. Thelen	606-341-8181
Mo	St. Louis, Kathrinus, Kelly & Co.	314-968-3800
NJ	Haddonfield, Keefe Elctrn.	609-429-4650
NM	Albuquerque, Inter-Mountain Engrg.	505-344-2212
NY	Brooklyn, J. D. Coury	212-836-7387
NY	Great Neck, Cooper-Simon	516-487-1142
NY	Rochester, B. H. Tollefson Assocs.	716-271-4141
NY	Woodmere, I. G. Strauss	516-374-5273
NC	Charlotte, B. Jackson	704-366-6678
Pa	Delmont, T. F. Laslo & Assocs.	412-468-5045
Tenn	Memphis, W. L. Porter Co.	901-386-7714
Tex	Dallas, R. E. Nesbitt	214-357-4601
Tex	Houston, R. E. Nesbitt Co.	713-224-3633
Wisc	Milwaukee, Gentron Co.	414-351-1660
For:	Can., Montreal 307, Que., Space Elctrns. Corp.	514-735-1108

CLAIREX ELCTRNS., 560 S. Third Ave., Mt. Vernon, N.Y., 10550, Tel: 914-664-6602; Sls. Mgr: G.A. Smith Vol 2•672,673

Local Sales Offices & Reps.

Ariz	Scottsdale, E.V. Roberts & Ass.	602-945-2531
Cal	Culver Cy., E. Roberts	213-870-9561
Cal	Palo Alto, E. Roberts	415-324-1671
Cal	San Diego, E.V. Roberts & Assoc.	714-282-7691
Colo	Eastlake, Jensen Rep.	303-466-6061
Conn	Bethel, A.L. Livera	203-748-4639
Fla	North Miami Beach, Irby & Connolly Inc.	305-948-5197
Fla	Orlando, Irby & Connolly Inc.	305-894-8471
Ill	Chicago, L-Tec, Inc.	312-286-1500
Kans	Overland Park, Ensco-Rep	913-381-7557
Md	Phoenix, Cunningham Assoc.	301-823-4220
Mass	S. Braintree, Bordewieck Sls. Engrg.	617-843-0845
Mich	Detroit, Hilltronics	313-342-3243
Minn	Mpls., H.M.R. Inc.	612-920-8200
Mo	St. Louis, Ensco-Rep	314-542-3935
NJ	Fort Lee, Tecnimet	201-461-8686
NY	Cato, Clairex Electronics	315-626-6426
NY	Mt. Vernon	914-664-6602
NY	Roslyn Heights, A.L. Livera & Assoc.	516-484-1276
NC	Charlotte, Electro Rep Inc.	704-333-0451
Ohio	Chardon, Clairex Elctrns.	216-285-3415
Pa	Media, Reeves	215-LO-6-6709
Tex	Dallas, J.B. Guenther Inc.	214-528-6286
Tex	Houston, J.B. Guenther Inc.	713-468-0232
Wash	Seattle, H. Levinson Co.	206-323-5100

CLAIREX Local Distributors

Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
Tenn	Nashville, Electra Distributing, 1914 W. End Ave.	615-329-3971

CLARE, C.P. & CO., 3101 Pratt Blvd., Chicago, Ill., 60645, Tel: 312-262-7700; V.P. Sls: F.H. Bihler Vol 2•702-716; Vol 4•474-478•

Local Sales Offices & Reps.

Ala	Huntsville, C.P. Clare	205-534-5438
Ariz	Phoenix, Spectrum Assocs.	602-277-8168
Ark	Fort Smith, J. R. Masterson	501-646-7756
Cal	Mountain View, C.P. Clare	415-968-2831
Cal	Santa Ana, Spectrum Assocs.	714-835-4114
Colo	Denver, Walker Assocs.	303-623-8713
Fla	Ft. Lauderdale, R.I. Smith Assocs.	305-772-5100
Ga	Atlanta, A. Brown Assocs.	404-457-6381
Ill	Chicago, C.P. Clare & Co.	312-262-7700
Ind	Ft. Wayne, Baehr, Greenleaf	219-483-6864
Iowa	Des Moines, C.P. Clare	515-276-4147
Kans	Overland Park, Lowell-Kangas & Assocs.	913-888-3200
Md	Ellicott City, Doss Electronics	301-465-1336
Mass	Needham, C.P. Clare & Co.	617-449-4780
Mich	Mt. Clemens, C.P. Clare	313-468-1784
Minn	St. Paul, REPOR, Inc.	612-645-8618
Mo	St. Louis, Lowell-Kangas & Assocs.	314-821-4050
NY	Fayetteville, C.P. Clare	315-637-3939
NY	Great Neck, C.P. Clare	516-466-2100
NC	Charlotte, R.W. Chapman	704-525-2421
NC	Raleigh, R.W. Chapman & Co.	919-782-2624
Ohio	Cincinnati, Baehr, Greenleaf	513-891-3826
Ohio	Cleveland, Baehr, Greenleaf	216-221-9030
Ohio	Columbus, Baehr, Greenleaf	614-486-4046
Pa	Erie, Foster-Mc Clinton	814-455-9111
Pa	Ft. Wash., C.P. Clare & Co.	215-643-5321
Pa	Pittsburgh, Foster-McClinton	412-561-4803
SC	Greenville, R.W. Chapman & Co.	803-233-0053
Tex	Dallas, R.E. Nesbitt Co.	214-357-4601
Tex	Houston, Getty-Eads-Adair	713-781-3005
Va	Richmond, Advance Control Equip	703-288-0124
Wash	Bellevue, C.P. Clare	206-747-5600
WVa	Huntington, Foster-Mc Clinton	304-736-5161
Wisc	Wauwatosa, Larsen Assocs.	414-258-0529
For:	Can., Montreal, Que., C.P. Clare Can. Div.	514-482-9750
For:	Can, Toronto, Ont., C.P. Clare Canada, Div.	416-762-8154

CLARE, C.P. Local Distributors

Ala	Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr.	205-539-2731
Fla	Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave	305-885-8761
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Mass	Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy.	617-491-3300
Mich	Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza	313-729-8500
Neb	Lincoln, Scott Elctrn Supply Corp., 4040 Adams St	403-434-8308
NJ	Clifton, Eastern Radio, 312 Clifton Ave.	201-471-6600
NY	Binghamton, Wilshire Elctrns., 617 Main St., Westover Plaza	607-797-1236
NY	Buffalo, Genesee Radio & Parts Co., 2550 Delaware Ave.	716-873-9661
NY	Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd.	716-328-3230
Ohio	Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St.	216587-3600
Ohio	Dayton, Pioneer/Dayton, 1900 Troy St.	513-236-9900
Pa	Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave	215-365-1900
Tenn	Nashville, Electra Distributing, 1914 W. End Ave.	615-329-3971
Wash	Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S.	206-763-2300
Wisc	Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd.	414-545-6500

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

CLARE-PENDAR CO., Box 785, Post Falls, Idaho, 83854, Tel: 208-773-4541; Mktg. Mgr: S.F. Meyer

Local Sales Offices & Reps.

Ala	Huntsville, C. P. Clare & Co.	205-534-5438
Ark	Ft. Smith, J.R.Masterson	501-646-7756
Cal	Mountain View, C. P. Clare & Co.	415-968-2831
Cal	Santa Ana, C. P. Clare & Co.	714-835-4114
Cal	Sun Valley, Richey Elctdns.	213-983-0222
Colo	Denver, Omega Ltd.	303-758-1508
Fla	Ft. Lauderdale, C.P. Clare & Co.	305-772-5100
Ga	Atlanta, Hooker Reid Co.	404-237-9385
Ill	Chicago, C. P. Clare & Co.	312-262-7700
Ill	Palatine, OHM/Elctrns.	312-359-5500

Ind Ft. Wayne, Baehr, Greenleaf & Assoc. 219-483-6864
Iowa Des Moines, C. P. Clare & Co. 515-276-4147
Kans Overland Park, Lowell-Kangas & Assoc. 913-888-3200
Mass Needham, C.P. Clare & Co. 617-449-4780
Mich Mt. Clemens, C. P. Clare & Co. 313-468-1784
Minn St. Paul, Repor Inc. 612-645-8618
Mo St. Louis, Lowell-Kangas & Assoc. 314-821-4050
NJ Moorestown, Angus Inc. 609-235-1900
NY Buffalo, Genesee Radio & Parts 716-873-9661
NY Fayetteville, C. P. Clare & Co. 315-637-3939
NY Great Neck, C. P. Clare & Co. 516-466-2100
NY Huntington, Caravan Sls. 516-692-2839
NY Syosset, Milo Elctrns. 516-364-1400
NC Charlotte, R.W. Chapman & Co. 704-525-2421
Ohio Cincinnati, Baehr, Greenleaf & Assoc., Inc. 513-891-3826
Ohio Cleveland, Baehr, Greenleaf & Assoc., Inc. 216-221-9030
Ohio Columbus, Baehr, Greenleaf & Assoc., Inc. 614-486-4046
Pa Erie, Foster-McClinton 814-455-9111
Pa Ft. Washington, C.P. Clare & Co. 215-643-5321
Pa Pittsburgh, Foster-McClinton 412-561-4803
Tex Dallas, R. E. Nesbitt Co. 214-357-4601
Tex Houston, Gettys-Eads-Adair Inc. 713-781-3005
Wash Bellevue, C. P. Clare & Co. 206-747-5600
WVa Huntington, Foster-McClinton 304-736-5161
Wisc. Wauwatosa, Larsen Assoc. 414-258-0529
For: Can., Toronto, Ont., C. P. Clare Can., Ltd. 416-762-8154

CLARKE - HESS, Comm. Resch. Corp., 43 W. 16th St., New York, N.Y., 10011, Tel: 212-255-2940; Sls. Mgr: K.K. Clarke .....Vol 1•411

Local Sales Offices & Reps.
Ala Huntsville, J.L. Highsmith 205-881-3294
Fla Orlando, J.L. Highsmith 305-293-5202
Ill Chicago, P. Lind Elctrns. 312-774-1246
Ind Indpls., P. Lind Elctrns. 317-547-9178
Kans Leawood, Leemark Engrs. 913-NI-8-0124
Mich Royal Oak, Satullo 313-549-3910
Minn Circle Pines, P. Lind Elctrns. 612-786-5770
NJ Hazlet, Mer Mon 201-264-1851
NY N.Y., Clarke-Hess Comm. Resch. 212-255-2940
NC Charlotte, J.L. Highsmith 704-333-7743
Ohio Cleveland, Satullo 216-486-2800
Ohio Dayton, Satullo 513-293-7001
Pa Mt. Penn, Mer Mon 215-779-1640

CLAROSTAT MFG. CO., INC., Washington St., Dover, N.H., 03820, Tel: 603-742-1120, TWX: 510-297-4455; Sls. Mgr: H. Taylor .....Vol 3•1218,1219

Local Sales Offices & Reps.
Ariz , Jack Berman Co. Enterprize 1281
Ark Magnolia, J.Y. Schoonmaker Co.
Cal Inglewood, J Berman Co. 213-678-1281
Cal Menlo Park, Straube Assocs. 415-323-2476
Colo Boulder, Straube Assocs. Mt. States 303-443-8600
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-2474
Fla Pompano Beach, Hutto-Hawkins-Pereguy
Fla Tampa, Hutto-Hawkins-Peregoy 813-837-2512
Ga Atlanta, Millar Elctrns. 404-261-6160-61
Haw Honolulu, Pegart Int'l. Hawaii
Ill Chicago, Clarostat Mfg. Co., Inc. 312-792-3898-99
Ind Ft. Wayne, Needler Sales Co. 219-447-2123
Ind Indianapolis, New/Era Sales, Inc. 317-257-7333
Iowa Cedar Rapids, Palatine Engrg. Sls. 319-365-8071
Kans Andover, Palatine Engrg. Sls. 316-683-7512
Kans Overland Park, Palatine Engrg. Sls. 913-262-5643
Md Lutherville, L.D. Lowery, Inc. 301-VA-3-2172
Md Silver Spring, Lowery Assocs. 301-HE-9-3542
Mass Concord, Clarostat Mfg. Co. Inc. 617-369-7933-34
Mich Ferndale, Hilltronics 313-342-3242
Minn Minneapolis, A.J. Warner Co. 612-729-7371
Mo St Louis, Palatine Engrg. Sls. 314-426-7055
NY Manhasset, Win-Cor Elctrn. Sls. 516-627-9474
NY N. Syracuse, L. D. Allen 315-458-7470
NY Snyder, L. D. Allen
NC Raleigh, Millar Elctrns. 919-787-9564
Ohio Cleveland, K.W. Elctrns. Sls. 216-831-6232
Ohio Dayton, K.W. Elctrns. Sls. 513-890-2150
Okla Tulsa, J.Y. Schoonmaker Co.
Ore Portland, Almac/Stroum Elctrns. 503-292-3534
Pa Broomal, L. D. Lowery 215-356-5300
Pa Harrisburg, Beil & Whitaker 717-652-0184
Pa Reading, Beil& Whitaker 215-779-2610
Pa Waterford, K.W. Electronic Sales Inc. 814-786-6093
Tex Dallas, J.Y. Schoonmaker Co. 214-357-8481
Tex Houston, J.Y. Schoonmaker Co.
Tex San Antonio, J.Y. Schoonmaker Co. 512-342-0251
Utah Morgan, Straube Assocs/Mt. States 801-829-6448
Va Charlottesville, L.D. Lowery, Inc. 703-973-6672
Wash Seattle, Almac/Stroum Co. 206-763-2300
Exp: N.Y., New York, M. Simons & Son Co. 212-227-5513
For: Can., Downsview, Ont., Tri-Tel Assocs. Ltd. 416-633-4325

CLAROSTAT Local Distributors
Ala Birmingham, Ack Radio Supply, 3101 4th Ave., S. 205-322-0588
Ala Birmingham, J.W. Clary Co., 1713 Second Ave. S. 205-322-2488
Ala Huntsville, Cramer/Ew Huntsville, 2310 Bob Wallace Ave.SW 205-539-5722
Ariz Phoenix, Sterling Elctrns., Inc., 1930 No. 22nd Ave. 602-258-4531
Cal Garden Grove, Allied Elctrns., 12311 Industry St. 213-598-6605
Cal Hollywood, Hollywood Radio & Electr., 5250 Hollywood Blvd. 213-466-3181
Cal Irvine, Cramer/L. A., 17201 Daimler St. 714-979-3000
Cal Los Angeles, WESCO Elctrns.-L.A., 5650 Jillson St. 213-685-9525
Cal Mountain View, Terminal Hudson Electrns., 880 Maude Ave. 415-969-9240
Cal Palo Alto, WESCO Elctns.-Palo Alto, 3973 E. Bayshore Rd. 415-968-3475
Cal Riverside, Electronic Supply, 2486 Third 714-683-8110
Cal San Carlos, Sterling Electronics, 1061 Industrial Rd. 415-592-2353
Cal San Diego, Richey Elctrn., 5258 Kearny Villa Way 714-565-4444
Cal San Diego, Sterling Electronics, 6158 Mission Gorge Rd. 714-283-6575
Cal Sunnyvale, Cramer/San Fran., 720 Palomar Ave. 408-739-3011
Cal Sun Valley, Richey Elctrn. Inc., 10871 La Tuna Canyon Rd. 213-875-2862
Colo Denver, Acacia Sales Inc., 785 S. Jason St. 303-744-6356
Colo Denver, Elctrn. Parts Co., 1212 S. Broadway 303-744-1992
Colo Denver, Newark-Denver Elctrns., 2170 So. Grape St. 303-757-3351
Conn East Haven, J. V. Electronics, 600 Main St. 203-469-2321
Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Conn North Haven, Cramer/Conn., 35 Dodge Ave. 203-239-5641
Conn Stratford, Greene-Shaw Co., 90 Morningside Dr. 203-378-9948
Fla Ft. Lauderdale, Cramer/Florida Elec., 4141 N.E. 6th Ave., Cinico Bayou
Fla Miami, Elctrn. Equip. Co., 2701 NW 42nd Ave. 305-871-3500
Fla Miami, Electro Standard Labs., 3560 N W 34th St. 305-633-6973
Fla Oakland Park, Peerless Radio/Fla., 1040 N.E. 43rd Ct. 305-566-5966
Fla Orlando, Hammond Electrns., 911 W. Central Blvd. 305-241-6601
Fla Pensacola, Grice Electronics, 320 E. Gregory St. 904-433-4616
Fla Tampa, Lykes Elctrns Corp., 121 S. Ashley Dr. 813-229-1885
Ga Atlanta, Ack Radio Supply Co., 554 Deering Rd. N.W.
Ga Atlanta, Cramer/Atlanta, 3923 Oakcliff Industrial Court 404-448-9050
Ga Atlanta, Lykes-Jackson Electrns., 1135 Chattahoochee 404-355-2223
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Allied Radio Corp., 2400 W. Lake St. 312-421-2400
Ill Chicago, Newark Elctrns, 500 N. Pulaski Rd. 312-638-4411
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ind Evansville, Hutch & Son, Inc., 200 No. Main St. 812-425-7155
Ind Indianapolis, Ra-Dis-Co., Inc., 814 N. Senate Ave., Box 1064 317-637-5571
Iowa Cedar Rapids, Deeco, Inc., 2500 16th Ave. S.W. 319-365-7551
Iowa Davenport, Klaus Radio & Elec., 322 E. Fourth St. 319-323-9761
Kans Wichita, Radio Supply Co., 115 Laura 316-267-5216
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
La Baton Rouge, Ralph's, Inc., 1732 Plank Rd. 504-344-3761
La Lafayette, Ralph's Inc., 3004 Cameron St. 318-234-4507
La New Orleans, Epcor/Lykes, 3308 Orleans Ave. 504-486-3777
La Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094 318-423-6131
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Md Gaithersburg, Cramer/Ew Washington, 16021 Industrial Drive 301-948-0110
Md Rockville, Pioneer/Washington, 1037 Taft St. 301-427-3300
Md Savage, Pyttronic Ind., 8200 Wellmoor Ct.
Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Mass Boston, Sager Elec. Sup. Co., 172 High St. 617-542-2281
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Dedham, Gerber Elctrn., 852 Providence Hwy 617-329-2400
Mass Newton, Cramer Elctrn. Inc., 85 Wells Avenue 617-969-7700
Mass N. Wilbraham, Industrial Components, 2551 Boston Rd. 413-596-3854
Mass Watertown, Sterling Electronics, 51 Spring St. 617-926-9720
Mich Ann Arbor, Wedemeyer Elctrn. Supply Co., 2280 S. Ind'l. Hwy. 313-665-8611
Mich Augusta, Great Lakes Elctrns, Box 217 616-731-4156
Mich Oak Park, Newark-Detroit Elec., Inc., 20700 Hubbell Ave. 313-548-0250
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Mich Wyoming, Newark Elctrns., 3645 Linden S.E. 616-241-6651
Minn Minneapolis, Harry Stark Electrns. Supply, 112 3rd Ave., N. 612-332-1325
Minn Minneapolis, Newark-Minneapolis Elec Corp., 336 Hoover St. NE 612-331-6350
Mo No. Kansas City, LCOMP-Kan City, 1520 Taney St. 910-221-2400
Mo St. Louis, Olive Ind'l Elctrns Inc, 6662 Olive Blvd 314-863-7800
Neb Lincoln, Scott Elctrn Supply Corp., 4040 Adams St 403-434-8308
NH Concord, Evans Radio, Box 893
NJ Edison, William Elctrnc. Supply, 1863 Woodbridge Ave. 201-985-3700
NJ Hanover, State Elctrn. Parts Corp., 36 Rte 10 201-887-2550
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
NM Albuquerque, Elctrn Parts Co., 222 Truman St. N.E. 505-265-8401
NY Albany, E. E. Taylor, 465 Central Ave. 518-436-4461
NY Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave. 212-492-9590
NY Buffalo, Standard Elctrns., 3519 Union Rd.
NY Endwell, Cramer/Binghamtom, 3220 Watson Blvd. 607-754-6661
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Long Island City, Dalis Ind'l. Elctrn., 35-35 24th St. 212-EM1-1117
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Calvert Elctrns. Int'l., 220 E. 23 St. 212-679-1340
NY New York, Terminal-Hudson, 236 W. 17th St.
NY Plainview, Fairmont Elctrns., 35 S. Service Rd. 516-694-8200
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
NY Rome, Rome Elctrncs., 108-110 Spring St. 315-337-5400
NC Charlotte, Dixie Radio, 2220 Tryon St. 704-377-5413
NC Greensboro, Hammond Elctrns. of Carolina, 2923 Pacific Ave. 919-275-6391
NC Winston-Salem, Kirkman Elctrns., Inc., 901 W. Second St. 919-724-0541
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Cincinnati, Cramer/Tri-States, 666 Redna Terr. 513-771-6441

Ohio Cincinnati, Hughes-Peters, Inc., 4865 Duck Creek Rd. 513-351-2000
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Columbus, Hughes-Peters, Inc., 481 E. 11th Ave. 614-294-5351
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Dayton, Stotts-Friedman Co., 108 N. Jefferson St 513-224-1111
Okla Oklahoma City, Trice Wholesale Electr., 4701 No. Stiles 405-524-4411
Okla Tulsa, Cramer/Tulsa, 6336 East 13th Street 918-836-3371
Okla Tulsa, Radio Inc., 1000 S. Main St. 918-587-9123
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Allentown, A.A. Peters, 404 Union Blvd.
Pa Erie, Erie Corporate Contractors, 1968 Buffalo Rd. 814-455-8110
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Harrisburg, Cumberland Electrns., 1345 S. 12th St. 717-233-5883
Pa Philadelphia, Almo Elctrns, 9815 Roosevelt Blvd. 215-676-6000
Pa Philadelphia, Phila Electronics Inc., 1225 Vine St. 215-568-7444
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Pa Pittsburgh, RPC Elctrns., 620 Alpha Dr. 412-782-3770
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Pa Scranton, Fred Pursell Co., 122-37 N. Washington Ave. 717-346-2011
Pa Trevose, Hall-Mark Elctrns., Box 125 215-355-7300
Pa West Chester, West Chester Elec. Supply, 716 E. Market St. 215-923-1520
RI Providence, Wm. Dandreta & Co., 28 Wolcott St. 401-861-2800
RI Warwick, W. H. Edwards Co., 55 Electronic Dr. 401-781-8000
SC Columbia, Dixie Radio Supply, Box 408 803-253-5333
SC Greenville, Dixie Radio Supply, 500 Pendleton St. 803-232-5357
SC Greenville, Hammond Elctrns. of Carolina, 100 Augusta St. 803-233-4121
Tenn Memphis, Bluff City Distr. Co., Box 418, 234 East St. 901-725-9500
Tenn Nashville, Electra Distributing, 1914 W. End Ave. 615-329-3971
Tex Dallas, All State OEM, 510 S. Good Latimer 214-651-0242
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Garland, Newark Elctrns., 707 Easy St. 214-271-2511
Tex Houston, Lenert Co., Box 2184 713-225-1465
Tex Houston, Sterling Electronics, Box 1229 713-623-6600
Utah Salt Lake City, Bintz Co., W.H., 433 W. 3rd St
Va Charlottesville, Virginia Radio Supply, 717 Henry Ave. 703-296-4184
Va Richmond, Meridian Electrns., 1001 W. Broad St. 703-355-0669
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wash Seattle, Sterling Electronics, 5608 6th Ave., S. 206-762-9100
Wisc Milwaukee, Cramer/Wisconsin, 5626 North 91st Street 414-462-8300
Wisc Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave. 414-228-8100

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CLAUSS Local Distributors
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971

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CLEMENS MFG. CO., 630 S. Berry Rd., St. Louis, Mo., 63122, Tel: 314-WO-1-7228; Owner: J. Clemmens

CLEMENTS MFG. CO., 6656 S. Narragansett Ave., Chicago, Ill., 60638, Tel: 312-767-7900; Sls. Mgr: J.B. Handy

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Cal Brisbane, B. Gillies 415-467-5640
Cal Los Angeles, Bob Gillies/Lectrowest 213-627-4188
Colo Lakewood, R.H. Emich/Electro Sls. 303-232-3070
Ga Atlanta, Cobb & Lester, Inc. 404-688-3191
Ill Chicago, D. Baker 312-352-1032
Ill Wheaton, D. Dewolf 312-668-4397
Mass Reading, F. G. Banester Co. 617-944-3776
Mich Dearborn, Reynolds Machine & Tool Distributors 313-565-0300
NJ Carlstadt, Hoyt Equip. Co. 201-935-0044
NY Rome, G. C. Carley Co. 315-336-6630
NC Charlotte, B. Henry/Berrington Collins Corp. 704-333-8397
Pa Camp Hill, A. L. Slade & Co. 717-761-1311
Utah Bountiful, P. E. Anderson 801-295-2842
Wash Seattle, J. J. Backer Co. 206-285-1300
Wisc Milwaukee, D. Deering Co. 414-421-0857
Exp: Westchester, Ill., Subent Co. G. Lacina 312-343-6425

CLEVELAND ELCTRNS., INC., 17877 St. Clair Ave., Cleveland, Ohio, 44110, Tel: 216-249-3700; Gen. Sls Mgr: M.K. Smith

CLEVELAND MICA CO., 1360 Hird Ave., Lakewood, Ohio, 44107, Tel: 216-226-1360; Sls. Mgr: W.D. Burton

CLEVELAND REFRACTORY METALS DIV., Chase Brass & Copper Co., 28850 Aurora Rd., Solon, Ohio, 44139, Tel: 216-248-0300; Sls. Supv: D.K. Telzrow; Sls. Corresp: H. Stephens; Sls. Corresp: R. Golden

CLIFTON PRECISION, Litton Systems, Inc., Marple at Brdway., Clifton Hgts., Pa., 19018, Tel: 215-622-1000, TWX: 510-669-9782; Pres: A. Owen

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Ariz Phoenix, Clifton Precision 602-242-0910
Cal Norwalk, Comar Co. 213-921-8695
Cal Sunnyvale, Comar 408-245-3193
Fla Altamonte Springs, Clifton Precision 305-831-1441
Iowa Cedar Rapids, Midwest Meridian 319-365-6561
Mass W. Newton, Darbury Corp. 617-244-2053
Mich E. Grand Rapids, Midwest Meridian 616-949-7798
Mo Maryland Hgts., Midwest Meridian 314-878-4441
NY Greenlawn, Reflex Elctrn. 516-549-1888
Ohio Dayton, Midwest Meridian 513-276-4137

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CLIPPARD INSTR., INC., 7350-90 Colerain Rd., Cincinnati, Ohio, 45239, Tel: 513-521-4261

CML-MACARR, INC., 167 National Rd., Edison, N.J., 08817, Tel: 201-287-2810, TWX: 710-998-0560; Mktg. Dir: H. Modzelewski ..... Vol 1•641-645

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Cal Costa Mesa, Meas. Assocs. 714-540-7160
Cal Sunnyvale, RDP Instrs. 408-735-9040
Colo Evergreen, Fahnestock Assoc. 303-674-5255
Fla Orlando, Datarep 305-843-5224
Fla Pompano Bch., Datarep 305-781-9279
Ill Chicago, L. Green 312-286-6824
Ill Des Plaines, Marsland Assoc. 312-298-2620
Ind Indianapolis, L. Green 317-293-9827
Md Ellicot Cy., Gans-Fryling 301-837-6311
Mich Detroit, H. Teplitz 313-537-9058
Minn Mpls., L. Green 612-781-1611
Mo Florissant, Marsland Assocs. 314-278-6949
NJ Woodbury, Sweeney & Co. 516-692-4222
NY Fayetteville, M. P. Andrews 315-637-3144
NY Woodbury, Sweeney & Co. 516-692-4222
NC Winston-Salem, RADCO Co. 919-722-9671
Ohio Cleveland, H. Teplitz & Co. 216-371-2044
Ohio Dayton, H. Teplitz & Co. 513-277-6531
Pa Exton, Scientific Mktg. 215-363-7377
Tex Dallas, True Technology 214-691-7870
Va Arlington, Gans-Fryling 703-527-3262

CO-OPERATIVE INDS., INC., 100 Oakdale Rd., Chester, N.J., 07930, Tel: 201-879-5151, TWX: 510-235-1277; Sls. Mgr: V.C. Bonardel

CO-ORD SWITCH, See LVC Ind's.

COAST COIL CO., 5333 W. Washington Blvd., Los Angeles, Calif., 90016, Tel: 213-936-6188; Sls. Mgr: W.L. Queen

COBEHN, INC., 226 Passaic Ave., Fairfield, N.J., 07006, Tel: 201-227-6675; Sls. Mgr: D.F. Cook

Local Sales Offices & Reps.
Cal Fullerton, John Broadbent, Jr. 714-879-4974
Cal San Diego, J. C. Henberger Co. 714-223-7114
Ill Des Plaines, Marsland Assocs., Inc. 312-298-2620
Ind Indianapolis, Marsland Assocs., Inc. 317-924-3568
Md Kensington, Aeron Assocs. 301-946-0070
Mass Boston, R. E. Bailey 617-426-0846
Mich Cedar, C & D Assocs. 616-334-3722
Minn Minneapolis, Marsland Assocs., Inc. 612-545-4481
Mo St. Peters, Marsland Assocs., Inc. 314-278-6949
NJ Montclair, Ameresco, Inc. 201-746-5300
NY Rochester, Rochester Ind'l. Supply Co. 716-325-2386
Pa Reading, Chemtronics Div., Ind'l. Abrasives 215-372-2826
Tex El Paso, Test Equip. Co. 915-755-9192
Utah Bountiful, Bert Randall Assocs. 801-292-4965

COBER ELCTRNS., INC., 7 Gleason Ave., Stamford, Conn., 06902, Tel: 203-327-0003, TWX: 710-474-3371; Mktg. Mgr: B. Zarkower ..... Vol 1•545

Local Sales Offices & Reps.
Ariz Phoenix, Hytronic Meas. 602-253-6104
Cal Los Altos, J. Stone 415-948-4563
Cal Los Angeles, Cain 213-476-2251
Colo Denver, Hytronic Meas. 303-770-4400
DC Wash, Eastern Instr. 301-839-3800
Fla Palm Bay, SparTech Assocs. 305-727-8045
Ga Smyrna, SparTech Assocs. 404-432-3644
Mass Waban, Instrument Consits. 617-969-9881
Mass Waltham, Meas. Consits. 617-890-4400
Mich Detroit, Micro Sls. 313-482-1229
NM Albuquerque, Hytronic Meas. 505-268-3941
NY E. Syracuse, Ossmann Instr. 315-437-6666
NY Great Neck, Eastern Instr. 516-466-9505
Ohio Dayton, Micro Sls. 513-298-3033
Pa Phila., Eastern Instr. 215-927-7777
Tex Fort Worth, Carey, Wolf & Assoc. 817-738-1996
Utah Salt Lake City, Hytronic Meas. 801-466-4924
For: Calgary 21, Alberta, Can., Canadian Dynamics, Ltd. 403-243-2018
For: Tokyo, Japan, Industrial Imports
For: Vancouver, B.C., Can., Canadian Dynamics, Ltd. 604-325-6014

CODEX CORP., 15 Riverdale Ave., Newton, Mass., 02195, Tel: 617-969-0600; Dir-Mktg: J Pugh

COGNITRONICS CORP., 25 Crescent St., Stamford, Conn., 06906, Tel: 203-327-5307; Sls. Mgr: I.B. Goldberg

Local Sales Offices & Reps.
Ala Huntsville, Col-Ins-Co., Inc. 205-539-1771
Ariz Phoenix, The Thorson Co. 602-956-5300
Cal Los Angeles, The Thorson Co. 213-937-0790
Cal Palo Alto, The Thorson Co. 415-321-2414
Cal San Diego, The Thorson Co. 714-298-8385
Cal Santa Anna, The Thorson Co. 714-544-5121
Colo Denver, The Thorson Co. 303-355-3521
Fla North Palm Beach, Col-Ins-Co., Inc. 305-423-7615
Fla Orlando, Col-Ins-Co., Inc. 305-423-7615
NM Albuquerque, The Thorson Co. 505-265-5655
NC Raleigh, Col-Ins-Co., Inc. 919-834-6591
Tex Dallas, The Thorson Co. 214-233-5744
Tex Houston, The Thorson Co. 713-771-3506
Utah Salt Lake City, The Thorson Co. 801-322-2127
Wash Seattle, The Thorson Co. 206-632-0710

COHN, SIGMUND, 121 S. Columbus Ave., Mt. Vernon, N.Y., 10553, Tel: 914-664-5300, TWX: 710-562-0112; Sls. Mgr: R. Cohn

Local Sales Offices & Reps.
Cal Burbank, S. Cohn Corp. of Calif. 213-VI-9-6777

COIL CO. OF AMER., 221 Washington St., Northvale, N.J., 07647, Tel: 201-768-3434; Pres: M.E. Gottlieb; Chief Eng: R. Yedavalli

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Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

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Ariz	Nogales, Collins Radio Co.	602-287-2101
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Cal	Long Beach, Collins Radio Co.	213-593-8722
Cal	Los Angeles, Collins Radio Co.	213-647-5611
Cal	San Carlos, Collins Radio Co.	415-343-3224
Colo	Colorado Springs, Collins Radio Co.	303-471-0282
Fla	Madeira Beach, Collins Radio Co.	813-391-8065
Fla	Miami, Collins Radio Co.	305-888-0611
Ga	Atlanta, Collins Radio Co.	404-761-0607
Kans	Wichita, Collins Radio Co.	316-942-4201
La	Pineville, Collins Radio Co.	318-443-1228
Md	Baltimore, Collins Radio Co.	301-675-5438
Mass	Boston, Collins Radio Co.	617-272-7930
Minn	Maple Plain, Collins Radio Co.	612-479-2633
Minn	Minneapolis, Collins Radio Co.	612-922-2876
Mo	Kansas City, Collins Radio Co.	816-763-3928
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NY	New York, Collins Radio Co.	212-661-6530
Ohio	Cincinnati, Collins Radio Co.	513-825-3802
Okla	Oklahoma City, Collins Radio Co.	405-732-6801
Ore	Portland, Collins Radio Co.	503-654-1189
Pa	Philadelphia, Collins Radio Co.	215-672-7797
SC	Rock Hill, Collins Radio Co.	803-366-7322
Tenn	Knoxville, Collins Radio Co.	615-525-4966
Va	Arlington, Collins Radio Co.	703-524-9503
Wash	Seattle, Collins Radio Co.	206-725-1000

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COLLINS Local Distributors

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Tex	Ft. Worth, Allied Elctrns., 401 E. 8th St.	817-336-5401

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Local Sales Offices & Reps.

Ala	Huntsville, BCS Assocs., Inc.	205-881-6220
Cal	San Diego, Perspective Meas.	714-278-8931
Colo	Littleton, Cropley, Inc.	303-794-4231
Fla	Orlando, BCS Assocs., Inc.	305-843-1510
NJ	Clifton, Doron Assoc.	201-661-0440
NC	Greensboro, BCS Assocs. Inc.	919-273-1918
Pa	Exton, Scientific Mktg.	215-363-7377
Tex	Dallas, Perception Sys.	214-233-5497

COLT INDUSTRIES, Crucible Magnetics Div., Box 100, Elizabethtown, Ky., 42701, Tel: 502-769-1333; V.P. Mktg: R.E. Budde

COLUMBIA COMPONENTS, Div. Computer Instrs., 60 Madison Ave., Hempstead, N.Y., 11550, Tel: 516-483-8200, TWX: 510-222-4189; Delay Line Sls. Mgr: L. Eagle; Hybrid Microcircuit S.M: A. Goldstein Vol 2•593; Vol 3•1221

Local Sales Offices & Reps.

Hybrid Microcircuit Div. See Computer Instruments Corp.

Delay Line Div.

Ala	Huntsville, Int'l. Scien. Instr.	205-837-1601
Cal	Los Angeles, E. Landa	213-897-0770
Cal	Menlo Park, Frauman	415-322-8461
Cal	San Diego, B. Tauber & Assoc. Inc.	714-274-7242
Fla	Orlando, F. Baetzman	305-295-4817
Ill	Chicago, Lightner Assoc.	312-SP-4-1500
Md	Pimonium, Barn Hill & Assoc.	301-252-5610
Mo	Kansas City, Automatic General Elec.	816-333-8206
NY	Huntington, Andrews & Andrews	516-692-8686
NY	Rochester, Semple	716-342-1413
Ohio	Fairborn, Technical Assoc.	513-878-2484
Utah	Salt Lake City, Cannon Eng. & Sls.	206-454-2514
Va	Lynchburg, Glen White	703-846-4624

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COLUMBIA ELETRN. CABLES, 11 Cove St., New Bedford, Mass., 02744, Tel: 617-999-4455; VP-Sls: S. Rudolph; G. M: H. Stern ..... Vol 3•1348-1353

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Md	Baltimore, C. Emrich	301-747-8348
Mass	Sherborn, Naton Assoc.	617-235-1966
Minn	St. Paul, Countryman Assocs.	612-645-9151
Mo	Kansas Cy., K.S.W. Assocs.	816-363-5651
NJ	Haddonfield, Mesa Tech.	609-429-4675
NY	Buffalo, Quality Comps.	716-839-4170
NY	Garden City, Comtronic Assoc.	516-741-8966
NC	Greensboro, L & D, Inc.	919-292-3201
Tex	Dallas, Stevens Sls.	214-350-2476

CROWN INT'L., Box 1000, Dept. EEM, Elkhart, Ind., 46514, Tel: 219-294-5571; Sls. Mgr: C. Moore; Ind. Sls. Mgr: M.H. Stoll .....Vol 1•309

CRYSTAL NETWORK PRODS. CORP., 818 Parade St., Erie, Pa., 16503, Tel: 814-525-0124; Sls. Mgr: R.H. Tuznik

CRYSTAL TECHNOLOGY, 2510 Old Middlefield Way, Mountain View, Cal, 94040, Tel: 415-961-9311; Mkt. Mgr: R.L. Carlson; Asst. Mkt. Mgr: L.J. Castelli

Local Sales Offices & Reps.

Ariz	Phoenix, Griot Associates	602-275-4991
Cal	El Segundo, Griot Associates	213-322-8383
Cal	Los Altos, Griot Associates	415-941-2533
Cal	Tustin, Griot Associates	714-838-2330
Fla	Longwood, Lenz Engrg. Co.	305-831-9797
Ill	Chicago, Brooks Engrg. Co.	312-944-1227
Md	Silver Spring, Spectroscopy Sys.	301-949-8261
Mass	Billerica, Drew Associates	617-667-6643
NJ	E Windsor, Cook & Weil, Inc.	609-448-7409
NM	Albuquerque, Southwestern Engrg. & Equip. Co.	505-265-6775
Tex	Dallas, Southwestern Engrg. & Equip. Co.	214-826-6661
Tex	Houston, Southwestern Engr. & Equip. Co.	713-666-2313
Wash	Bellevue, Griot Associates	206-454-8592

CRYSTALONICS DIV., See Teledyne Crystalonics

CRYSTEK DIV., Whitehall Elctrns., 1000 Crystal Dr., Ft. Myers, Fla., 33901, Tel: 813-936-2109, TWX: 510-951-7373; Sls. Mgr: B.C. Lochner; Sls. Reps: L. Stacey

CRYSTEK Local Distributors

Mass	Woburn, Abbott Elctrn., 902 Main St.	617-935-2040

CSR INDUSTRIES INC., Semiconductor Div., 59 Central Ave., E. Farmingdale, N.Y., 11735, Tel: 516-694-3404, TWX: 510-224-6444; Sls. Mgr: D. Russell

CTS CORP, 905 N. West Blvd., Elkhart, Ind., 46514, Tel: 219-293-7511, TWX: 810-294-2256; V.P. Corp. Sls: R.A. Stackhouse

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Local Sales Offices & Reps.

Ala	Huntsville, W. A. Brown Comps.	205-539-4411
Ariz	Phoenix, Hecht, Henschen & Assoc.	602-275-4411
Cal	Burlingame, J. Logan	415-697-6100
Cal	S. Pasadena, CTS Corp.	213-682-1137
Colo	Denver, Elctrn. Comps. Sls.	303-771-6200
Conn	North Haven, CompRep	203-239-9762
Fla	Ft. Lauderdale, Orbe, Inc.	305-771-8915
Fla	St. Petersburg, Orbe, Inc.	813-894-0687
Ill	Sandwich, CTS Knights	815-786-8411
Ind	Elkhart, CTS Corp.	219-293-7511
Iowa	Marion, Thomas & Modrcin Assocs.	319-377-6261
Kans	Shawnee Mission, Thomas & Modrcin Assocs.	913-432-2131
Mass	Needham, CompRep	617-444-2484
Mich	Southfield, J. L. Montgomery, Inc.	313-358-2616
Minn	Mpls., R.W. Marshall	612-929-0457
Minn	Mpls., Stoss Assocs.	
Mo	Hazelwood, Thomas & Modrcin Assocs.	314-838-6446
NJ	Cherry Hill, CTS Corp.	609-424-1207
NM	Albuquerque, Elctrn. Comp.	505-256-9831
NY	Jamaica, S-J Sls.	212-291-3232
NY	Syracuse, Nycom, Inc.	315-437-8343
NC	Skyland, CTS of Asheville	704-684-6451
Ohio	Cincinnati, Baehr, Greenleaf & Assoc.	513-891-3827
Ohio	Cleveland, Baehr, Greenleaf & Assoc.	216-221-9030
Ohio	Columbus, Baehr, Greenleaf & Assoc.	614-486-4046
Pa	Pittsburgh, Covert & Newman Co.	412-563-0303
Tex	Addison, Parvin Sales Co.	214-239-9148
Tex	Houston, Parvin Sls. Co.	713-721-1054
Utah	Salt Lake Cy., Elctrn. Comp.	801-486-2317
Wash	Bellevue, SD-R2 Prods. & Sls.	206-747-9424
For:	Can., Streetsville, Ont., CTS Of Can., Ltd.	416-826-1141
For:	P.R., San Juan, Moriss Saliss	809-764-1842

CTS Local Distributors

Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ill	Skokie, Bell Inds. Elctrn. Distr. Div., 7701 N. Austin Ave.	312-282-5400
Neb	Lincoln, Scott Elctrn Supply Corp., 4040 Adams St	403-434-8308
NJ	Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys.	609-662-4000

NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171

CUBIC CORP., 9233 Balboa Ave., San Diego, Cal., 92123, Tel: 714-277-6780, TWX: 714-279-0267; Mgr. Adv: J. Ringer; Sls. Mgr: T. Grady; V.P. Mktg: C.C. Wellborn

CUNNINGHAM, Sub. Gleason Works, 10 Carriage St., Honeoye Falls, N.Y., 14472, Tel: 716-624-2000; Switching Eqmpt: G.R. Appleton; CCTV Eqmpt: F.E. Schlesing ..... Vol 1•337; Vol 4•327-334•

Local Sales Offices & Reps.
Ala Huntsville, Gentry 205-534-9771
Cal Pasadena, Luscombe Engrg. Pasadena 213-684-2000
Cal San Mateo, Luscombe Engrg. San Francisco 415-342-7057
Colo Wheat Ridge, Technology Mktg. Assocs. 303-423-6106
Conn Hamden, Instr. Consits. 203-288-5246
Fla Orlando, Gentry Assocs. 305-894-4401
Ill Des Plaines, Cozzens & Cudahy 312-298-3600
Ind Indianapolis, Cozzens & Cudahy 317-244-2456
Md Bethesda, Bartlett 301-656-3061
Mass Waban, Instrument Consits., Inc. 617-969-9881
Minn Minneapolis, Cozzens & Cudahy 612-884-4336
Mo St. Louis, Cozzens & Cudahy 314-423-1234
NM Albuquerque, Tech. Mktg. Assocs. 505-298-4321
NY White Plains, Bartlett 914-949-6476
NC Burlington, Gentry 919-227-3639
Pa Wayne, Bartlett 215-688-7325
Tex Houston, Scien. Sls. 713-781-2711
Tex Richardson, Scien. Sls. 214-231-6541
Wash Seattle, Delcom Sls. Corp. 206-248-0090
For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

CURTIS DEV. & MFG., 3278 N. 33rd St., Milwaukee, Wisc., 53216, Tel: 414-445-1817, TWX: 910-262-3125; Sls. Mgr: R.K. Johnson ..... Vol 3•660,661

Local Sales Offices & Reps.
Cal Los Altos, Ewing-Foley, Inc. 415-941-4525
Cal Santa Fe Springs, Sls. Engrs. Ltd. 213-921-4337
Colo Boulder, Components Prods. Sls. Co. 303-444-2730
Fla Orlando, Buchanan & Abrams Assoc., Inc. 305-422-9005
Haw Honolulu, Dougherty Enterprises
Ill Downers Grove, Richmar Elctrn. Co. 312-968-0118
Ind Ft. Wayne, Val-Skol Sls., Inc. 219-742-9122
Ind Indianapolis, Val-Skol Sls., Inc. 317-926-5063
Md Lutherville-Timonium, Naudain Assocs. 301-252-5378
Mass Boston, Elec. Apparatus Co., Inc. 617-782-7440
Mich Farmington, Electro-Matic 313-851-6265
Minn St. Paul, Kenco 612-645-7717
NJ Mt. Laurel, Naudain Assoc. 609-235-1801
NY Great Neck, Cooper-Simon & Co., Inc. 516-487-1142
NY Kingston, Ossmann Comp. Sls. Corp. 914-338-5505
NY Rochester, Ossmann Comp. Sls. Corp. 716-442-3290
NY Syracuse, Ossmann Comp. Sls. Corp. 315-454-4477
NY Vestal, Ossmann Comp. Sls. Corp. 607-785-9949
NC Winston-Salem, L. G. White & Co., Inc. 919-725-3612
Ohio Cincinnati, Val-Skol Sls., Inc. 513-563-6790
Ohio Cleveland Hgts., Val-Skol Sls., Inc. 216-462-2822
Ohio Columbus, Val-Skol Sls., Inc. 614-291-4123
Okla Tulsa, T. J. Ray Co. 918-627-1515
Pa Pittsburgh, R.F. Clark Co. 412-242-9500
Tex Dallas, R. F. Kimball Co. 214-363-5431
Wash Seattle, C. B. Parsons & Co. 206-762-7373
Wisc Milwaukee, Curtis Dev. & Mfg. Co. 414-445-1817
For: Can., Willowdale, Ont., A. C. Simmonds & Sons, Ltd. 416-491-1010

CURTIS DEV. & MFG. Local Distributors
Ala Birmingham, MG Electric & Equip. Co., 3112 6th Ave. So. 205-328-4525
Cal Burlingame, Rose Elec. Distributing Co., 846 Stanton Rd. 415-697-0224
Cal Commerce, California Wholesale Elec. Co., 3237 S. Garfield Ave. 213-723-6711
Cal Garden Grove, Allied Elctrns., 12311 Industry St. 213-598-6605
Cal Los Angeles, Master Distrs., Box 25662 213-395-2637
Cal San Diego, A.E. Yale Enterprises, 4031 Pacific Hwy. 714-296-6148
Cal San Francisco, Plough Elec. Supply Co., 1155 Bryant St. 415-431-6300
Cal San Jose, Buckles-Smith Elect. Co., 885 Auzerais Ave. 408-294-8482
Cal Stockton, Valley Elec. Co., 945 E. Lindsay, Box 431 209-464-9474
Conn Bridgeport, Tower-Olschan Corp., 15 Dewey St. 203-367-7401
Conn Hartford, Electrical Supplies Inc., 3466 Main St. 203-527-7111
Fla Miami, Elctrn. Equip. Co., 2701 NW 42nd Ave. 305-871-3500
Fla Tampa, Leader Elctrncs. Dist., 3411 S. Dale Mabry Hwy.
Ga Dalton, Dick Henderson Ind'l. Equip., 441 N. Hamilton St., Box 773 404-279-8307
Ill Arlington Heights, S & R Corp., 2420 E. Oakton 312-593-2545
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Electro-Kinetics Inc., 4114 N. Nashville Ave. 312-286-4200
Ill Peoria, Klaus Radio & Elec. Co., 8400 N. Pioneer Pkwy 309-691-4840
Ill Rockford, Muntz Electric Supply Co., 1211 23rd Ave., Box 1028 815-968-8866
Ind Elkhart, Elkhart Supply, 1129 N. Nappanee 219-264-4156
Ind Evansville, Superior Elec. & Distrg. Co., 721 W. Franklin St., Box 3156 812-423-7838
Ind Indianapolis, Farrell-Argast Elec. Co., 6905 E. 32nd St. 317-546-5041
Ind Indianapolis, Peerless Elec. Supply Co., 1401 Stadium Dr. 317-635-2361
Ind Mishawaka, X-Cel Controls Inc., 1600 W. 6th St. 219-259-7804
Ind South Bend, Koontz-Wagner Elec. Co., 3801 Voorde Dr. 219-232-2051, Ext. 33
Ind Wabash, Wabash Elec. Supply, 1400 S. Wabash St. 219-563-4146
Iowa West Des Moines, Ramco Co., 1207 Maple St., Box 310 515-274-2548
La Lafayette, Ralph's Inc., 3004 Cameron St. 318-234-4507
Md Timonium, Earl B. Beach Co., 2003 Greenspring Dr. 301-252-5260
Mass Allston, Apparatus Service Co., 355 Everitt St. 617-787-1300
Mass Boston, Graybar Elec. Co., 345 Harrison Ave. 617-482-9320
Mass Cambridge, Brownell Electro Inc., 271 Vassar St. 617-864-7500
Mass Springfield, T.F. Cushing Inc., 1026 Bay St., Box 2049 413-788-7341
Mich Detroit, LaSalle Elec. Supply Co., 470 Brainard St. 313-831-0470
Mich Madison Heights, McNaughton-McKay Elec. Co., 1357 E. Lincoln Ave. 313-399-7500
Mich Marquette, NWR Elctrns. Corp., 1010 W. Washington St. 906-226-7578
Mich Muskegon, Fitzpatrick Elec. Supply Co., 444 Irwin Ave. 616-722-6621
Minn Minneapolis, Control Design, Inc., 3433 E. 25 St 612-721-1629
Minn Minneapolis, Harry Stark Electrns. Supply, 112 3rd Ave., N. 612-332-1325
Minn Minneapolis, J.E. Braas Co., 84 W. 78th St. 612-869-3246
Mo St. Louis, Butler Elec. Co., 5715 Elizabeth Ave. 314-647-5333
Mo St. Louis, Electric Controls Co., 2735 Mercantile Dr. 314-645-2400
Neb Omaha, Schneider Elec. & Equip. Co., 1102-08 Farnam St. 402-346-5500
NJ Edison, Pamco Elctrns. Inc., 146 U.S. Hwy. # 1 201-985-6950
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Buffalo, Wehle Elec. Co., 475 Ellicott St. 716-854-3270
NY New York, Knickerbocker Annunciator Co., 75 Murray St. 212-227-5306
NY Rochester, Masline Elctrncs., 511 Clinton Ave. S.
NY Scarsdale, Logicomp Elctrns. Inc., Box 37H 914-723-3334
NY Vestal, Wholesale Elec. Supply Co., Sycamore Rd. 607-729-1526
NC Greensboro, Hammond Elctrns. of Carolina, 2923 Pacific Ave. 919-275-6391
NC Greensboro, Maddux Supply, Box 6787 919-275-9603
NC Winston-Salem, Kirkman Elctrns., Inc., 901 W. Second St. 919-724-0541
Ohio Akron, Akron Elctrnc. Supply, 107 S. Arlington St.
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Cincinnati, Hughes-Peters, Inc., 4865 Duck Creek Rd. 513-351-2000
Ohio Cleveland, Gateway Megatech Inc., 30214 Lakeland Blvd. 216-944-8565
Ohio Cleveland, Milner Elec. Co., 1320 St. Clair Ave. 216-696-9300
Ohio Columbus, Basic Elec. Corp., 999 Kinnear Rd. 614-486-0621
Ohio Columbus, Mc Junkin Corp., Box 2119 614-294-3711
Ohio Cuyahoga Falls, The Willmott Elec. Co., 257 Huddleston Ave. 216-923-4821
Ohio Dayton, ESCO, 221 Crane St. 513-224-9192
Ohio Toledo, F.N. Cuthbert Inc., 2909 N. Detroit Ave. 419-242-7311
Ohio Toledo, Girkins Elec. Corp., 2056 Canton St. 419-243-9238
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Pa Yeadon, Earl B. Beach Co., 546 Penn St. 512-622-2210
Tenn Memphis, Brownell Electro Inc., 217 Cumberland Ave. 901-323-8554
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Houston, Altair Co., 6345 Beverly Hill 713-781-5300
Tex Odessa, Automation Engrg., 2310 Stevens Rd. 915-362-2596
Tex Richardson, Altair Co., 405 N. Plano Rd. 214-231-5166
Utah Salt Lake City, Bintz Co., W.H., 433 W. 3rd St
Va Richmond, Meridian Electrns., 1001 W. Broad St. 703-355-0669
Wash Seattle, Puget Electro Prods., 5319 Fourth Ave. S. 206-762-7373
WVa Beckley, Control Prods. Inc., Box 1087, Stanford Rd. 304-252-5378
Wisc Cedarburg, A.A. Electric Inc., 1220 Hwy. # 143,Box 322 414-377-8000
Wisc Menomonee Falls, Hydro-Electro Equip. Inc., 13740 W. Silver Spring Dr., Box 231 414-781-3015
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500
Wisc Milwaukee, Midwestern Elec. Co., 3801 N. 35th St. 414-871-9700
For: Can., Willowdale, Ont., A.C. Simmonds & Sons Ltd., 285 Yorkland Blvd. 416-491-1010

CURTIS INSTRS., INC., 200 Kisco Ave., Mt. Kisco, N.Y., 10549, Tel: 914-666-2971, TWX: 710-571-2163; Sls. Mgr: M. Eichenbaum ..... Vol 1•418

Local Sales Offices & Reps.
Ala Huntsville, Murphy & Cota 205-539-8476
Cal Long Beach, Cairns Engrg. Sls. Co. 213-432-7444
Cal Santa Clara, Richards Assocs. 408-246-5860
Colo Littleton, Aztec Entprs. 303-798-4573
Fla St. Peterburgh, Lynch-Gentry 813-347-5131
Ill Palatine, Butor Sls. 312-358-2988
Ind Ft. Wayne, McDonald Sls. Co. 219-745-9214
Md Timonium, Heller-Freedman Assoc. 301-252-4780
Mass Brookline, Harman Assocs. 617-232-6687
Minn Minneapolis, E.C. Elctrn. Sls. 612-831-0229
NM Albuquerque, Aztec Enterprises 505-255-2440
NY Greenvale, B. D. Aaron, Inc. 516-621-0630
NY Syracuse, Rep. Tech., Inc. 315-437-2845
NC Winston-Salem, Murphy & Cota 510-931-3101
Ore Portland, J. J. Backer 503-297-3776
Pa Media, W. Reeves Assocs., Inc. 215-LO-6-6709
Tex Dallas, Techno Assocs. 214-FL-7-9213
Wash Seattle, J.J. Backer Co. 206-285-1300
Wisc Milwaukee, Star Engrg. Co. 414-543-3469

CURTIS INSTRS. Local Distributors
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

CUSTOM COIL & TRANSFORMER CO., Box 2624, Zanesville, Ohio, 43701, Tel: 614-452-6973; Sls. Mgr: G. Mills; V.P. Engrg: D. Young

CUSTOM CONNECTOR CORP., 1738 E. 30th St., Cleveland, Ohio, 44114, Tel: 216-241-1679; Pres: J.R. Crosby; V.P: D.G. Harper

CUSTOM ELCTRNS., Browne St., Oneonta, N.Y., 13820, Tel: 607-432-3880, TWX: 510-241-8292; Gen. Mgr: Mr. W.P. Harris; Sls. Mgr: S. Vance; Sls. Mgr: D. Hathaway Vol 3•411

Local Sales Offices & Reps.
Cal Los Angeles, M.A. Stolaroff Co. 213-295-7781
Cal Santa Clara, Richards Ass. 408-246-5860
Ill Chicago, Rozner Sales 312-283-0022
Iowa Cedar Rapids, Seltec Sls. Corp. 319-362-8155
Mass Stow, Mosello Ass. 617-369-5900
Mo Grand View, L.R. Harry & Ass. 816-763-3634

Tex Dallas, Hillman Entprs. 214-827-4790
For: Can., Quebec, Villa La Salle 650, Electrodesign Ltd. 514-363-5120

CUSTOM ELCTRNS. Local Distributors
Tex Houston, Lenert Co., Box 2184 713-225-1465

CUSTOM SCI. INSTRS., INC., Box A, Whippany, N.J., 07981, Tel: 201-538-8500; Sls. Mgr: H.J. Bultman, Jr.

CUTLER-HAMMER, 4201 N. 27th St., Milwaukee, Wisc., 53216, Tel: 414-442-7800, TWX: 910-262-3089; Sls. Mgr: W.G. Cudlip

CUTLER-HAMMER Local Distributors
Cal Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way 213-685-5511
Cal San Diego, Hamilton/Avnet Corp., 5569 Kearny Villa Rd. 714-279-1550, 279-2421
Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ill Schiller Park, Hamilton-Avnet Elctrs., 3900 N. 25th Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Kans Prairie Village, Hamilton/Avnet Elctrncs., 3500 W. 75th St. 913-362-3250
Mich Livonia, Hamilton/Avnet Elctrns. 313-522-4700
Minn Minneapolis, Hamilton/Avnet Elctrns. 612-854-8400
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
NY Westbury, Hamilton-Avnet Electrns., 70 State St.
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tenn Nashville, Electra Distributing, 1914 W. End Ave. 615-329-3971
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wash Seattle, Kierulff - Seattle, 5940 6th Ave. S. 206-763-1550
Wisc Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave. 414-228-8100
For: Can., Montreal, Hamilton/Avnet Elctrns. 514-735-6393
For: Can., Ottawa, Ont., Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl.
For: Can., Toronto, Ont., Hamilton/Avnet Elctrns. 416-789-1838

CW INDUSTRIES, 550 Davisville Rd., Warminster, Pa., 18974, Tel: 215-355-7080, TWX: 510-667-1875; Sls. Mgrs. Switches: J. Purisky; Resistors: H. Cohen
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Local Sales Offices & Reps.
Cal Redwood City, W. Hickey Sls. 415-368-3849
Cal Van Nuys, Shephard Comps. 213-787-4610
Colo Denver, L.G. Moss 303-985-9815
Colo Greeley, G. Moss Elctrns. 303-353-1452
Fla St. Petersburg, Orbe 813-894-0687
Ill Chicago, G. Mcl Cole 312-774-3535
Ind Indpls., Southern Sls. 317-253-3359
Md Pikesville, J. Nichols 301-484-6376
Mass Needham, A & M Elctrn. Reps. 617-444-8170
Mich Dearborn, Pitcher Poulin 313-582-5450
Minn Minneapolis, E. Melius 612-854-4270
Miss Meridian, Herron Assoc. 601-483-9306
Mo St. Louis, E. Hill 314-621-1818
NJ Oaklyn, A. Wetterhahn 609-858-3003
NM Albuquerque, Electro Rep. 303-744-2821
NY Elmont, F.E. Schmitt 516-437-8150
NY Elmont, S.S. Egert 516-488-2255
NY Syracuse, W.A. Franklin Sls. Corp. 315-474-2954
NY Whitesboro, H. Lessman 315-736-5460
Ohio Cincinnati, H. Behrends 513-351-4441
Ohio Rocky River, G. Herrick 216-333-0333
Tex Dallas, Stasco 214-239-5054
Va Chesapeake, F.B.D. Sls. 703-484-3162
Wash Seattle, Carlyle Tech. 206-632-4290
Wisc Racine, L. Lucas 414-933-2733
Exp: N.Y., N.Y., Roburn Agencies 513-294-1648
For: Can., Weston, Ont., C. Pipe 416-249-1766

CW Local Distributors
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121

CYCLE-DYNE, INC., Sub. Axel Elctrns., Inc., 134-20 Jamaica Ave., Jamaica, N.Y., 11418, Tel: 212-AX-1-3907, TWX: 710-582-2618; Sls. Mgr: G. McCook; Appl. Mgr: N. Gagliardi; Sls. Correspdt: A.H. Fisher

CYCLO-TRONICS, INC., 3858 N. Cicero Ave., Chicago, Ill., 60641, Tel: 312-282-6141; Pres: D. Goldware

CYCON, INC., 1080E Duane Ave., Sunnyvale, Cal., 94086, Tel: 408-732-8311, TWX: 910-339-9216; V.P. Mktg: W. Peacock; Prod. Mktg. Mng: R. Solomon
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Local Sales Offices & Reps.
Ala Huntsville, South Central Mktg. 205-852-4600
Ariz Tempe, J. F. Hurlbut Co. 602-968-5962
Cal Culver City, De Angelo, Rothman & Co., Inc. 213-398-6239
Cal San Carlos, Elctrn. Engrg. Assoc. 415-593-2189
Colo Golden, J. F. Hurlbut Co. 303-279-7138
Conn Hamden, Instrument Consits. 203-248-4174
Fla Orlando, Truex Asso. 305-359-2160
Ill Des Plaines, Coombs Assoc. 312-298-4830
Mass Waban, Instrument Consits., Inc. 617-963-9881
Minn Minneapolis, Arjay Sls. 612-925-1833
Mo St. Louis, Coombs Assoc. 314-567-3657
NJ Wallington, Comp-Tech Sls. 201-935-5454
NY New Hyde Park, Comp-Tech Sls. 516-593-2628
NY Syracuse, T Elctrns. 315-463-8592
Ohio Cincinnati, R.O. Whitesell & Assocs., Inc. 513-521-2290
Ohio Cleveland, R.O. Whitesell & Assocs., Inc. 216-228-7525
Ohio Columbus, R.O. Whitesell & Assocs., Inc. 614-888-9396
Ohio Dayton, R.O. Whitesell & Assocs., Inc. 513-298-9546
Pa Abington, Bach-Stewart Assocs. 215-885-1550
Pa Pittsburgh, R.O. Whitesell & Assocs., Inc. 412-242-0100
Tenn Bristol, R.O. Whitesell & Assoc., Inc. 615-968-4195
Tex Dallas, McCoy Assocs. 214-352-9517
Tex Houston, Carter Assocs. 713-644-1307
Va Fairfax, Schibley 703-591-3008
Wash Seattle, Rush S. Drake Assoc. 206-763-2755
Exp: London, England, Rastra 01-748-31-43
Exp: Milano, Italy, Banto 639-751
Exp: Munchen, Germany, Neumuller, GmbH 0811-59-24-21
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DUNCAN ELCTRNS., 2865 Fairview Rd., Costa Mesa, Cal., 92626, Tel: 714-545-8261, TWX: 910-595-1128; Reg. Sls. Mgr: R.L. Rissler; Reg. Sls. Mgr: J. Laughlin Vol 3•1224,1225

Local Sales Offices & Reps.

Ariz	Phoenix, Southwest e/m Engrg., Inc.	602-944-1521
Cal	Costa Mesa, Duncan Elctrns., Inc.	714-545-8261
Cal	Glendora, The Telemart Co.	213-334-7119
Cal	San Mateo, Jack Pyle Co.	415-347-1401
Colo	Wheatridge, Waugaman Assocs., Inc.	303-423-1020
Conn	New Haven, Gerber Sls. Corp.	203-777-6279
Fla	Ft. Lauderdale, Orbe, Inc.	305-771-8915
Fla	Palm Beach Gardens, Orbe, Inc.	305-622-6464
Fla	St. Petersburg, Orbe, Inc.	813-894-0687
Ga	Atlanta, Grady Duckett Sls. Co.	404-451-3529
Ill	Chicago, Carlson Elctrn. Sls. Co.	312-774-0277
Md	Rockville, Marktron, Inc.	301-762-6210
Md	Towson, Marktron, Inc.	301-825-8222
Mass	East Longmeadow, Gerber Sls. Corp.	413-LA-5 -3059
Mass	Waltham, Gerber Sls. Corp.	617-890-8040
Mich	Detroit, Greiner Assocs., Inc.	313-499-0188
Minn	Minneapolis, J-Ex Elctrns. Sls. Co.	612-566-5340
Mo	St. Louis, Carlson Elctrn. Sls. Co.	314-991-0262
NJ	Irvington, Sencor, Inc.	201-371-6927
NY	Binghamton, Reed Elctrns., Inc.	607-722-7929
NY	Copiague, Sencor, Inc.	516-691-2204
NY	Rochester, Reed Elctrns., Inc.	716-473-2767
Ohio	Columbus, Rockford Controls Ohio, Inc.	614-231-5890
Ohio	Dayton, Rockford Controls Ohio, Inc.	513-278-7362
Ohio	Euclid, Rockford Controls Ohio, Inc.	216-731-5250
Okla	Tulsa, Kemp Engrg. Co. Inc.	918-628-0369
Pa	Erie, Rockford Control Ohio, Inc.	814-452-3762
Pa	Pa., Sencor, Inc.	215-342-0223
Tex	Dallas, Kemp Engrg. Co., Inc.	214-357-6663
Tex	Houston, Kemp Engrg. Co., Inc.	713-688-1431
Wash	Seattle, Carlyle Tech. Sls.	206-ME-2 -4290

DUNCAN Local Distributors

Cal	Garden Grove, Allied Elctrns., 12311 Industry St.	213-598-6605
Cal	Mountain View, Terminal Hudson Electrns., 880 Maude Ave.	415-969-9240
Cal	San Carlos, Sterling Electronics, 1061 Industrial Rd.	415-592-2353
Cal	Sun Valley, Richey Elctrn. Inc., 10871 La Tuna Canyon Rd.	213-875-2862
Fla	Miami, Lykes Elctrns. Corp., 1800 N.W. 23 St.	
Fla	Tampa, Lykes Elctrns Corp., 121 S. Ashley Dr.	813-229-1885
Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ill	Chicago, Bodelle Co., Inc., 13803 S. School St.	
Ind	Ft. Wayne, Bodelle Co., Inc., 3342 Terry La.	
Mass	Watertown, Sterling Electronics, 51 Spring St.	617-926-9720
Mich	Detroit, Bodelle Co., Inc., 20441 James Couzens Hwy.	
Minn	Minneapolis, Harry Stark Electrns. Supply, 112 3rd Ave., N.	612-332-1325
NJ	Clifton, Parts Master, 411 Main Ave.	
NJ	Perth Amboy, Sterling Elctrns., 774 Pfieffer Blvd.	
Ohio	Akron, Akron Elctrnc. Supply, 107 S. Arlington St.	
Ohio	Akron, Akron Elctrn. Supply, 107 S. Arlington St	216-762-8818
Ohio	Akron, Sun Radio Co., 110 E. Market St.	216-HE-4-2171
Ohio	Dayton, J. A. Becker Co., 1341 E. 4th St.	513-224-1071
Ohio	Warren, REM Elctrns. Supply Co., 264 W. Market St.	216-399-2777
Ohio	Warren, REM Elctrns. Supply Co., 264 W. Market St.	
Pa	Allentown, A.A. Peters, 404 Union Blvd.	
Pa	Braddock, M. Leff Radio Parts Co., 223 Braddock Ave.	
Pa	Erie, Mace Elctrn., 2631 W. 8th St.	814-838-3544
Tex	Ft. Worth, Allied Elctrns., 401 E. 8th St.	817-336-5401
Tex	Houston, Southwest Elctrns. Inc., 5700 Savoy La.	
Tex	Irving, Southwest Elctrns. Inc., 2005 Exeter	

Wash Seattle, Radar Electric Co., 168 Western Ave., W. 206-282-2511

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

DUNTON, M.W. CO., 350 Kinsley Ave., Providence, R.I., 02903, Tel: 401-331-3600; Sls. Mgr: J.J. Carter

DURA PLASTICS N.Y., INC., 49 Richmondville Ave., Westport, Conn., 06880, Tel: 203-227-9588; Sls. Mgr: J.F. Layman

DURANT DIGITAL INSTRS., Cutler Hammer Co., 901 S. 12th St., Watertown, Wisc., 53094, Tel: 414-261-4070, TWX: 910-260-3713; Sls. Mgr: H.L. Sisson ....Vol 2•335

Local Sales Offices & Reps.

Ala	Birmingham, J. Spader Inc.	205-879-1366
Cal	Belmont, Durant	415-592-5238
Cal	Los Angeles, Durant	213-876-4000
Colo	Denver, Vinson Assoc.	303-757-5151
Conn	Stamford, Durant	203-327-1750
Fla	Clearwater, H. Gross Inc.	813-446-6649
Ill	Chicago, Durant Co.	312-237-1222
Kans	Mission, Durant	913-262-2199
Md	Baltimore, Durant Co.	301-825-6626
Mass	Wakefield, Durant	617-246-0024
Mich	Detroit, Durant	313-535-3630
Minn	Minneapolis, Durant	612-926-0919
Mo	St. Louis, Durant	314-423-3431
NY	Rochester, Durant Co.	716-328-5700
NC	Charlotte, Durant	704-525-3149
Ohio	Cincinnati, Durant	513-531-5073
Ohio	Cleveland, Durant	216-464-8787
Ore	Beaverton, N.R. Schultz Co.	503-646-1345
Pa	Paoli, Durant	215-688-5055
Tex	Houston, Durant	713-528-4183
Wash	Bellevue, N. Schultz Co.	206-454-0300
Wisc	Watertown, Durant	414-261-4070
For:	Can. London, Ont., Wainbee	519-433-7881
For:	Can. Montreal, Que., Wainbee	514-636-4870
For:	Can. Toronto, Ont., Wainbee	416-248-5621
For:	Can., Vancouver, B.C., WainBee Ltd.	604-266-8351

DUTREX INDS., INC., 150 Fifth Ave., New York, N.Y., 10011, Tel: 212-989-5000; Sls. Mgr: H.H. Friedman

DYNA-MOD POWER PRODS., Box 152, Little Ferry, N.J., 07643, Tel: 201-440-9112; Mktg. Mgr: D. Western Vol 1•662,663

DYNACO, INC., 3060 Jefferson St., Philadelphia, Pa., 19106, Tel: 215-232-8000, TWX: 831-493; Dir. Mktg: F.D. Lintern

DYNACOR, Div. Vectrol, Inc., 1010 Westmore Ave., Rockville, Md., 20850, Tel: 301-424-6900; Pres: R. Vollmer; V.P: R. Mitchell

DYNAGE, 1331 Blue Hills Ave., Bloomfield, Conn., 06002, Tel: 203-243-0315, TWX: 710-425-6063; Sls. Mgr: J.A. Pfingsten; Applic. Engr: D. Poland; V.P: S. Oakleaf Vol 1•660

Local Sales Offices & Reps.

Ariz	Scottsdale, Meas. Consits.	602-946-7252
Cal	Burbank, Tech. Sources	213-849-6864
Cal	Palo Alto, Engrg. Assocs.	415-326-7842
Colo	Broomfield, Measurement Consits.	303-466-1402
Conn	Bloomfield, Dynage, Inc.	
Fla	Melbourne, Markasell Entprs.	305-727-0081
Ga	Atlanta, Electro-Mech Sls. Engrg. Co.	404-256-4414
Ill	Des Plaines, Control Sls.	312-296-5595
Mass	Norfolk, Dynage Regional Sls. Office	617-528-4477
Mich	St. Clair Shores, J. Thorpe	313-779-6363
Minn	St. Paul, Countryman Assoc.	612-645-9151
Mo	St. Charles, Cairns & Hayes Elec. Sls. Co.	314-946-6671
NM	Albuquerque, Measurement Consits.	505-344-3575
NY	Melville, Astrorep, Inc.	516-423-2266
NY	Rochester, Daner-Hayes	716-467-5100
Ohio	Dayton, Midwest Mktg.	513-433-2511
Pa	Paoli, Stitzer Assocs.	215-644-5500
Tex	Dallas, Merit Co.	214-352-8040
Va	Fairfax, Tom Davis Mkts.	703-591-7390

DYNAIR ELCTRNS. INC., 6360 Federal Blvd., San Diego, Calif., 92114, Tel: 714-582-9211, TWX: 910-335-2040; Sls. Mgr: D.A. Keller

DYNALAB CORP., 7808 Gloria Ave., Van Nuys, Cal., 91406, Tel: 213-781-3151; Sls. Mgr: M. Caston Vol 2•312

DYNAMIC CONTROLS CORP., 8 Nutmeg Rd., S. Windsor, Conn., 06074, Tel: 203-289-6807, TWX: 710-425-1994; Sls. Engr: R. Kowalski

Local Sales Offices & Reps.

Cal	Los Angeles, Ledbetter Assocs.	213-454-2421

DYNAMIC CONTROLS CORP., Power Supply Div., 8 Nutmeg Rd., So. Windsor, Conn., 06074, Tel: 203-289-6807, TWX: 710-425-1994; Gen. Mgr: B.. Mack; Engr: P. Zanini; Sales: J. Dutton .....Vol 1•661

Local Sales Offices & Reps.

Cal	Los Angeles, Ledbetter Assoc.	
Fla	Clearwater, W. Wimberly	813-446-7072
Fla	Orlando, W. Wimberly	305-425-3083
Mo	St. Louis, Zak & Assocs.	314-872-3191
NJ	Englewood, Andrews & Andrews Inc.	201-569-8800
NY	Huntington, Andrews & Andrews Inc.	516-692-8686
NY	Massapequa, C.B-Hopkins Co.	516-796-0066
NY	Syracuse, Reptech	315-437-2845
Ohio	Cleveland, Automated Equip. & Engrg.	216-371-5244
Pa	Pittsburgh, Automated Equip. & Engrg.	412-931-7616

DYNAMIC DATA CORP., 1183 Chesapeake Ave., Columbus, Ohio, 43212, Tel: 614-488-3189; Chief Ex. Officer: R. Arpino

DYNAMIC INSTR. CORP., 115 E. Bethpage Rd., Plainview, N.Y., 11803, Tel: 516-694-6000, TWX: 510-224-6482; Sales Mgr: J. Gildea Vol 1•665; Vol 2•639

Local Sales Offices & Reps.

Omni-Action Control Div. Reps

Ariz	Phoenix, Runyon Co.	602-959-6060
Ariz	Scottsdale, Runyon Co.	
Cal	Monrovia, Electro Mechanical Instrs.	213-358-1881
Conn	Bloomfield, Zaslow Sls. Co.	203-242-7781
Ill	Northfield, Such-Bohmer, Inc.	312-446-8934
Ind	Fort Wayne, TX Sls., Inc.	219-485-0805
Kans	Shawnee Mission, M. E. Bettis Co.	913-362-0772
Kans	Wichita, M. E. Bettis Co.	316-685-7441
Md	Baltimore, R. P. Luce & Co.	
Mass	Lowell, Zaslow Sls. Co.	617-458-8452
Mass	Northboro, Zaslow Sls. Co.	617-393-8150
Minn	Anoka, Such-Bohmer, Inc.	612-421-0751
Mo	St. Louis, M. E. Bettis Co.	314-429-2099
NJ	Berkeley Hgts., R. P. Luce & Co.	201-464-6440
NY	New Hyde Park, R. P. Luce & Co.	516-437-4550
NY	Plainview, O.E.M. Mectronix Sls.	516-293-1530
NY	Syracuse, Naylor Elec. Co.	315-472-9183
Pa	Philadelphia, R. P. Luce & Co.	215-884-8365
Tex	Dallas, E. B. Robertson, Inc.	214-942-2711
Tex	Houston, E. B. Robertson, Inc.	785-6800
For:	Can., Ottawa, Ont., Orion Elctrns.	613-746-3100

Power Conversion Prods. Div. Reps

Cal	Burlingame, J. Logan & Assocs.	415-697-6100
Cal	Pasadena, Electro-Mechanical Instrs.	213-681-2748
Cal	Sunnyvale, (Export) IMAI Mktg. Assocs.	408-245-3511
Colo	Arvada, Arrowhead Sls.	303-423-5556
Colo	Broomfield, Arrowhead Sls. Corp.	
Colo	Denver, Arrowhead Sls. Corp.	303-222-6462
Conn	Bloomfield, Zaslow Sls. Co.	203-242-7781
Fla	Maitland, Hutto, Hawkins & Peregoy	305-831-2474
Ga	Atlanta, Millar Elctrns.	404-261-6160
Ill	Oakbrook, Whitmore Assocs.	312-325-4727
Minn	St. Paul, H. A. Cullen & Assocs.	612-646-7371
NY	Plainview, O.E.M. Mectronix Sls.	516-293-1530
NY	Syracuse, Naylor Elec. Co.	315-GR-2-9183
Ohio	Englewood, Ad-El-Tek Co.	513-836-2741
Tex	Dallas, E. B. Robertson	214-942-2711
For:	Can., Downsview, Ont., Zaslow Sls. Co.	416-633-5068

DYNAMIC MEASUREMENTS CORP., 6 Lowell Ave., Winchester, Ma., 01890, Tel: 617-729-7870; V.P. Mktg: K.M. Corbett; Pres: C.M. Hayward

DYNAMICS ELCTRNC. PRODS., INC., 12117 E. Slauson Ave., Santa Fe Springs, Cal., 90670, Tel: 213-945-2493; AM D.E. Cantrell; Oper Mgr D.E. Cantrell Vol 2•310,311

Local Sales Offices & Reps.

Ariz	Scottsdale, J. Smith & Assocs.	602-943-4131
Cal	Palo Alto, Egbert Engrg. Assocs.	415-326-1387
Cal	San Diego, L. L. Stoakes, Inc.	714-274-6281
Colo	Boulder, J. Smith & Assocs.	303-449-7509
Ill	Chicago, P. Lind Elctrns.	312-774-1246
Kans	Lenexa, P. Lind Elctrns.	317-547-9178
Md	Wheaton, K - G Elctrns., Inc.	301-946-4055
Mass	Bedford, Webb Assocs.	617-275-8310
Mich	Detroit, S. Sterling Co.	313-255-1970
Minn	Circle Pines, P. Lind Elctrns.	612-786-5770
Mo	St. Louis, S. Sterling Co.	314-567-3636
NM	Albuquerque, J. Smith & Assocs.	505-255-2111
NY	Great Neck, RDI R. Diamond, Inc.	516-482-8387
Ohio	Cleveland, S. Sterling Co.	216-442-8080
Ohio	Dayton, S. Sterling Co.	513-298-7573
Pa	Pittsburgh, S. Sterling Co.	412-922-5720
Wash	Bellevue, Topp Engrg. Sls. Corp.	206-747-5401

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

DYNAPAR CORP., 1675 Delany Rd., Gurnee, Ill., 60031, Tel: 312-662-2666; Sls. Mgr: J. Appelgren

Local Sales Offices & Reps.

NJ	Westfield, Dynapar Corp.	201-654-3111
Ohio	Willowick, Dynapar Corp.	216-944-9616

DYNASCAN CORP., 1801 W. Belle Plaine Ave., Chicago, Ill., 60613, Tel: 312-327-7270; Adv. Mgr: J. Passini; Mktg. Mgr: M. Bond; Off. Mgr: C. Annella ..... Vol 1•400,401

DYNASCAN Local Distributors

Cal	Goleta, Radio Prods. Sls., 350 S. Kellogg Ave	805-964-6823
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Minn	Duluth, Northwest Radio, 123 E. First St.	218-727-1565
Minn	Minneapolis, Elctrn Center Inc., 127 3rd Ave. N.	612-338-5881
Pa	Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave	
Tenn	Nashville, Electra Distributing, 1914 W. End Ave.	615-329-3971

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

DYNISCO, 20 S. West Pk., Westwood, Mass., 02090, Tel: 617-326-8210; V.P. Mktg. Mgr: R.T. Carrara; Natl. Sls. Mgr: A.R. Firenze

Local Sales Offices & Reps.

Cal	Long Beach, E. Kirk Engrg. Co.	213-439-9559
Cal	Sunnyvale, Industrial Mktg. Assocs.	408-245-3431
Conn	Newtown, D. Hayes Inc.	203-426-9094
Fla	Palm Beach Gardens, Beacon Elctrn. Assocs. Inc.	305-622-2770
Ga	Atlanta, Beacon Elctrn. Assocs. Inc.	404-351-3654
Ill	Park Ridge, Electrical Materials & Equip. Co.	312-696-1540
Kans	Shawnee Mission, Florence & Meyer Inc.	913-722-5210
Mass	Newton Centre, D. Hayes Inc.	617-969-4650
Minn	Minneapolis, Automated Controls Inc.	612-377-7727
Mo	St. Louis, Florence & Meyer	314-423-7200
NJ	Englewood, Tridon Sls. Co.	201-569-8011
NY	Rochester, D. Hayes Inc.	
Ohio	Cincinnati, Schlemmer Assocs.	513-522-8340
Ohio	Cleveland, Orr Assocs.	216-885-1324
Pa	Jenkintown, PDC Corp.	215-887-9610
Pa	Pittsburgh, Gilson Engrg. Sls.	412-931-6114
SC	Spartanburg, Beacon Elctrn. Assocs. Inc.	803-582-4613
Tex	Arlington, D. Dawson Co.	817-265-6426
Utah	Salt Lake City, Applied Engrg. Prods. Co.	801-582-4942

DYTRO CORP., 63 Tec St., Hicksville, N.Y., 11801, Tel: 516-822-2130, TWX: 710-593-4135; Sls. Mgr: F. Braley Vol 1•342

Local Sales Offices & Reps.

Cal	No. Hollywood, Crown Elctrns.	213-877-3550
Mass	Waltham, Instr., Control & Meas.	617-891-8059
Mich	Detroit, H. Teplitz	313-537-9058
NY	Bronx, Bradley	212-KI-9-8500
Ohio	Cleveland, Teplitz	216-371-2044
Ohio	Dayton, H. Teplitz	513-277-6531
SC	Columbia, J.L.H. Electrodynamics, Inc.	803-772-4856
Tex	Houston, Leeco	713-649-7727
Tex	Richardson, Leeco	214-231-7696

DYTRONICS CO., 4800 Evanswood Dr., Columbus, Ohio, 43229, Tel: 614-885-3303; Sls. Mgr: P.A. Ryan Vol 1•422

Local Sales Offices & Reps.

Instrument Div.

Cal	Downey, Wieler	213-861-2534
Fla	Ft. Lauderdale, Beacon Elctrn.	305-622-2770
Fla	Maitland, Beacon Elctrn.	305-647-3498
Ga	Atlanta, Beacon Elctrn.	404-351-3654
Ill	Des Plaines, Marsland Assoc.	312-775-1309
Ind	Indpls., Marsland	317-924-3568
Minn	Mpls., Marsland	612-545-4481
Mo	St. Louis, Marsland	314-278-6949
NJ	Englewood, Central	201-568-0808
NY	Buffalo, Angus Instr.	716-835-0223
NY	New York, J. Plasencia	212-867-8084
NY	Plainview, Central	516-433-0808
Tex	Dallas, Airep Elctrns.	214-363-5291

Industrial Div.

Ala	Huntsville, Tech. Sls.	205-881-1750

Cal Costa Mesa, Robinson Tech. Assoc. 714-557-1622
Cal San Mateo, Dayton Assocs., Inc. (Instrumentation only) 415-347-9419
Colo Wheatridge (Denver), Tech. Mktg. Assoc. 303-423-6106
Fla Orlando, MacKay, Smith & Assoc. (Ind'l. only) 305-277-1513
Ill Des Plaines, S. Sterling Co. 312-298-8454
Ind Indianapolis, Meas. Instr. Inc. 317-631-0909
Kans Lenexa, S. Sterling Co. 913-888-2995
Ky Paducak, Lynn McGuffey Co.
La Shreveport, A.R. Johnson & Assocs. 318-865-1511
Mass Wellesley, Meas. Instr. Inc. 617-235-4577
Mich Marquette, N.W.R. Elctrn. Corp. 906-226-7578
Mich Plymouth, Meas. Instr. Inc. 313-352-2144
Minn Minneapolis, Automated Svcs. Corp. 612-929-1118
Mo St. Louis, S. Sterling Co. 314-567-3636
NM Albuquerque, Tech. Mktg. Assoc. 505-298-4321
NC Charlotte, MacKay Smith & Assoc. (Ind'l. only) 704-527-0240
Ohio Columbus, Meas. Instrs. 614-488-9753
Pa Monroeville (Pitts), Meas. Instr. 412-366-1906
Tex Houston, Lynn McGuffy Co. 713-464-2761
Va Arlington, Gans-Fryling, Inc. (Ind'l. & Instrumentation) 703-527-3262
Wash Seattle, J. B. Jolly, Inc. (Ind'l. & Instrumentation) 206-938-4166

DZUS FASTENER CO., INC., 425 Union Blvd., West Islip, N.Y., 11795, Tel: 516-669-0494, TWX: 96 1454; Dir. Mktg: G.M. Blaney; Bus. Mgr: V. Barth; Des. Engr: P. Schenk

E-H RESCH. LABS., INC., Dept. A., 515 11th St., Oakland, Cal., 94604, Tel: 415-834-3030, Ext. 353, TWX: 910-366-7258; Sls. Mgr: D. Carney

Local Sales Offices & Reps.
Ala Huntsville, BCS Assocs. 205-881-6220
Ariz Phoenix, Hytronic Meas. 602-253-6104
Cal Oakland, E-H Research Labs. 415-834-3030
Colo Denver, Hytronic Meas., Inc. 303-388-4081
Conn W. Hartford, Instr. Dynamics 203-233-5503
Fla Orlando, BCS Assocs. 305-843-1510
Ill Chicago, Carter Elctrns. 312-585-5485
Md Baltimore, E-H Research Labs. 301-532-7400
Md Silver Spgs., Brimberg
Mass Wakefield, Instr. Dynamics 617-245-5100
Minn Mpls., Carter Elctrns. 612-544-9393
Mo St. Louis, Carter Elctrns. 314-731-2237
NJ Camden, QED Elctrns.
NJ Union, SBM Assocs. 201-687-8737
NM Albuquerque, Hytronic Meas. 505-268-3941
NY Pleasantville, SBM Assocs. 914-769-1811
NY Rochester, SBM Assocs. 716-381-8330
NC Greensboro, BCS Assocs. 919-273-1918
Ohio Cleveland, WKM Assocs. 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Ore Portland, McLaren-Topp 503-297-2248
Pa Pittsburgh, WKM Assocs. 412-892-2953
Tex Dallas, Data Mktg. 214-358-4643
Tex Houston, Data Mktg. 713-686-9627
Wash Bellevue, McLaren-Topp 206-746-5750
Wisc Milwaukee, Carter Elctrns.

E & M LABORATORIES, INC., 5388 Sterling Ctr. Dr., Westlake Village, Cal., 91361, Tel: 213-889-1470, TWX: 910-494-1953; Sls. Mgr: M.K. Elliott; Export Sls. Mgr: C.C. Carnegie

Local Sales Offices & Reps.
Ala Huntsville, Southeastern Comp. Sls. 813-531-8324
Ariz Tempe, Jarko Assocs. 602-966-3020
Cal Menlo Park, Straube Assoc. 415-323-2476
Cal Westlake Village, 3 DBM, Inc. 213-889-2300
Colo Wheatridge, TMA, Inc. 303-423-6106
Fla Orlando, Southeastern Comp. Sls. 813-531-8324
Ill Park Ridge, RF Specialists 312-698-2044
Ind Indianapolis, R.F. Specialists 317-783-7630
NJ Englewood, Central Assocs., Inc. 201-568-0808
NJ Pennsauken, Megargel/Himmelstein Assoc. 215-629-1072
NJ Pennsauken, Megargel/Himmelstein Assoc. 609-662-3081
NM Albuquerque, TMA, Inc. 505-298-4321
NY No. Syracuse, Naco Elctrns. 315-699-2651
NY Plainview, Central Assocs., Inc. 516-433-0808
NY Rochester, NACO Elctrns. 716-223-4490
NY Utica, Naco Elctrns. Corp. 315-732-1801
Okla Oklahoma City, Airep Elctrns. EN-1795
Tex Dallas , Airep Elctrns. 214-363-5291
Tex Houston, Airep Electronics EN-1795
Wash Seattle, Datacom Assoc. 206-329-2989
For: Can., Quebec, Microwave Tech. 514-334-9140

E-SYSTEMS INC., Garland Div., Box 6118, Dallas, Tex., 75222, Tel: 214-BR-6-7111, TWX: 214-276-8576; A.M: D. Dirks

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Cal San Jose, Grosken, Inc. 408-293-3108
Md Lutherville-Timonium, Naudain Assocs. 301-252-5378
NJ Mount Laurel, Naudain Assocs. 609-235-1801, 215-564-3194
NJ Nutley, I. Brill 201-667-0653
Tex Houston, Texas Special Elctrn. Comps. 713-666-5871

ELECTRONIC LABORATORY SUPPLY, 7208 Germantown Ave., Philadelphia, Pa., 19119, Tel: 215-248-2700 .....Vol 2•596

ELCTRN. MEAS. INC., 405 Essex Rd., Neptune, N.J., 07753, Tel: 201-922-9300; Sls. Mgr. R.J. Hill Vol 1•673-675

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Ariz Scottsdale, Williams-Assocs. 602-947-4297
Cal Sunnyvale, RDP Insts. Inc. 408-735-9040
Cal Van Nuys, Gordon-Elliot Inc. 213-873-6862
Colo Denver, Williams-Assocs. 303-343-2911
Conn Hamden, Applied Measurements 203-288-5288
Fla Fort Lauderdale, W. A. Brown 305-564-8000
Fla Fort Walton Beach, W. A. Brown 904-243-6426
Fla Orlando, W. A. Brown 305-425-5505
Ga Tucker, W. A. Brown 404-939-1674
Haw Honolulu, Aloha Assocs. 808-941-1574
Ill Des Plaines, Marsland Assocs. 312-298-2620
Ind Indianapolis, Marsland Assocs. 317-924-3568
La Gretna, W. A. Brown 504-367-4971
Md Rockville, Farrell Assoc. 301-424-9460
Mass Acton, Applied Measurements 617-263-2766
Mich Royal Oak, The Satullo Co. 313-549-3910
Minn Mpls., Marsland Assocs. 612-545-4481
Mo St. Peters, Marsland Assocs. 314-278-6949
NJ Hackensack, SJS Assoc. 201-488-2444
NM Albuquerque, Williams Assocs. 505-255-1638
NY E. Syracuse, Ossmann Instr. 315-437-6666
NY Rochester, Ossmann Instr. 716-328-2230
NY Vestal, Ossmann Instr. 607-785-9947
NC Research Triangle Park, W.A. Brown Instrs. 919-489-1546
NC Winston-Salem, W.A. Brown Instrs. 919-768-3600
Ohio Cleveland, Satullo Co. 216-486-2800
Ohio Dayton, The Sautullo Co.
Pa Melrose Park, RBT Meyers Assoc. 215-224-1663

ELCTRN. MEMORIES, 12621 Chadron Blvd., Hawthorne, Cal., 90252, Tel: 213-644-9881, TWX: 910-325-6213; Dir. Mktg. Comm. Prod: P. Harding; Dir. Mktg. Mil. Prod: D. Knutson

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Mass Wellesley, EMM 617-237-4800
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Minn Minneapolis, EMM 612-941-1843
Mo Clayton, EMM 314-863-0015
NJ Saddle Brook, EMM 201-845-0450
Ohio Cleveland, EMM 216-884-1980
Pa Pittsburgh, EMM 412-921-1221
Tenn Memphis, EMM 901-362-9180
Tex Dallas, EMM 214-243-2374
Tex Houston, EMM 713-626-3592
Va Annandale, EMM 703-941-2100
Wash Seattle, EMM 206-623-1477

ELECTRONIC MODULES, INC., 2500 E. Foothill Blvd., Pasadena, Cal., 91107, Tel: 213-795-4231; App. Eng: A. Anderson

ELCTRN. MOLDING CORP., 88 Mill St., Woonsocket, R.I., 02895, Tel: 800-556-6969, 401-769-3800, TWX: 710-387-1350; V.P: J. Murphy; Sls. Mgr: I. Dulude; V.P. Mktg: A. Klepper .....Vol 3•666

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Cal Gardena, Compar, Coron Corp. 213-327-6550
Conn Hamden, Compar, N.E. 203-288-9276
Fla Orlando, G.F. Bohman Assocs. 305-855-0274
Mass Newton Highlands, Compar, New England 617-969-7140
NY Plainview, R. Smith Assocs. 516-681-3155
NC Thomasville, Powertronics, Inc. 919-476-6727
SC Greenville, Powertronics, Inc. 803-244-1336

Tex Richardson, Semiconductor Sls. Assoc. 214-231-6181

ELCTRN. MOLDING Local Distributors
Tex Houston, Lenert Co., Box 2184 713-225-1465

ELCTRN. NAVIGATION INDS., INC., 3000 Winton Rd. S, Rochester, N.Y., 14623, Tel: 716-473-6900; Sls: L.M. Salmen ..... Vol 2•314

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Ala Huntsville, Scientific Devices 205-536-1969
Ariz Scottsdale, Williams Assocs. 602-947-4297
Cal Burbank, OMNIA 213-843-7240
Cal Portola Valley, Kipp Assocs. 415-851-0123
Colo Denver, Williams Assocs. 303-388-4391
Fla Orlando, Scientific Devices 305-424-6792
Ill Chicago, Carter Elctrns. 312-585-5485
Ind Indianapolis, Carter Elctrns. 317-293-0696
Md Silver Springs, Gawler-Knoop Co. 301-589-4406
Mass So. Chelmsford, Independent Mktg. Rep. 617-256-8251
Mich Ferndale, Tiby Co. 313-547-3550
Minn Minneapolis, Carter Elctrns. 612-544-9393
Mo Hazelwood, Carter Elctrns. 314-731-2237
NM Albuquerque, Williams Assocs. 505-255-1638
NY Greenvale, B. D. Aaron & Co. 516-621-0630
NC Burlington, Scientific Devices 919-584-8311
Ohio Cleveland, Tiby Co. 216-371-5335
Pa Newtown Sq., SWR Assocs. 215-356-8550
Tex Richardson, Lear Assocs. 214-231-5388
Wash Seattle, Underwood & Underwood 206-243-2133
Wisc Milwaukee, Carter Elctrns. 414-464-5555

ELCTRN. PRECISION COMPS., 11 W. Sandford Blvd., Mt. Vernon, N.Y., 10550, Tel: 914-664-2333; Pres: D.R. Edwards; Sls. Mgr: J.V. Daughtrey

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Mass Burlington, Burlington Sls., Inc. 617-272-7655
NJ Nutley, I. Brill 201-667-0653

ELECTRONIC RESCH. ASSOCS., 311 E. Park St., Moonachie, N.J., 07074, Tel: 201-641-3650, TWX: 710-994-5789; Sls. Mgr: P. Greco

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Cal Whittier, DeAngelo, Rothman & Co. 213-945-2341
Colo Denver, Telemetry Sls. Corp. 303-424-5574
Ill Park Ridge, R. F. Specialists 312-698-2044
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Mass Canton, New England Elctrn. Sls. 617-828-4935
Mo St. Louis, Ensco-Rep 314-567-3935
NJ Cherry Hill, Stemler Assoc., Inc. 609-966-4070
NM Albuquerque, Telemetry Sls. Corp. 505-266-7861
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NY Plainview, R. Smith Assocs. 516-681-3155
NY Spring Valley, R. Smith Assocs. 914-352-1067
Pa Paoli, Stemler Assoc., Inc. 215-644-3477
Tex Dallas, E. B. Robertson, Inc. 214-942-2711
Va Alexandria, Stemler 703-548-7818

ELECTRONIC RESEARCH CO., Div. Textron, Inc., Box 913, Shawnee Mission, Kan., 66202, Tel: 913-631-6700, TWX: 910-749-6477; Sls. Mgr: G.J. Dehnert, Freq. Con. Prods. Sls. Mgr: R.L. Rush, Instrs.; Sls. Mgr., Digital Prod: C.S. Cech ..... Vol 1•430,431; Vol 2•405

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Frequency Control Prods. Div.
Cal Menlo Park, J. S. Heaton Co. 415-369-4671
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Fla Clearwater, Dyne-A-Mark 813-446-3229
Fla Pompano Beach, Dyne-A-Mark 305-942-5870
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Ky Fort Mitchell, G. W. Thelen Co. 606-341-8181
Mass Norwood, S Pierce, Inc. 617-762-3164
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NY New Hyde Park, Comp-Tech Sls. 516-593-2628
NY Rochester, H. R. Murray 716-244-1100
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Ind Indianapolis, Couchman-Conant 317-849-9890
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Mo Kansas City, Production Automation 913-236-6600
Mo St. Louis, Production Automation 314-426-2331
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NY Latham, L-Tron Corp. 518-785-5032
NY Tonawanda, L-Tron Corp. 716-691-8887
NC Winston-Salem, Radco Co. 919-722-9671
Ohio Aurora, EMA, Inc. 216-562-6104
Ohio Centerville, EMA, Inc. 513-433-2800
Pa Abington, Powell-Pendergraph 215-657-0330
Tex Houston, Palatine Engrg. 713-777-4477
Tex Richardson, Palatine Engrg. 214-231-9489
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For: Can., Ottawa, Ont., Whittaker Elctrns. 613-224-1221
For: Can., Roxboro, Que., Whittaker Elctrns. 514-683-3621
For: Can., W Vancouver, B.C., Whittaker Elctrns. 604-926-3411

ELCTRN. SEALS, 13766 Saticoy St., Van Nuys, Cal., 91402, Tel: 213-873-4982; Sls. Mgr: H. Adelman

ELECTRONIC SPECIALTY DIV., Datron System, 18900 N.E. Sandy Blvd., Portland, Ore, 97220, Tel: 503-665-0121, TWX: 910-469-8782; Relay Prod. Mgr: R. Lisdero ..... Vol 2•724-729

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Ill Hinsdale, J. O. Allyn 312-325-0495
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Minn St. Paul, Countryman Assoc. 612-645-9151
Mo St. Louis, Engrg. Srvc. 314-726-2233
NY Smithtown, TX Sales 516-979-8750
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NY Syracuse, C. W. Floring 315-478-2140
Ohio Dayton, Berberich Assoc. 513-252-9981
Pa Broomall, L. D. Lowery 215-356-5300
Pa Harrisburg, L. D. Lowery 717-233-0917
Tex Dallas, R. R. Thomas 214-363-8591
Wash Bellevue, H. Thorp Co. 206-454-0667
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ELECTRONS CO., Unit of General Signal Corp., 65 Passaic Ave., Fairfield, N.J., 07006, Tel: 201-227-3830; V.P. Sls: D.J. Hall; Sls./Svc: Mrs. J. Yost

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Colo Denver, Gaer Sls. 303-758-3223
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Fla Gulf Breeze, Whitman Assoc. 904-932-5670
Fla Jacksonville, Whitman Assoc. 904-354-5985
Fla Tampa, Whitman Assoc. 813-877-6091
Ga Atlanta, Whitman Assocs. 404-521-0977
Ill Chicago, Weldy-Lamont Assoc., Inc. 312-777-8575
Ky Covington, Hackman Electrical Sls. Co. 606-291-3800
La New Orleans, Southern Mfg. Rep., Inc. 504-944-7484
Md Baltimore, A. L. Daniels 301-752-0982
Mass West Roxbury, Northeast Mfrs. Assocs. 617-325-3252
Mich Royal Oak, Continental Products Co. 313-546-4520
Mo St. Louis, H. J. Weisler & Assoc. 314-428-3934
Mont Missoula, Pacific Western Agencies 406-543-5296
NJ Old Bridge, R. W. Duffy & Assocs. 201-721-1756
NC Charlotte, Whitman Assoc. 704-334-4776
NC Raleigh, Whitman Assoc. 919-787-2437
Ore Portland, Pacific Western Agencies 503-228-7261
Pa Pittsburgh, Brown Elec. Equip. Co. 412-563-4444
SC Columbia, George W. Greene Agency 803-252-3032
Tenn Knoxville, Whitman Assoc. 614-687-3578
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Va Roanoke, Whitman Assoc. 703-774-6029
Va Va. Beach, Whitman Assoc. 703-428-8717
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Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521

ELECTROSPACE SYSTEMS INC., Box 1359, Richardson, Tex., 75080, Tel: 214-231-9303, TWX: 910-867-4768; Sls. Mgr: B.H. Gardner

ELECTROSTATICS, INC., 7718 Clairemont Mesa Blvd., San Diego, CA, 92111, Tel: 714-279-1414; Sls. Mgr: R.D. McCartney ..... Vol 1•676

ELECTROVERT, 86 Hartford Ave., Mt. Vernon, N.Y., 10553, Tel: 914-664-6090; Dir. Tech. Info: F.J. Farrell; Chf. Eng: H. Tawil; Tech. Dir: P.J. Bud

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Cal Glendale, Tooltronics, Inc. 213-240-4000
Cal Los Angeles, K. Anderson Co. 213-268-6771
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Cal Saratoga, Enterprise Engrg. Reps 408-255-7272
Colo Boulder, Mile High Elctrns. 303-444-5615
Colo Boulder, Straube Assoc. 303-443-8600
Colo Denver, B. T. Clark Inc. 303-623-2011
Fla Clearwater, H. R. Gross & Co. 813-446-6649
Fla Maitland, Rowe Engrg. Sls. 305-894-2700
Ga Atlanta, Hopper & McCoy 404-872-5802
Ga Atlanta, J. Spears Assoc. 404-237-4531
Haw Makaha, Pacific Mktg. Assoc. 696-3283
Ill Chicago, Cumming & Foley Sls. Co. 312-725-8110
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Ill Northlake, Electrovert, Inc. 312-562-1700
Ind Indianapolis, Central States Machinery Co. 317-923-5433
Ind Indianapolis, Phillips Sls. of Ind. 317-547-5291
Iowa Cedar Rapids, A. Sell & Assoc. 319-393-3225
Ky Louisville, Phillips Sls. of Ky. 502-459-0796
Md Bethesda, ARA Elctrns. Inc. 301-657-2585
Mass Newtonville, Edcom, Inc. 617-969-9710
Mass Norwood, JMG, Inc. 617-762-5333
Mich Grosse Point Park, J. L. Miner Assoc. 313-886-5878
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Mich Southfield, M. A. Percival Co. 313-356-5710
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NY Guiderland, Solder Pot 518-355-1829
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Tex Irving, Electrovert, Inc. 214-255-1516

Tex Richardson, P. J. Scanlon Co. 214-231-4661
Utah Salt Lake City, Straube Assoc. 801-328-4513
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Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401

ELGAR CORP., 8159 Engineer Rd., San Diego, Cal., 92111, Tel: 714-565-1155, TWX: 910-335-1246; V.P. Mktg: R.H. Wheelock; Chief Applications Engr: W.E. Foy .....Vol 1•677

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Cal Santa Clara, Ward/Davis Assocs. 408-246-9202
Colo Denver, Barnhill 303-934-5505
Conn Hamden, P. Jenks Assocs., Inc. 203-281-0810
Fla Orlando, BCS 305-896-4881
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Ohio Dayton, Carter, McCormic & Peirce 513-278-5873
Ohio Worthington, Carter, McCormic & Peirce, Inc. 614-888-4466
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Tex Richardson, Barnhill 214-231-2573
Wash Bellevue, Brennan 206-454-9332
Exp: San Diego, Elgar 714-565-1155

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Conn Glastonbury, Instrs. Reps., Inc. 203-633-0777
DC Washington, R. Davies Assoc. 301-937-2215
Fla Orlando, Lee Assocs. 305-843-6200
Ga Chamblee, Lee Assocs. 404-457-7117
Md Silver Spg., R. Davies Assoc. 301-937-2215
Mass Arlington, Instrs. Reps. 617-861-8620
NM Albuquerque, Tech. Mktg. Assoc. 505-298-4321
NY Great Neck, H. Krasner Assoc. 516-487-0690
NC Raleigh, Lee Assocs. 919-787-5818
Pa Newtown Square, Holdsworth & Co. 215-EL-6-8550

ELGIN ELCTRNS. INC., Sub. Basic, Inc., Walnut St., Waterford, Pa., 16441, Tel: 814-796-2601, TWX: 510-699-6859; Sls. Mgr: L.C. Stuller

ELIN DIV., California Instrs. Co., Div. of Aiken Ind., 5150 Convoy St., San Diego, Cal., 92111, Tel: 714-279-8620; Prod. Appl. Eng: W.W. Hanford

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Ariz Scottsdale, Williams Associates, Inc. 602-947-4297
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Cal Los Angeles, T. Louis Snitzer Co. 213-836-6170
Colo Denver, Williams Associates, Inc. 303-343-2911
Fla Orlando, Currie Aerospace 305-855-0843
Haw Honolulu, Aloha Associates 808-941-1574
Ill Chicago, Megatek, Inc. 312-889-1277
Iowa Cedar Rapids, Palatine Engrg. Sls. Co. 319-365-8071
Kans Andover, Palatine Engrg. Sls. Co. 316-683-7512
Kans Overland Pk., Palatine Engrg. Sls. Co. 913-262-5643
La Baton Rouge, SESCO 504-927-7574
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Minn Minneapolis, Megatek, Inc. 612-925-4242
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NJ Fairfield, KLS Assocs. 201-227-2900
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NM Albuquerque, Williams Associates, Inc. 505-255-1638
NY Depew, Labtronics, Inc. 716-685-4111
NY Endicott, Labtronics, Inc. 607-748-0509
NY Syracuse, Labtronics 315-454-9314
NY Ulster Pk., Labtronics, Inc. 914-883-6279
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Ohio Cleveland, Hocker Assocs. 216-734-4433
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Pa Mt. Penn, Mer-Mon (2M) Electr. Instrum. 215-779-1640
Tex Houston, SESCO 713-668-7840
Tex Richardson, SESCO 214-231-9364
Va Annandale, Nine Assocs. 703-256-9105

ELMWOOD SENSORS, INC., 1655 Elmwood Ave., Cranston, R.I., 02907, Tel: 401-781-6500, TWX: 710-381-6413; VP Sls: A.W. Cannon .....Vol 2•1161

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Fla	Orlando, Hammond Electrns., 911 W. Central Blvd.	305-241-6601
Fla	Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way	305-859-1450
Fla	Tampa, Hammond Elctrns. Inc., 1516 Cypress St.	813-253-0104
Ga	Atlanta, Specialty Distributing, 763 Juniper St. N.W.	404-873-2521
Ill	Chicago, Allied Radio Corp., 2400 W. Lake St.	312-421-2400
Ill	Chicago, Burstein-Applebee	312-763-4848
Ill	Chicago, Newark Elctrns, 500 N. Pulaski Rd.	312-638-4411
Ill	Peoria, Klaus Radio & Elec. Co., 8400 N. Pioneer Pkwy	309-691-4840
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ind	Indianapolis, Graham Elctrncs., 133 S. Penn. St.	317-634-8480
Iowa	Cedar Rapids, Deeco, Inc., 2500 16th Ave. S.W.	319-365-7551
Kans	Kansas City, Burstein-Applebee	816-561-5460
Kans	Wichita, Radio Supply Co., 115 Laura	316-267-5216
La	Metairie, Ind'l Distrs. Inc., 710 Papworth Ave.	504-835-7281
Md	Baltimore, ASI Elctrn./Astrex, 1728 Whitehead Rd.	301-265-5100
Md	Beltsville, Powell Elctrns/Washington, 10728 Hanna St.	301-937-4030
Md	Rockville, Pioneer/Washington, 1037 Taft St.	301-427-3300
Mass	Dedham, Gerber Elctrn., 852 Providence Hwy	617-329-2400
Mich	Detroit, RS Elctrns., 12775 Lyndon St.	313-491-1000
Mich	Grand Rapids, Stotts-Friedman, 2035 Eastern Ave. S.E.	616-241-6731
Miss	Columbus, Bluff City Distrg. Co., 116 S. 22nd St., Box 2186	601-328-6212
Miss	Greenville, Bluff City Distrg. Co., Box 5606	601-334-4412
Miss	St. Paul, Gopher Elctrn. Co., 2520 W. Larpenteur Ave.	612-645-0889
Miss	Tupelo, Bluff City Distrg. Co., 210 S. Glaster	601-842-6832
Mo	Kansas City, Burstein Applebee	816-561-5460
Mo	No. Kansas City, LCOMP-Kan City, 1520 Taney St.	910-221-2400
Mo	St. Ann, Interstate Ind Elctrn, 10525 St. Charles Rock Rd	314-428-8522
Mo	St. Louis, Olive Ind'l Elctrns., 6662 Olive Blvd.	314-863-7800
Neb	Lincoln, Burstein Applebee	402-434-0678
NJ	So. Plainfield, Brownell-Electro Inc., 500 Hadley Rd. & Durham Ave	201-753-4600
NM	Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E.	505-247-1055
NY	Buffalo, Summit Dist. Inc., 916 Main St.	716-884-3450
NY	Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110	516-694-6800
NY	New York, Brownell Electro Inc., 85 10th Ave.	212-924-6000
NY	New York, Roburn Agencies Inc., 509-N.W. W. 14th St.	212-989-5939
NY	Rochester, Summit Dtstrs., 292 Commerce Dr.	716-884-3450
NC	Charlotte, Dixie Radio, 2220 Tryon St.	704-377-5413
Ohio	Cincinnati, Hughes-Peters, Inc., 4865 Duck Creek Rd.	513-351-2000
Ohio	Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St.	216587-3600
Ohio	Columbus, Hughes-Peters, Inc., 481 E. 11th Ave.	614-294-5351
Okla	Tulsa, Oil Capitol Elec., 708 S. Sheridan	918-836-2541
Ore	Portland, Eoff Elec. Co., 509-N.E. 10th Ave.	503-222-9411
Pa	Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave	215-365-1900
Pa	Pittsburgh, RPC Elctrns., 620 Alpha Dr.	412-782-3770
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	
SC	Columbia, Dixie Radio Supply, Box 408	803-253-5333
Tenn	Memphis, Bluff City Distr. Co., Box 418, 234 East St.	901-725-9500
Tenn	Nashville, Electra Distributing, 1914 W. End Ave.	615-329-3971
Tex	Dallas, Texas Instrs. Supply, 6000 Denton Dr.	214-238-6850
Tex	Ft. Worth, Allied Elctrns., 401 E. 8th St.	817-336-5401
Tex	Houston, Solid State Elctrns./Tex., 6400 Westpark Dr.	713-785-5205
Tex	Houston, Texas Instrs. Supply, 3939 Ann Arbor Dr.	713-785-4800
Va	Charlottesville, Piedmont Elec. Supply, 1150 Rose Hill Dr.	703-296-6167
Wash	Seattle, Sterling Electronics, 5608 6th Ave., S.	206-762-9100
Wisc	Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd.	414-545-6500
Wisc	Milwaukee, Parts Mart, 1314 N. 7th St.	414-276-4160

ESSEX INTERNATIONAL, Stemco Controls, Box 1007, Mansfield, Ohio, 44903, Tel: 419-884-1311; Prod. Mgr: J. Shoughnessy; Prod. Mgr: Mel Deerdorf

ESSEX, STEMCO Local Distributors

Colo	Denver, Burstein-Applebee	303-244-3336
Ill	Chicago, Burstein-Applebee	312-763-4848
Kans	Kansas City, Burstein-Applebee	816-561-5460
Mo	Kansas City, Burstein Applebee	816-561-5460
Mo	St. Ann, Interstate Ind Elctrn, 10525 St. Charles Rock Rd	314-428-8522
Neb	Lincoln, Burstein Applebee	402-434-0678

ESTERLINE ANGUS DIV., Esterline Corp., Box 24000, Indianapolis, Ind., 46224, Tel: 317-244-7611; Dig. Prod. Mgr: R. Moore; Servo. Prod. Mgr: P. Peek; Direct Writing Mgr: B. Relick ..... Vol 1•538,539

Local Sales Offices & Reps.

Ala	Birmingham, J. Spader Co.	205-879-1366
Ariz	Scottsdale, BFA Corp. of Ariz.	602-946-4215
Ark	Little Rock, Electra-Tech Midsouth	501-562-4090
Cal	City of Industry, Esterline Angus	213-330-1621
Cal	Hayward, Esterline Angus	415-785-8232
Colo	Denver, C. Beabout Co.	303-244-3151
Fla	Orlando, Datarep, Inc.	305-855-8945
Fla	Pompano Beach, Datarep, Inc.	305-781-9279
Ga	Woodstock, James Spader Co.	404-428-0366
Haw	Honolulu, Berkley Eng. & Equip. Co.	808-538-1921
Ill	Elmhurst, Esterline Angus	312-833-4410
Ind	Indianapolis, C.D. Arnold Co.	317-546-4053
Iowa	Cedar Rapids, H. E. Ferris Co.	319-362-9156
Iowa	Des Moines, H.E. Ferris Co.	515-255-5008
La	New Orleans, Mid-South Sls. Co.	504-822-3030
Mass	Holliston, Esterline Angus	617-235-5343
Mich	Berkley, G.R. Peters Assocs.	313-564-6325
Mich	Marquette, NWR Elctrns.	906-226-7578
Minn	Minneapolis, Elec. Jobbers	612-377-7904
Minn	Virginia, NWR Elctrns.	218-741-5080
Mo	Crestwood, C. B. Fall Co.	314-968-3850
NJ	Lodi, Esterline Angus	201-471-0084
NM	Albuquerque, BFA Corp. of Ariz.	505-296-8303
NM	Las Cruces, BFA Corp. of Ariz.	505-523-0601
NY	Buffalo, R.F. Lamb Co.	716-874-4900
NY	Kingston, R.F. Lamb Co.	914-338-8833
NY	Rochester, R. F. Lamb Co.	716-544-5580
NY	Syracuse, R.F. Lamb Co.	315-454-2469
NC	Charlotte, Ranson, Wallace & Co.	704-334-4244
Ohio	Brecksville, Waldrip, Blankenburg & Co.	216-526-1100
Ohio	Cincinnati, Beedle Equip. Co.	513-793-0140
Okla	Oklahoma City, Kennedy Engrg.	405-524-6048
Ore	Portland, McLaren, Inc.	503-297-2248
Pa	Jenkintown, Esterline Angus	215-887-2268
Pa	Pittsburgh, Bollinger & Richards	412-LO-1-2340
Tenn	Knoxville, G.W. Massey Co.	615-577-9553
Tex	Borger, Kennedy Engrg.	806-273-2871
Tex	Euless, Data Aids Assocs.	817-268-3505
Tex	Houston, Data Aids Assocs.	713-785-0581
Va	Fairfax, Hildenbrand Co.	703-280-2330
Wash	Bellevue, McLaren Inc.	206-454-3400
WVa	Charleston, Vynock Engr. Co.	304-722-3525
Wisc	Milwaukee, T. R. Bickler Assocs.	414-453-3772
For:	Can., Burnaby 2, B.C., Ahearn & Soper, Ltd.	604-291-0214
For:	Can., Calgary, Alberta, Showalter Agencies Ltd.	403-269-6411
For:	Can., Montreal, Que., Instro-Test, Ltd.	514-637-1231
For:	Can., Toronto, Ont., Ahearn & Soper, Ltd.	416-789-4325

ESTERLINE Local Distributors

Pa	Reading, Barbey Elctrn., 333 N. 4th St.	

ESTES ENGRG. CO., 543 West 184th St., Gardena, Calif., 90248, Tel: 213-321-9811; Sls. Mgr: S. Estes

ETC, DIV. ITT, 990 East 67 St., Cleveland, Ohio, 44103, Tel: 216-HE-2-0855, TWX: 810-421-8264; Sls. Mgr: F. Hoyle, Jr. ..... Vol 3•664,665

Local Sales Offices & Reps.

Ariz	Phoenix, Toward Engrg. Assoc.	602-955-3193
Ark	Hot Springs, M. Young	501-262-1365
Cal	Anaheim, Lodan South	714-956-1560
Cal	San Carlos, Lo-Dan Inc.	415-592-4600
Colo	Denver, Camel Elctrns.	303-757-6191
Conn	W Simsbury, Anchor Engrg.	203-658-6261
Fla	Pompano Beach, CBC, Inc.	305-782-0804
Ga	Roswell, E. Rushin Co.	404-993-6498
Ill	Chicago, A. J. Ellis	312-262-2708
Iowa	Cedar Rapids, J. Vrbik	319-377-8244
Kans	Leawood, Thunderbird Tech. Sls. & Svcs.	913-642-7220
Kans	Wichita, Thunderbird Tech. Sls.	316-684-3941
Ky	Louisville, B. T. Clark & Assoc. (GE accounts only)	502-425-0746
Mass	Wellesley Hills, Anchor Engrg.	617-235-6330
Mich	Detroit, R. C. Merchant & Co.	313-535-6000
Minn	Hopkins, Grayden & Flemmer	612-941-1120
Mo	St. Louis, Thunderbird Tech. Sls.	314-567-6488
NY	Mount Vernon, Friedman-Smith Sls.	914-664-4866
NY	Rochester, L. Marchese	716-342-7664
Ohio	Cleveland	216-432-0855
Ore	Beaverton, ES/Chase Co.	503-649-6177
Pa	Harrisburg, A. Rados	215-LO-3-4415
Pa	Pittsburgh, C. Dibble	412-391-3149
Tex	Irving, AID Elctrns.	214-259-4761
Va	Roanoke, J. Ramsey	703-362-9749
Wash	Edmonds, ES/Chase Co.	206-774-3586
Wisc	Milwaukee, Devoz-Prinz	414-272-0356

ETC, Local Distributors

Ariz	Phoenix, Faspeco, 2935 McDowell Rd.	602-273-0460
Ariz	Phoenix, Liberty Electrns., 3612 N. 16th St.	602-264-4438
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	San Carlos, Advance Electrical Sls., 850 Montgomery La., Box 516	415-591-9651

Cal Sun Valley, Richey Elctrn. Inc., 10871 La Tuna Canyon Rd. 213-875-2862
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Colo Denver, Acacia Sales Inc., 785 S. Jason St. 303-744-6356
Fla Miami, Florida Aviation Corp., Box 235 Miami Int'l Airport 305-887-7571
Ill Chicago, Hyland Elec. Supply Co., 623 W. Monroe St. 312-263-4100
Iowa Cedar Rapids, Jerry Vrbik Co., 3 - 50th St., N.E. 319-377-8244
Mass Wellesley Hills, In-Stock Products Co., 40 Washington St. 617-235-6549
Mich Detroit, RS Elctrns., 12775 Lyndon St. 313-491-1000
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Mich Troy, Terminal Supply Co., 500 Oliver St. 313-689-4200
Minn Minneapolis, Berquist Co., 4350 W. 78th St. 612-925-2322
Mo Creve Coeur, Coron Corp., 2260 Grissom Rd. 314-432-3444
NJ Jersey City, Cuny-Guerber, Inc., 3468 Kennedy Blvd 201-227-7722
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NM Albuquerque, Industrial Elctrns, Inc., 310 Val Verde S.E. 505-266-8721
NY Binghamton, Wilshire Elctrns., 617 Main St., Westover Plaza 607-797-1236
NY Plainview, Progress Elctrns, Inc., 205 Express St. 516-433-1700
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Rome, Rome Elctrncs., 108-110 Spring St. 315-337-5400
NC Charlotte, J. O. King, Inc., 3300 A Cessna Rd. 704-527-0054
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Menter, Menter Elec. Co., 7444 Tyler Blvd. 216 946-8950
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Erie, Erie Corporate Contractors, 1968 Buffalo Rd. 814-455-8110
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Tex Dallas, National Precision Prods., 10549 Denton Dr. 214-357-3921
Tex Houston, Altair Co., 6345 Beverly Hill 713-781-5300
Tex Houston, Houston Elec. Distr. Co., 1609 Velasco St. 713-224-4771
Tex Houston, Nappco Fastners, 11260 Hempstead Hwy.. 713-688-2521
Tex Richardson, Altair Co., 405 N. Plano Rd. 214-231-5166
Utah Salt Lake City, S & H Terminals, Inc., 323 W. 1410 South 801-484-7649
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
WVa Beckley, Halley Elctrns, 713 S. Oakwood Ave. 304-253-2561

EUBANKS ENGRG., 225 W. Duarte Rd., Monrovia, Calif., 91016, Tel: 213-358-4531; Sls. Mgr: N.C. Sallemi

Local Sales Offices & Reps.
Ala Huntsville, Powertronics, Inc. 205-852-6347
Cal Glendale, Tool Tronics, Inc.
Cal Los Angeles, IFM, Inc. 213-851-5641
Cal Mountain View, Charles Morse 415-960-7722
Cal Mountain View, Tool Tronics, Inc. 415-967-5305
Cal Pasadena, O.E.M. Sls. Co. 213-796-9937
Colo Denver, Y. W. Strong & Assocs., Inc. 303-292-6900
Conn Bridgeport, Technical Instrs., Inc. 203-368-4582
Fla Titusville, Powertronics, Inc. 305-267-5699
Ill Lake Forest, Marsland Distributing Corp. 312-295-1616
Md Bethesda, Ara Elctrns. Inc. 301-657-2585
Mass Wilmington, Technical Instrs., Inc. 617-944-3930
Mich Detroit, Electro Entprs., Inc. 313-521-1500*2
Minn Minneapolis, Production Automation Corp. 612-866-5700
Mo Kansas City, Production Automation Corp. 913-236-6600
Mo St. Louis, Production Automation Corp. 314-426-2331
NJ Livingston, Argo Engrg. Co. 201-992-4367
NY Spring Valley, Salit Assocs. 914-352-4443
NY Syracuse, Maloney Sls. Co. 315-488-3440
NC Raleigh, Powertronics, Inc. 919-787-9090
NC Thomasville, Powertronics, Inc. 919-476-6727
Ohio Cleveland, Electro Entprs., Inc. 216-261-7670
Ohio Dayton, Electro Entprs., Inc. 513-426-6071
Ore Portland, Vandy, Inc. 503-292-8633
Pa Glenside, Ara Elctrns. Inc. 215-887-5250
Pa Pittsburgh, Electro Entprs., Inc. 412-371-8497
Tex Dallas, Sivright Co. 214-357-6681
Wash Seattle, Vandy, Inc. 206-789-3300
For: Can., Thornhill, Ontario, Robert Neill Co. 416-889-9971

EVANS, GEORGE CORP., 121-37th St., Moline, Ill., 61265, Tel: 309-762-9456; Sls. Mgr: H.C. Easter Vol 3•1045

EVAPORATED COATINGS, INC., 798 Welsh Rd., Huntingdon Valley, Pa., 19006, Tel: 215-WI-7-1465; Sls. Mgr: C.H. Barto; Business Mgr: R. Schaffer

EWALD INSTRS. CORP., Rte. 7R, Kent, Conn., 06757, Tel: 203-927-3278; Sls. Mgr: M.K. Ewald

EWC, INC., 725 Federal Ave., Kenilworth, N.J., 07033, Tel: 201-245-3200, TWX: 710 996 5993; Sls. Mgr: D.E. Mac Millan

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Local Sales Offices & Reps.
Ala Huntsville, BCS Assoc. 205-881-6220
Ariz Phoenix, PLS Assocs., Inc. 602-947-9110
Cal Newport Beach, Feeger, Lucas, Wolfe 714-540-4412
Cal N. Hollywood, Feeger, Lucas, Wolfe 213-877-5518
Cal Palo Alto, Coherent Mktg. Assocs. 415-327-2217
Cal San Diego, Feeger, Lucas, Wolfe 714-277-0993
Colo Denver, PLS Assocs., Inc. 303-771-0140
Conn Hamden, P Jenks Assocs. 203-281-0810
Fla Orlando, BCS Assocs. 305-896-4881
Ill Chicago, Pivan Engrg. 312-539-4838
Ind Indianapolis, Pivan Engrg. 317-253-1681
Kans Shawnee Misson, Pivan Engrg. 913-722-1030
Md Kensington, Elec. Mktg. Assoc. 301-881-5300
Mass Wakefield, P Jenks Assocs. 617-246-1590
Mich Farmington, Carter-McCormic & Pierce 313-477-7700
Minn Minneapolis, Pivan Engrg. 612-537-4501
Mo Manchester, Pivan Engrg. 314-227-3501
NM Albuquerque, PLS Assocs., Inc. 505-255-2330
NY Great Neck, Meas. Tech. 516-482-3500
NY New Hartford, KLM Assoc. 315-735-8525
NY North Syracuse, KLM Assoc. 315-458-6214
NY Rochester, KLM Assocs. 716-442-0820
NC Greensboro, BCS Assoc. 919-273-1918
Ohio Cleveland, Carter-McCormic & Pierce 216-333-5650
Ohio Dayton, Carter-McCormic & Pierce 513-278-5873
Ohio Worthington, Carter, McCormic and Peirce Inc. 614-888-4466, 4469
Pa King of Prussia, Elec. Mktg. Assoc. 215-265-1600
Pa Pittsburgh, Carter-McCormic & Pierce 412-824-3760
Tex Houston, Barnhill Assoc. 713-621-0040
Tex Richardson, Barnhill Assocs. 214-231-2573
Utah Salt Lake City, PLS Assocs., Inc. 801-272-3681
Wash Seattle, Hayes Technical 206-763-2210
Wisc Brookfield, Pivan Engrg. 414-786-1940

EXCEL SPECIALTY CORP., 6335 N. Broadway, Chicago, Ill., 60660, Tel: 312-262-4781; Sls. Mgr: M. Bank

EXECUTONE, INC., 29-10 Thomson Ave., Long Island City, N.Y., 11101, Tel: 212-392-4800, TWX: 710-582-2610; V.P. Mktg. & Sls: H. Hellering

F-DYNE ELCTRNS., 449 Howard Ave., Bridgeport, Conn., 06605, Tel: 203-367-6431; Ch. Eng: A. Horne; Sls. Mgr: M. Koenigsberg ..... Vol 3•442-444

Local Sales Offices & Reps.
Ariz Scottsdale, S. C. Blaker Co. 602-948-3061
Ark Hot Springs, M. Young 501-262-1365
Cal Redwood City, Parks & Pruitt 415-364-1640
Colo Denver, Walter Engrg. 303-777-5585
Conn Wethersfield, Con/Pak 203-563-4784
Del Wilmington, T. Davis Marketeers 302-998-0123
Fla Maitland, Ellis & Assocs. 305-645-1101
Ill Northfield, Pretat & Travis 312-441-6055
Ind Indianapolis, Electric Sls. & Engrg. 317-251-7245
Kans Shawnee, J. Guernsey Co. 913-631-2414
Mass Needham, Com/Pak 617-444-1259
Mich St. Clair Shores, J. M. Thorpe Co. 313-779-6363
Minn Mpls., Int'l. Sls. Co. 612-881-6683
NY Hempstead, Kahgan Sls. 516-538-2300
NY Syracuse, Naylor Elec. 315-472-9183
NC Greensboro, L & D, Inc. 919-292-3201
Ohio Cleveland, Marlow Assocs. 216-381-4500
Tex Dallas, J. A. Green Co. 214-631-7450
Va Fairfax, T. Davis Marketeers 703-591-7390
For: Can., Don Mills, Ontario, B. D. Vallillee Elctrns. 416-447-8482

F-DYNE Local Distributors
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500

FABRI-TEK, INC., 5901 S County Rd. #18, Minneapolis, Minn., 55436, Tel: 612-935-8811, TWX: 910-576-2913; Dir. of End User Sls: K. Geason; Dir. of OEM Sls: G. Larsen

FABRI-TEK, INC., Memory Products Div, 5901 S. County Rd. 18, Minneapolis, Minn., 55436, Tel: 612-935-8811, TWX: 910-576-2403; Sls. Mgr: G. Larsen

FABRICAST, INC., 2517 Seaman Ave., So. El Monte, Cal., 91733, Tel: 213-443-3247; Pres: H.P. Wood; V.P: T. Elam ..... Vol 2•642-644

Local Sales Offices & Reps.
Wash Seattle, J.J. Backer Co. 206-283-6470

FACIT-ADDO, INC., 501 Winsor Dr., Secaucus, N.J., 07094, Tel: 201-866-5111, TWX: 710-992-8927; Sls. Mgr: T. Jahn

FAIR-RITE PRODS. CORP., Wallkill, N.Y., 12589, Tel: 914-895-2055, TWX: 510-249-4819; Pres: R.G. Parker Vol 3•1008

Local Sales Offices & Reps.
Cal City of Industry, Micrometals 213-968-4718
Colo Denver, A-G Electronics 303-759-4790
Conn W Hartford, R. S. Pettigrew & Assoc. 203-233-8533
Fla Maitland, J Barrett 305-678-0172
Ill Palestine, Fair-Rite Prod. 618-586-2556
NJ Summit, H Delaney 201-673-7660
Ohio Cincinnati, F. J. Campisano & Assoc. 513-662-1616
Tex Dallas, Stasco 214-239-5054
Va Roanoke, A. B. Kreger & Assoc. 703-345-7011
Wash Seattle, J. Bergford & Assoc. 206-937-6664

FAIRCHILD SEMICONDUCTOR COMPS. GRP., Div. Fairchild Camera & Instr. Corp., 464 Ellis Street, Mountain View, Cal., 94040, Tel: 415-962-5011

FAIRCHILD SEMICONDUCTOR Local Distributors
Ala Huntsville, Hall-Mark Elctrns., Box 1133 205-539-0691
Ariz Phoenix, Liberty Electrns., 3612 N. 16th St. 602-264-4438
Cal El Segundo, Liberty Elctrns., 124 Maryland St. 213-322-8100
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Fla Orlando, Hall-Mark Elctrn., 7233 Lake Ellenor Dr. 305-855-4020
Ill Chicago, Semiconductor Specialists, Inc. 312-279-1000
NC Raleigh, Hall-Mark Elctrns., 3000 Indust. Dr. 919-832-4465
Okla Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave. 918-835-8458

Pa Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave 215-365-1900
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200

FAIRCHILD SOUND EQUIP., Sub. Robins Inds., 75 Austin Blvd., Commack, N.Y., 11725, Tel: 516-543-5200; V.P. Engrg: G. Alexandrovich, Sr.; Sls. Mgr: R.C. Belmont

Local Sales Offices & Reps.
Ala Birmingham, Adams & Assocs., Inc. 205-822-8109
Cal Oakland, Hank Gabriel 415-465-5361
Colo Westminster, Electro-Tek Sls., Inc.
Fla Tampa, Repelect 813-227-5051
Ga Decatur, Adams & Assocs., Inc. 404-981-2207
Haw Honolulu, Gene Piety Factors, Inc. 808-839-9059
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Mich Detroit, Robert Milsk Co. 313-342-6660
Minn Minneapolis, Clark R. Gibb Co. 612-377-1200
Mo Kansas City, K & W Assocs. 816-358-5240
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Local Sales Offices & Reps.
Ala Huntsville, Int'l. Scien. 205-837-1601
Cal Sherman Oaks, Windsor Dynamics 213-989-3631
Cal Woodside, Windsor Dynamics 415-854-4870
Fla Orlando, Truex Assoc. 305-859-2160
Ill Des Plaines, S. Sterling Co. 312-298-8545
Md Rockville, Marktron Inc. 301-762-6210
Mass Newton Highlands, Compar New England 617-969-7140
Mich Ferndale, Tiby Co. 313-547-3550
Mo St. Louis, S. Sterling Co. 314-542-3636
NJ Englewood, Scien. Devices-East 201-871-3916
NY Rochester, Ossmann Comps. 716-442-3290
NC Winston Salem, Int'l. Scien. 919-722-1783
Ohio Cleveland, Tiby Co. 216-371-5335
Pa Glenside, Elcom Inc. 215-885-1325
Tex Houston, R. Martin Assocs. 713-462-4077
Wash Renton, S. Wilson Co. 206-226-0650
Exp: New York, New York, Henley Electronics 212-986-5544

FREQUENCY ENGRG. LABS., Div. Harvard Inds., Inc., Box 527, Farmingdale, N.J., 07727, Tel: 201-938-9221, TWX: 201-938-2456; Sls. Mgr: S.C. Bucher; Prod. Mktg. Mgr: J. Silance

Local Sales Offices & Reps.
Cal San Francisco, Frequency Engrg. Labs 415-327-3633
Tex Ft. Worth, C. Wolf Co. 817-738-1702
Tex Houston, C. Wolf Co. 713-643-2114
Tex Universal City, C. Wolf 512-658-6672

FREQUENCY SOURCES, 166 Middlesex St., No. Chelmsford, Mass., 01863, Tel: 617-251-8747, TWX: 710-343-6506; Sls. Mgr: P.K. Butler

Local Sales Offices & Reps.
Ala Huntsville, FM Assocs. 205-536-9990
Ariz Phoenix, Thorson Co. 602-264-5878
Cal Los Angeles, The Thorson Co. 213-937-0790
Cal Sunnyvale, Waldman Assoc. 408-245-2500
Colo Denver, The Thorson Co. 303-355-3521
Fla Orlando, Currie Aerospace 305-855-0843
Ill Chicago, Techrep, Inc. 312-761-6548
Ind Ft. Wayne, Tx Sls. 219-485-0805
Md Ellicott City, VPI, Inc. 301-465-4060
Mass Weymouth, O'Sullivan Elctrn. Sls. 617-337-3134
Mo Shawnee, John F. Guernsey 913-631-2414
NM Albuquerque, The Thorson Co. 505-265-5655
NY Tuckahoe, Spectrum Sls. 914-793-1660
NY Utica, B.D. Hummel 315-732-2370
NC Greensboro, FM Assocs. 919-294-2754
Tex Dallas, The Thorson Co. 214-233-5744

FREUDENBERG, B., INC., 50 Rockefeller Plaza, New York, N.Y., 10020, Tel: 212-757-9130; Sls. Mgr: W.J. Leonhardt

Local Sales Offices & Reps.
Cal Pasadena, C. Harrison & Assocs. 213-798-0913

FRIEND'S MFG., Rd. 2, Box 74, Williamstown, N.J., 08094, Tel: 609-629-7919; Sls. Mgr: F. Friend

JUNCTION MODULES, INC., 2441 Campus Dr., Irvine, Cal., 92664, Tel: 714-833-8314, TWX: 910-595-1706; Mktg. Mgr: G. Osgood; V.P: T. Cate

FURNAS ELEC. CO., 1197 McKee St., Batavia, Ill., 60510, Tel: 312-879-3410, TWX: 720-458; Mgr. Adv. & PR: C. Witschonke

FUSION SYSTEMS CORP., 12111 Parklawn Dr., Rockville, Md., 20852, Tel: 301-881-5934; Mktg: M. Greenblatt; Engr: M.G. Ury

GABRIEL ELCTRNS. INC., Box 626, Scarborough Ind'l. Pk., Scarborough, Me., 04074, Tel: 207-883-5161; Sls. Mgr., Bell Sys. Accounts: D.B. Crisman; Sls. Mgr., Commercial Accounts: R. McCallum

GAERTNER SCIENTIFIC CORP., 1261A Wrightwood Ave., Chicago, Ill., 60614, Tel: 312-281-5335; Sls. Mgr: E.G. Watson

GAF CORP., 140 W. 51 St., New York, N.Y., 10020, Tel: 212-582-7600, TWX: 212-640-5088; Dir. Mkt. Indl. Prods: F.T. Campagna; Prod. Mgr., Micrographic Prods., Office Sys. Div: S. Tytel

GAGNE ASSOCS., INC., 1080 Chenago St., Dept. 3EE-27, Binghamton, N.Y., 13901, Tel: 607-723-9556; Pres: A.F. Gagne; V/P Sls: J.W. Cady; Sls. Mgr: J. Edwards

GAMBLE, CHARLES T. INDS., New Jersey Ave. & Fairview St., Riverside, N.J., 08075, Tel: 609-461-1900; Pres: C.T. Gamble; V.P: T. Gamble ....Vol 3•1142,1143

Local Sales Offices & Reps.

Cal	Escondido, Andrews Elctrn. Sls.	714-747-3015
Cal	Los Angeles, Penwarden Entprs.	213-785-0773
Fla	Orlando, G. Bohman Assoc.	305-855-0274
Mass	Norwood, JMG Assoc.	617-762-5333
Mich	Detroit, Rathsburg Assocs.	313-882-1717
Okla	Tulsa, Vista Assoc.	918-627-7557
Tex	Richardson, Vista Assoc.	214-235-4547

GAMMA SCI., Dept. 301, 3777 Ruffin Rd., San Diego, Cal., 92123, Tel: 714-279-8034; Applications Engr: G.C. Unangst

Local Sales Offices & Reps.

Ariz	Phoenix, Griot Assocs.	602-275-4991
Cal	El Segundo, Griot Assocs.	213-322-8383
Cal	Los Altos, Griot Assocs.	415-941-2533
Cal	Tustin, Griot Assocs.	714-838-2330
DC	Washington, D.C., Eastern Instrumentation Corp.	301-839-3800
Fla	Winter Park, McMahan Assocs.	305-645-0463
Ill	Chicago, Brooks Engrg.	312-944-1227
Mass	Sudbury, DLG Assocs.	617-877-7880
NJ	Summit, Eastern Metro Assocs.	201-277-2226
NY	Plainview, Eastern Metro Assocs.	516-931-1414
Pa	Elkins Park, Snow Assocs.	215-379-4700
Tex	Plano, Optical Services Co.	214-231-9171
Wash	Bellevue, Griot Assocs.	206-454-8592

GAP INSTR. CORP., 110 Marcus Blvd., Hauppauge, N.Y., 11787, Tel: 516-273-0909, TWX: 510-227-6237; Exec. V-P: W.P. Soboleski

Local Sales Offices & Reps.

Cal	Gardena, Compar/Coron	213-327-6550
Fla	Clearwater, Brennan Assocs., Inc.	813-466-5006
Md	Simpsonville, A/O Elctrns.	301-531-6700
Mass	Attleboro, Electronic Sls. of New England	617-222-4078
Minn	Anoka, A & R Assocs.	612-421-0751
NY	New York, Frathom Co.	212-687-9390
NY	Plainview, O. E. M. Mectronix Sls., Inc.	516-293-1530
Tex	Dallas, Vidal Elctrns.	214-352-9381
Wash	Mercer Island, Penryn Sls. & Engrg.	206-232-3411

GAR ENTERPRISES, 2031 N. Lincoln Ave., Pasadena, Cal., 91103, Tel: 213-798-0785; Sls. Mgr: G. Sugimoto

GARDINER ELCTRNS., 4729 North 7th Ave., Phoenix, Ariz., 85013, Tel: 602-274-9681

GARDINER SOLDER CO., Div. Gardiner Metal Co., 4820 S. Campbell Ave., Chicago, Ill., 60632, Tel: 312-847-0100, TWX: 910-221-2510; Sls: L. Tessier

GARDNER-DENVER CO., Gardner Expwy., Quincy, Ill., 62301, Tel: 217-222-5400; Sls. Mgr: D.E. Kipley

GARNER GLASS CO., 177 S. Indian Hill Blvd., Claremont, Calif., 91711, Tel: 714-NA-4-5071; Sls. Mgr: J.C. Hyatt

GATES ELCTRN. CO., 526 Van Nest Ave., Bronx, N.Y., 10460, Tel: 212-TU-1-5900; Sls. Mgr: J. Regenbogen Vol 1•686-688

GATES ENERGY PRODS. INC., Div. Gates Rubber Co., 999 S. Broadway, Denver, Colo., 80217, Tel: 303-744-4806, TWX: 910-931-2658; Mktg. Mgr: R. Doster; Appl. Mgr: R. Hammel

GATES, GEO. W. & CO., Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y., 11010, Tel: 212-347-0787; Sls. Mgr: T.E. Schulz

GAVITT WIRE & CABLE DIV., RSC Inds., Inc., Brookfield, Mass., 01506, Tel: 617-867-6476; Sls. Mgr: H.R. Chesson; Mktg. Mgr: J.M. Richardson

GC ELECTRONICS, Div. Hydrometals, 400 S. Wyman St., Rockford, Ill., 61101, Tel: 815-968-9661; Sls. Mgr: B. Aubery; Adv.-Sls. Prom: J. Hogan .....Vol 3•679

Local Sales Offices & Reps.

Mass	Andover, R. Purinton	617-475-7055

GC Local Distributors

Ala	Birmingham, J.W. Clary Co., 1713 Second Ave. S.	205-322-2488
Ariz	Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway	
Cal	San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.	
Ga	Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW	404-355-2223
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
La	Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094	318-423-6131
Mass	Woburn, Abbott Elctrn., 902 Main St.	617-935-2040
Minn	Duluth, Northwest Radio, 123 E. First St.	218-727-1565
Mo	St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave	314-MA-1-5000
Neb	Omaha, J-B Distributing Co., 1616 Cass St	402-341-5525
Neb	Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St.	402-341-7700
NJ	Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22	201-376-8900
NY	Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave.	212-492-9590
NY	Lynbrook, Peerless Radio, 19 Wilbur St.	516-593-2121
NY	New York, Midway Ind'l. Elec., 38 E. 29th St.	212-889-0370
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080
Ohio	Cleveland, Pattison Supply Co., 4550 Willow Pkwy.	216-441-3000
Ohio	Solon, REPCO, 6835 Cochran Rd.	216-248-8900
Pa	Pittsburgh, Cameradio Co., 2801 Liberty Ave.	412-391-7400
Tenn	Nashville, Electra Distributing, 1914 W. End Ave.	615-329-3971
Tex	Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St	817-335-6521
Utah	Salt Lake City, Standard Supply Co., 225 E. 6th So.	801-355-2971
Va	Norfolk, Priest Elctrn., 6431 Tidewater Dr.	703-855-2021
Wisc	Madison, Satterfield Elctrn., 1900 S.Park St.	608-257-4801
Wisc	Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd.	414-545-6500

GEMS SENSORS DIV., Delaval, Spring La., Farmington, Conn., 06032, Tel: 203-677-1311; Sls. Mgr: R.J. White; Comm. Sls. Mgr: M.W. Brown

GENERAL ATRONICS, Elctrn. Tube, 1200 E. Mermaid La., Phila., Pa., 19118, Tel: 215-248-3700, TWX: 215-242-1295; Sls. Mgr: R. Koebert

GENERAL AUTOMATIC CORP., 235 W. First St., Bayonne, N.J., 07002, Tel: 201-437-7500; Sls. Mgr: M. Barron

GENERAL COMPUTERS, INC., 5990 W. Pico Blvd., Los Angeles, Calif., 90035, Tel: 213-939-7657, Sls. Mgr: C. Estes

GENERAL CONTROL CO., 1196 Soldiers Field Rd, Boston, Mass., 02134, Tel: 617-782-7440; Pres: W.J. Kelleigh

Local Sales Offices & Reps.

Cal	Los Angelis, Collier Co.	213-389-1223
Ga	Atlanta, O'Hara Assocs.	404-273-0600
Mass	Boston, Electrical Apparatus Co.	617-782-7440
NJ	Pennsauken, Leff Sls.	609-663-4025
Ohio	Cleveland, Electro Com.	216-886-2404

GENERAL DATA INDS. INC. INC., 131 Danbury Rd., Wilton, Conn., 06897, Tel: 203-762-0711, TWX: 710-468-4084; V.P. Sls: D.R. Lehrman

GENERAL DEVICES, INC., P.O. Box 253, Princeton, N.J., 08540, Tel: 609-924-2500; VP/GM: M. Medvin; Ch. Eng: M. Kirzecky; Mfg. Mgr: H. Jerzenski

Local Sales Offices & Reps.

Ala	Huntsville, Reynolds & Assoc.	205-536-1941
DC	Washington, MGI Corp.	202-296-3795
Fla	Bradenton, Reynolds & Assoc.	813-778-5219
Fla	Ft. Lauderdale, Reynolds & Assoc.	305-581-6611
Fla	Melbourne, Reynolds & Assoc.	305-727-3205
Ga	Atlanta, Reynolds & Assoc.	404-252-5360
Mass	Waban, Bawer Assocs.	617-244-8267
Mo	St. Louis, Aerotronics, Inc.	
NJ	Mountainside, Service & Technology Inc.	201-232-2666
NY	Commack, Service & Technology Inc.	516-543-1061
NY	Pompey, S. F. Foster Co., Inc.	315-677-3333
NC	Greensboro, Reynolds & Assoc.	919-275-3725
Ohio	Cleveland, R. K. P. Assocs.	216-526-5260
Ohio	Dayton, R. D. P. Assocs.	513-253-6175
Wash	Seattle, Comptronics	206-284-4842
Exp:	Bala Cynwyd, Tech Impex, Inc.	215-667-3155

GENERAL ELEC. CO., Elctrn. Comps. Sls. Dept., 1 River Rd., Schenectady, N.Y., 12345, Tel: 518-FR-4-2211 Vol 1•448,449,689; Vol 2•491,614,646,754,755, 1052; Vol 3•446,447,680,1237

Local Sales Offices & Reps.

Ariz	Phoenix	602-264-1751
Cal	Los Angeles	213-272-8566
Cal	Portola Valley	415-854-4010
Colo	Denver	303-388-5771
Conn	Bridgeport	203-334-1012
DC	Washington	202-393-3600
Fla	No. Palm Beach	305-844-5202
Fla	Tampa	813-877-8311
Fla	Winter Park	305-647-2030
Ga	Atlanta	404-633-4522
Ill	Chicago	312-777-1600
Ind	Fort Wayne	219-447-1511
Ind	Indianapolis	317-923-7221
Iowa	Cedar Rapids	319-364-9149
La	New Orleans	504-525-4324
Mass	Wellesley	617-237-2050
Mich	Southfield	313-355-3552
Minn	Minneapolis	612-927-5458
Mo	Kansas City	816-221-4033
Mo	St. Louis	314-429-6941
NJ	Clifton	201-472-8100
NY	Albany	518-458-7755
NY	E. Syracuse	315-456-1046
NY	Great Neck	516-466-8800
NY	Rochester	716-436-3480
NC	Charlotte	704-364-6313
NC	Greensboro	919-273-6982
Ohio	Cincinnati	513-281-2547
Ohio	Cleveland	216-266-2900
Ohio	Dayton	513-298-0311
Okla	Oklahoma City	405-943-9015
Pa	Erie	814-455-8377
Pa	Philadelphia	215-568-1800
Pa	Pittsburgh	412-921-4134
Tex	Dallas	214-521-1931
Tex	Houston	713-524-3061
Va	Charlottesville	703-296-8118
Va	Portsmouth	703-484-3521
Wash	Seattle	206-244-7750
Wisc	Milwaukee	414-271-5000

GENERAL ELEC. Local Distributors

Ala	Huntsville, Cramer/Ew Huntsville, 2310 Bob Wallace Ave.SW	205-539-5722
Ariz	Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave.	602-269-1391
Ariz	Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd.	602-273-7331
Ariz	Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway	
Cal	Culver City, Hamilton Electro Sales	213-870-7171
Cal	Hollywood, Hamilton/Avnet Elctrncs.	305-925-5401
Cal	Irvine, Cramer/L. A., 17201 Daimler St.	714-979-3000
Cal	Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way	213-685-5511
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	Mt. View, Hamilton/Avnet Corp., 340 Middlefield Rd.	415-961-7000
Cal	Palo Alto, Kierulff-Palo Alto, 3969 E. Bayshore Rd.	415-968-6292
Cal	San Diego, Hamilton/Avnet Corp., 5569 Kearny Villa Rd.	714-279-1550, 279-2421
Cal	San Diego, Kierulff-San Diego, 8797 Balboa Ave.	714-278-2112
Cal	San Diego, Western Radio, 1415 India St.	714-235-6571
Cal	Sunnyvale, Cramer/San Fran., 720 Palomar Ave.	408-739-3011
Colo	Denver, Hamilton/Avnet Electronics	303-534-1212
Conn	Hamden, Arrow Elctrncs., 295 Treadwell St.	203-248-3801
Conn	North Haven, Cramer/Conn., 35 Dodge Ave.	203-239-5641
Fla	Hollywood, Cramer/Ew Hollywood, 4035 North 29th Avenue	305-923-8181
Fla	Hollywood, Schweber Elctrns.	305-927-0511
Fla	Orlando, Cramer/Ew Orlando, 345 North Graham Avenue, Box 20214	305-894-1511
Ga	Atlanta, Cramer/Atlanta, 3923 Oakcliff Industrial Court	404-448-9050

Ga Atlanta, Hamilton/Avnet Elctrncs., 6700 1-85 Access Rd. 404-448-0800
Ga Atlanta, Schweber Elctrns. 404-449-9170
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Chicago, Schweber Elctrns. 312-593-2740
Ill Chicago, Semiconductor Specialists, Inc. 312-279-1000
Ill Schiller Park, Hamilton-Avnet Elctrs., 3900 N. 25th Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Iowa Cedar Rapids, Iowa Radio Supply Co. Inc., 719 Center Point Rd. NE 319-364-6154
Kans Prairie Village, Hamilton/Avnet Elctrncs., 3500 W. 75th St. 913-362-3250
La Baton Rouge, Ralph's, Inc., 1732 Plank Rd. 504-344-3761
La Lafayette, Ralph's Inc., 3004 Cameron St. 318-234-4507
La New Orleans, Ralph's, Inc., 4334 Stemway Dr. 504-242-2731
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Md Gaithersburg, Cramer/Ew Washington, 16021 Industrial Drive 301-948-0110
Md Hanover, Hamilton/Avnet Elctrns. 301-796-5000
Md Rockville, Schweber Elctrns. 301-881-2970
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Burlington, Hamilton/Avnet Elctrns. 617-273-2120
Mass Newton, Cramer Elctrn. Inc., 85 Wells Avenue 617-969-7700
Mass Newton, Cramer/International, 85 Wells Ave. 617-969-7700
Mass Waltham, Schweber Elctrns. 617-890-8484
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mich Detroit, Schweber Elctrns. 313-583-9242
Mich Livonia, Hamilton/Avnet Elctrns. 313-522-4700
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Minn Edina, Cramer/Bonn, 7275 Bush Lake Road 612-835-7811
Minn Minneapolis, Hamilton/Avnet Elctrns. 612-854-8400
Mo Hazelwood, Hamilton/Avnet Electronics 314-731-1144
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Scott Elctrn Supply Corp., 4040 Adams St 403-434-8308
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-239-0800
NJ Cherry Hill, Hamilton/Avnet Elctrns. 609-662-9337
NJ Moonachie, Cramer/N.J., 1 Barrett Ave. 201-935-5600
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Pennsauken, Cramer/Pa., 7300 Rte. 130 No. 215-923-5950
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NJ Somerset, Schweber Elctrns. 201-469-6008
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
NM Albuquerque, Cramer/N.M., 137 Vermont N.E. 505-265-5767
NM Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E. 505-247-1055
NY Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave. 212-492-9590
NY East Syracuse, Cramer/Syracuse, 6716 Joy Road 315-437-6671
NY Endwell, Cramer/Binghamtom, 3220 Watson Blvd. 607-754-6661
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Hauppauge, Cramer/Systems, 29 Oser Ave. 516-231-5682
NY Hauppauge, L.I., Cramer/Long Island, 29 Oser Avenue 516-231-5682
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
NY Rochester, Cramer/Rochester, 3259 Winton Road South 716-275-0300
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Rochester, Schweber Elctrns. 716-328-4180
NY Syracuse, Hamilton/Avnet Elctrns. 315-437-2642
NY Westbury, Hamilton-Avnet Electrns., 70 State St.
NY Westbury, Schweber Elctrns., Jericho Tpke 516-334-7474
NC Raleigh, Schweber Elctrns. 919-832-8881
NC Winston-Salem, Cramer/EW, 938 Burke Street 919-725-8711
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Beachwood, Schweber Elctrns. 216-464-2970
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Tenn Chattanooga, Curle Elctrns., 1813-S. Market
Tenn Nashville, Electra Distributing, 1914 W. End Ave. 615-329-3971
Tex Beaumont, Ralph's, Inc., 1270 Broadway 713-833-9443
Tex Dallas, Hamilton/Avnet Elctrns., 2403 Farrington
Tex Houston, Hamilton/Avnet Elctrns., 1216 W. Clay
Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-262-8451
Va Roanoke, Peoples Radio & Tv Supply Co., 1015 Moorman Rd
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wash Seattle, Hamilton/Avnet Elctrncs., 2320 6th Ave. 206-624-5930
Wisc Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave. 414-228-8100
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500
For: Can., Montreal, Hamilton/Avnet Elctrns. 514-735-6393
For: Can., Ottawa, Ont., Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl.
For: Can., Toronto, Ont., Hamilton/Avnet Elctrns. 416-789-1838

GENERAL ELECTRIC, Ind'l. Heating Business Dept., Shelbyville, Ind., 46176, Tel: 317-398-4411, TWX: 810-260-2616; Adv. Specialist: J. Grant

GENERAL ELEC., Insulating Matl's., 1 Campbell Rd., Schenectady, N.Y., 12306, Tel: 518-374-2211, TWX: 518-556-2290; Sls. Mgr: D.M. Berntson

GENERAL ELEC., Insulator Prods., 2525 Insulator Dr., Baltimore, Md., 21230, Tel: 301-752-8020; Sls. Mgr: C. Vaughn

GENERAL ELEC., Laminated Prods., Coshocton, Ohio, 43812, Tel: 614-622-5310, TWX: 614-623-7803; Mgr.-Tech. Serv: H.A. Schudel

GENERAL ELEC. CO., Lamp Parts & Equip. Sales Oper., 21800 Tungsten Rd., Cleveland, Ohio, 44117, Tel: 216-266-2451; Sls. Mgr: R.J. Sommer

Local Sales Offices & Reps.
Cal Los Altos 415-948-5000
Cal Los Angeles, General Elec. Co. 213-723-2541
Mass Newton Upper Falls, General Elec. Co. 617-332-6200
Mo Lee's Summit 816-524-5300
NJ East Orange 201-675-6100
Ohio Cleveland 216-266-3788
Pa Pittsburgh 412-531-5700

GENERAL ELECTRIC CO., Miniature Lamp Dept. Prods., Nela Park, Cleveland, Ohio, 44112, Tel: 216-266-2121; Mgr, OEM Market Planning: J.F. Vercellotti .....Vol 2•490

Local Sales Offices & Reps.
Cal Los Altos 415-948-5000
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Minn St. Paul, R. G. Ragon, Inc. 612-488-0201
NJ Mountain Lakes, Components For Elctrns. 201-334-2921
NJ Ridgefield, M - D Industries 201-941-3113
NY Liverpool, Vertex Corp. 315-457-6378
NC Charlotte, Bill Henry Associates 704-375-8958
Ohio Cincinnati, Tri State Mktg. Inc. 513-761-7993
Ohio Cleveland, Carter McCormic & Peirce 216-333-5650
Pa Pittsburgh, Carter McCormic & Peirce 412-824-3760
Tex Dallas, Blackburn Associates 214-FL-1-9991
Wash Seattle, F. Jackson Co. 206-782-2211

GRAPHIC CONTROLS CORP., Recording Chart Div., 189 Van Rensselaer St., Buffalo, N.Y., 14210, Tel: 716-853-7500; Sls. Mgr: C.J. Evans; Prod. Mgr: E.J. Gray

GRAPHITE METALLIZING CORP., 1036 Nepperhan Ave., Yonkers, N.Y., 10702, Tel: 914-968-8400; G.M: W.W. Walker ..... Vol 2•647

GRAYHILL INC., 569 Hillgrove Ave., LaGrange, Ill., 60525, Tel: 312-354-1040, TWX: 910-683-1850; V.P.Sls: B. Vinkemulder; Prod. Sls. Mgr: G. Kennedy; Prod. Sls. Mgr: J. Udisches ..... Vol 2•1056-1066; Vol 3•681

Local Sales Offices & Reps.
Ala Huntsville, J.L. Highsmith Co. 205-881-3294
Ariz Scottsdale, Impact Elctrns. 602-949-8432
Cal Garden Grove, Impact Elctrns. 213-431-3581
Cal Los Altos, Nickerson-Gray Assoc. 415-941-5777
Colo Denver, Lindberg Co. 303-758-9033
Fla Orlando, Geartner Assoc. 305-299-1000
Ill Hinsdale, Hill-Gray Assoc. 312-325-4810
Ind Fort Wayne, Menze Sls. 219-747-5616
Iowa Cedar Rapids, Reid Assoc. 319-362-6302
Kans Overland Park, Penzner-Mankus Assoc. 913-381-0004
Md Lutherville, Naudain Assocs. 301-252-5378
Mass Wellesley Hills, M. Scott Co. 617-235-0102
Mich Troy, C.B. Jensen & Assoc. 313-643-0506
Minn St. Paul, Northport Engrg. 612-698-3841
Mo Hazelwood, Penzner-Mankus Assoc. 314-731-4334
NJ Mount Laurel, Naudain Assocs. 609-235-1801
NM Albuquerque, Lindberg Co. 505-345-2489
NY Great Neck, F. Tylinski Company 516-466-9070
NY Ithaca, B. Dean Inc. 607-272-2187
NC Charlotte, J.L. Highsmith Co. 704-333-7743
Ohio Cleveland, A.H. Baier Co. 216-461-6161
Okla Tulsa, W.P. Fralia Co.
Pa Pittsburgh, Covert & Newman Co. 412-563-0303
Tex Fort Worth, W. P. Fralia Co. 817-738-2394
Utah Salt Lake City, Lindberg Co. 801-364-6409
Va Richmond, J.L. Highsmith Co. 703-272-5888
Wash Seattle, Seatronics 206-767-4330
For: Can., Willowdale 432, Ont., F.P. Taylor Ltd. 416-222-6924

GRAYHILL MOLDTRONICS, INC., 707 Rogers St., Downers Grove, Ill., 60515, Tel: 312-968-7000; Sls. Mgr: J. Collins

GREENLEE TOOL CO., 2136-12th St., Rockford, Ill., 61101, Tel: 815-963-4881, TWX: 910-631-0747; V.P. Sls: M.J. Tuckett

GREENLEE Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801

GREENRAY INDS., INC., 840 W. Church Rd., Mechanicsburg, Pa., 17055, Tel: 717-766-0223, TWX: 510-650-4939; Sls. Mgr: G.R. Kurzenknabe Vol 2•414,415,612,613

Local Sales Offices & Reps.
Cal Burlingame, Westronics Assoc. 415-342-1425
Cal Los Angeles, Cain Technology 213-476-2251
Colo Littleton, Aztec Entprs. 303-795-0250
Fla Palm Beach Gardens, Beacon Elctrns. 305-622-2770
Ga Atlanta, Beacon Elctrns. 404-351-3654
Ill Mt. Prospect, Cain & Co. 312-253-3578
Md Annapolis, Hayden Assocs. 202-296-6059
Mass Reading, Geder-Rotondi Assoc. 617-944-3105
Mo Florissant, KM & B Tech. Sls. 314-831-0015
NM Albuquerque, Aztec Entprs. 505-255-2440
NY Huntington, Andrews & Andrews, Inc. 516-692-8686
NY Syracuse, Electra Sls. 315-455-5783
Ohio Dayton, F. Ohmer Assoc. 513-434-1454
Okla Tulsa, J.A. Green Co. 918-742-4657
Pa Ambler, Wm. Assocs. 215-643-4119
Tex Dallas, J.A. Green Co. 214-631-7450
Tex Houston, J.A. Green Co. 713-526-2959
For: Can., St. Laurent, Que., Rutherford Agencies 514-747-4339

GRI COMPUTER CORPORATION, 320 Needham Street, Newton, Mass., 02164, Tel: 617-969-0800; Mgr. Adutz. & Sls. PR: F.C. Brunner; Mgr. Applications Engrg: R. Kirk

GRIES REPRODUCER CO., Div. Coats & Clark Inc., 162 Beechwood Ave., New Rochelle, N.Y., 10801, Tel: 914-633-8600, TWX: 914-235-2188; Dir. Mkt. Svc: L.R. Chasen

GRIGSBY-BARTON, INC., 3800 Ind'l. Dr., Rolling Meadows, Ill., 60008, Tel: 312-392-5900, TWX: 910-687-3789; Dir-Sales: S.E. Wilson ..... Vol 2•766,767

Local Sales Offices & Reps.
Cal Pasadena, Luscombe Engrg. Co. 213-684-2000
Cal San Mateo, Luscombe Engrg. 415-342-7057
Fla St. Petersburg, Orbe, Inc. 813-894-0687
Ill Chicago, J.G. Twist Co. 312-593-0200
Mass Andover, R Purinton, Inc. 617-475-7055
Minn St. Paul, Kenco Co. 612-645-7717
NJ Mountainside, H. Richter 201-233-4615
NY Fayetteville, H.G. Richter 315-637-6713
NC Raleigh, A.B. Andrews 919-833-5565
Ohio Cleveland, Pinesales & Engrg. 216-247-6198
Ore Beaverton, N.R. Schultz 503-646-1345
Pa Wyncote, Cooper-Clement 215-LI-8-5450
Tex Garland, Whiteside Sls. 214-276-8382
Tex Houston, Whiteside Sls. 713-498-2551
Wash Bellevue, N. Schultz 206-454-0300

GRIGSBY-BARTON, Local Distributors
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544

GRM CORP., Box 337, Medford, N.J., 08055, Tel: 609-267-7950; Sls. Mgr: T.A. McGarrity; Pres: M. Yurko; V.P: J. Fattorini ..... Vol 1•319

Local Sales Offices & Reps.
DC Washington, Instrucom, Inc. 202-223-1759
Neb Omaha, Newton Valve Svc. Inc. 402-397-3414
Tex Richardson, Horizon Engrg. Sls. Co. 214-238-5121
Wash Bellevue, Conrard Engrg. Co. 206-455-1336
Exp: New York, N. Y., J. Plasencia, Inc. 212-867-8084

GROOV-PIN CORP., 1125 Hendricks Causeway, Ridgefield, N.J., 07657, Tel: 201-945-6780, TWX: 710-992-8963; Sls. Mgr: V.J. Manobianco

GTE AUTOMATIC ELEC., 400 N. Wolf Rd., Northlake, Ill., 60164, Tel: 312-562-7100, TWX: 910-226-1975; Prod. Mgr. Comps: J.D. Ashby; Prod. Mgr. Com. Eqpt: B.W. Bishop

Local Sales Offices & Reps.
Ariz Phoenix, Dorton Entprs. 602-263-0414
Ark El Dorado, D. Bellew Sls. 501-863-8325
Cal Burlingame, GTE Automatic Elec. 415-697-6400
Cal North Hollywood, GTE Automatic Elec. 213-766-5203
Colo Denver, Gossard & Assocs. 303-985-0602
Conn Stamford, GTE Automatic Elec. 203-329-0981
Ga Atlanta, GTE Automatic Elec. 404-261-7441
Ill Northlake, GTE Automatic Elec. 312-562-7100
Mich Detroit, GTE Automatic Elec. 313-538-6040
Minn Minneapolis, GTE Automatic Elec. 612-835-4222
Mo Kansas City, GTE Automatic Elec. 816-363-7030
Ohio Cleveland, GTE Automatic Elec. 216-267-6288
Ohio Dayton, GTE Automatic Elec. 513-299-6481
Pa Haverford, GTE Automatic Elec. 215-525-7575
Tex Garland, GTE Automatic Elec. 214-272-3535
Tex Houston, GTE Automatic Elec. 713-333-2300
Va Falls Church, GTE Automatic Elec. 703-533-0636

GTE LENKURT INC., 1105 County Rd., San Carlos, Calif., 94070, Tel: 415-591-8461, TWX: 910-376-4396; Pub. Info. Mgr: T.F. Curry

GTE SYLVANIA, INC., W.M. Chace Sub., 1600 Beard Ave., Detroit, Mich., 48209, Tel: 313-842-7400; Sls. Mgr: W.J. Tait

GTE SYLVANIA, INC., Chem. & Metallurgical Div., Towanda, Pa., 18848, Tel: 717-265-2121; Gen. Mktg. Mgr: J.W. Parks

GTE SYLVANIA, Circuit Module Operation, Box 360, Muncy, Pa., 17756, Tel: 717-546-3191; Mktg. Mgr: S.R. Sisak; Sls. Mgr: R.J. Thorpe

GTE SYLVANIA INC., Consumer Prods. - Lighting Prods., 100 Endicott St., Danvers, Mass., 01923, Tel: 617-777-1900; Natl. Sls. Mgr: G.H. Mulcahy

GTE, CONSUMER Local Distributors
NY Buffalo, Genesee Radio & Parts Co., 2550 Delaware Ave. 716-873-9661

GTE SYLVANIA INC., Wilbur B. Driver Sub., 1875 McCarter Hwy., Newark, N.J., 07104, Tel: 201-481-3100; V.P. Mktg: C. Phayre

GTE SYLVANIA INC., Elctrn. Comps. Grp., 100 First Ave., Waltham, Mass., 02154, Tel: 617-890-9200; V. P: W.T. Buschmann

GTE, ELCTRN. COMPS. Local Distributors

Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
Md	Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd.	301-823-0070
Mass	Woburn, Abbott Elctrn., 902 Main St.	617-935-2040
NY	New York, Midway Ind'l. Elec., 38 E. 29th St.	212-889-0370
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	

GTE SYLVANIA INC., Elctrn. Sys. Gp., 100 First Ave., Waltham, Mass., 02154, Tel: 617-890-9200; Dir. Cust. Relations: W.R. Edgington

GTE SYLVANIA INC., Elctrn. Tube Div., Seneca Falls, N.Y., 13148, Tel: 315-568-5881

GTE, ELCTRN. TUBE Local Distributors

Cal	Goleta, Radio Prods. Sls., 350 S. Kellogg Ave	805-964-6823
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Mass	Boston, De Mambro Elctrns, 1095 Commonwealth Ave.	617-787-1200
Mass	Woburn, Abbott Elctrn., 902 Main St.	617-935-2040
Mich	Muskegon, Western Elctrn Supply, 1781 5th St	616-722-7628
Mo	St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave	314-MA-1-5000
Neb	Omaha, J-B Distributing Co., 1616 Cass St	402-341-5525
Neb	Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St.	402-341-7700
Ohio	Akron, Akron Elctrn. Supply, 107 S. Arlington St	216-762-8818
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080
Ohio	Cleveland, Farr Elctrns, 5403 Prospect Ave.	216-881-7403
Tex	Houston, Harrison Equip. Co. Inc., 1616 McGowen St.	713-224-9131
Tex	Lubbock, R & R Elctrn Supply Co, 1607 Ave. G, Box 1860	806-765-7727

GTE SYLVANIA INC., Gibson Electric Subsidiary, Delmont, Pa., 15626, Tel: 412-468-4121; V.P./Mktg: J.F. Barnyak

GTE SYLVANIA INC., Lighting Prods. Grp., Danvers, Mass., 01923, Tel: 617-777-1900; Sls. Mgr: R.L. Kleinfeld

GTE, LIGHTING Local Distributors

Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
Mo	St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave	314-MA-1-5000

GTE SYLVANIA INC., Miniature Lighting Prods., W. Main St., Hillsboro, N.H., 03244, Tel: 603-464-5533; Prod. Mktg. Mgr: D.S. Dewsnap; Sls. Mgr: J.J. Donelan; Customer Svc. Mgr: D.F. Smith ..... Vol 2•492-494

Local Sales Offices & Reps.

Cal	Los Altos, W.W. Posey Co.	415-948-7771
Cal	N. Hollywood, Bassett & Moore	213-766-2117
Colo	Arvada, Arrowhead Sls.	303-423-5556
Conn	Waterbury, Coakley, Boyd & Abbett	203-756-8766
Fla	Maitland, Hutto, Hawkins, Peregoy	305-831-2474
Fla	Pompano Beach, Hutto, Hawkins, Peregoy	305-943-9593
Fla	Tampa, Hutto, Hawkins, Peregoy	813-932-1800
Ga	Atlanta, Ho Smoak	404-762-1781
Ga	Atlanta, Millar Elctrns.	404-261-6160
Ill	Oak Park, G. E. Finnegan	312-383-9098
Ind	Indianapolis, Southern Sls.	317-257-7575
Iowa	Atlantic, Kimian Sls.	712-243-1626
Kans	Overland Park, Kimian Sls.	913-648-5191
Mass	Needham, Coakley, Boyd & Abbett	617-444-5470
Mich	Grand Rapids, R.O. Whitesell & Assoc.	616-451-8901
Mich	Southfield, R.O. Whitesell & Assoc.	313-358-2020
Mich	St. Joseph, R.O. Whitesell & Assoc.	616-983-7337
Minn	Minneapolis, E. Stoss Assocs.	612-925-2757
Mo	Maryland Heights, Kimian Sls.	314-739-1655
NJ	Kearny, Hudson Lamp Co.	201-997-1850
NJ	Kearny, P. Sweeney	201-997-1850
NY	Rochester, Fowler Beach Corp.	716-586-0468
NC	Raleigh, Millar Elctrns.	919-787-9564
Ohio	Cincinnati, R.O. Whitesell & Assoc.	513-521-2990
Ohio	Columbia, R. O. Whitesell	616-888-9396
Ohio	Dayton, R.O. Whitesell & Assoc.	513-298-9546
Ohio	Lakewood, R.O. Whitesell & Assoc.	216-228-7525
Pa	Glenside, Shelmar Elctrns.	215-885-0800
Pa	Pittsburgh, R.O. Whitesell & Assoc.	412-242-0100
Tex	Dallas, Dunbar Assoc.	214-239-7151
Utah	Salt Lake City, Arrowhead Sls.	801-487-3444
Wash	Seattle, Blum & Assocs.	206-782-1600
Wisc	Milwaukee, F.C. Du Bois & Assoc.	414-774-3100

GTE, MINIATURE Local Distributors

Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Colo	Denver, Burstein-Applebee	303-244-3336
Ill	Chicago, Burstein-Applebee	312-763-4848
Kans	Kansas City, Burstein-Applebee	816-561-5460
Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
Mo	Kansas City, Burstein Applebee	816-561-5460
Neb	Lincoln, Burstein Applebee	402-434-0678
Neb	Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St.	402-341-7700
NY	Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd.	716-328-3230
Ohio	Akron, Akron Elctrn. Supply, 107 S. Arlington St	216-762-8818

GTE SYLVANIA INC., Parts Div., 816 Lexington Ave., Warren, Pa., 16365, Tel: 814-723-2000; Sls. Mgr: R.F. Scalise

GTE SYLVANIA INC., Western Cold & Platinum Sub., 555 Harbor Blvd., Belmont, Cal., 94002, Tel: 415-593-3121, TWX: 415-594-8855; Sales Mgr: W.S. Smith

GTI CORP. (E), Manor Oak 2, 1910 Cochran Rd., Pittsburgh, Pa., 15220, Tel: 412-343-4070

GUARDIAN CALIFORNIA, 5755 Camille Ave., Culver City, Cal., 90230, Tel: 213-870-4642, TWX: 910-343-6464; Sales Mgr: G. Berglin; Pres: J.S. Winkler

Local Sales Offices & Reps.

Ala	Birmingham, Immco Inc.	205-879-0739
Cal	Palo Alto, O'Donnell Assocs.	415-327-9260
Cal	Torrance, O'Donnell Assocs.	213-323-9243
Colo	Denver, Arrowhead Sls.	303-222-5645
Fla	Winter Park, Floritronics	305-424-5070
Ga	Marietta, Immco Inc.	404-435-0079
Haw	Honolulu, G Piety Factors	808-841-0185
Ill	Chicago, Guardian Elec. Mfg.	312-243-1100
Ind	Fort Wayne, Needler Sls.	219-447-2123
Kans	Wichita, Thunderbird Tech. Sls. & Svcs.	316-684-3941
Md	Ellicott City, Mc Court Co.	301-465-4515
Mass	Concord, Sales Engrg. Co.	617-369-3943
Mich	Westland, Miltimore Sls.	313-349-5820
Mo	St. Louis	314-542-6488
NM	Albuquerque, Arrowhead Sls.	505-247-0287
NY	Massapequa, L.I., Coughlin Assocs.	516-799-7743
NY	Rochester, Elcom Sales	716-385-1400
Ohio	Miamisburg, W. C. Schmidt	513-866-3640
Ohio	Richmond Heights, W. A. Rowell, Jr.	216-291-0647
Pa	Delmont, T. F. Laslo & Assocs.	412-468-5045
Pa	Doylestown, T.O.E. Sls.	215-348-5333
Tex	Dallas, W Reese Assocs.	214-638-6575
Utah	Salt Lake City, Arrowhead Sls.	801-487-3444
Wash	Seattle, R. K. Squibb	206-632-2450
For:	Can., Williowdale, Ontario, A. C. Simmonds & Sons	416-491-1010

GUARDIAN CALIFORNIA Local Distributors

Ariz	Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway	

GUARDIAN ELEC. MFG. CO., 1562 W. Carroll Ave., Chicago, Ill., 60607, Tel: 312-243-1100, TWX: 910-221-5073; Sls. Mgr: G. Ewmett; Market Mgr: J. Rowell ..... Vol 2•768-784

Local Sales Offices & Reps.

Cal	Culver City, Guardian Elec.	213-870-4642
Cal	Palo Alto, O'Donnell	415-327-9260
Cal	Torrance, O'Donnell Assocs.	213-323-9243
Colo	Denver, Arrowhead Sls.	303-423-5556
Fla	Winter Park, Floridatronics	305-886-4818
Ga	Marietta, Immco, Inc.	404-435-0079
Haw	Honolulu, G. Piety Factors	808-841-0185
Ill	Chicago, Guardian Elec.	312-243-1100
Ind	Ft. Wayne, Needler Sls.	219-447-2123
Ind	Ft. Wayne, New/Era Sls.	219-743-5371
Ind	Indianapolis, Needler Sls.	317-255-8056
Kans	Prairie Vlg., Thunderbird Tech.	913-642-7220
Kans	Wichita, Thunderbird Tech.	316-684-3941
Md	Ellicott City, McCourt	301-465-4515
Mass	W. Concord, Sls. Engrg. Co.	617-369-3943
Mich	Novi, Miltimore Sls.	313-349-5820
Minn	St. Paul, R. A. Karr	612-739-4021
Mo	St. Louis, Thunderbird Tech.	314-567-6488
NJ	Englewood, Tech. Oriented Sls.	201-568-5747
NY	Binghamton, Elcom Sls.	607-723-9270
NY	Massapequa, J.F. Coughlin	516-799-7743
NY	Rochester, Elcom Sls.	716-385-1400
NY	Whitesboro, Elcom Sls.	315-732-6445
Ohio	Miamisburg, W.C. Schmidt	513-298-4451
Ohio	Richmond Hgts., W. Rowell	216-292-3633
Pa	Delmont, T.F. Laslo	412-468-5045
Pa	Doylestown, Tech. Oriented Elec.	215-348-5333
Tex	Dallas, W. Reese	214-638-6575
Tex	Houston, W. Reese	713-621-3134
Utah	Salt Lake City, Arrowhead Sls.	801-485-3362
Wash	Seattle, R. Squibb	206-632-2450
Wisc	Milwaukee, F.A. Nitti	414-933-1975
For:	Can., Willowdale, Ont., A. Simmond	416-491-1010

GUARDIAN ELEC. Local Distributors

Cal	Garden Grove, Allied Elctrns., 12311 Industry St.	213-598-6605
Colo	Denver, Burstein-Applebee	303-244-3336
Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ill	Chicago, Burstein-Applebee	312-763-4848
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Kans	Kansas City, Burstein-Applebee	816-561-5460
Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
La	Baton Rouge, Ralph's, Inc., 1732 Plank Rd.	504-344-3761
La	Lafayette, Ralph's Inc., 3004 Cameron St.	318-234-4507
La	New Orleans, Ralph's, Inc., 4334 Stemway Dr.	504-242-2731
Mich	Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza	313-729-8500
Mo	Kansas City, Burstein Applebee	816-561-5460
Mo	St. Ann, Interstate Ind Elctrn, 10525 St. Charles Rock Rd	314-428-8522
Neb	Lincoln, Burstein Applebee	402-434-0678
Neb	Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St.	402-341-7700
NJ	Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22	201-376-8900
NY	Buffalo, Radio Equip. Corp., 196 Vulcan St	716-874-2690
NY	Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd.	716-328-3230
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080
Ohio	Cleveland, Farr Elctrns, 5403 Prospect Ave.	216-881-7403
Ohio	Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St.	216587-3600
Ohio	Dayton, Pioneer/Dayton, 1900 Troy St.	513-236-9900
Pa	Erie, Mace Elctrn., 2631 W. 8th St.	814-838-3544
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	
Tenn	Nashville, Electra Distributing, 1914 W. End Ave.	615-329-3971
Tex	Beaumont, Ralph's, Inc., 1270 Broadway	713-833-9443
Tex	Ft. Worth, Allied Elctrns., 401 E. 8th St.	817-336-5401
Wisc	Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd.	414-545-6500

GUDEMAN CORP., 340 W. Huron St., Chicago, Ill., 60610, Tel: 312-337-7400, TWX: 910-221-3863; Sls. Mgr: P.J. LoVecchio; Sls. Co-Ordinator: E. Kacheris Vol 2•567; Vol 3•454-476

Local Sales Offices & Reps.

Ariz	Scottsdale, Piper Sales Co.	602-946-4437
Cal	El Sequndo, Varigon	213-644-3611
Cal	San Carlos, Melchior	415-591-7383
Cal	San Diego, D. Thurston Assocs.	714-565-8411
Colo	Denver, Walker Associates	303-623-8713
Fla	Orlando, Geartner Assoc.	305-299-1000
Ga	Atlanta, Electro-Mech Sls. Engrg.	404-256-4414
Ill	Hinsdale, Momak Sls.	312-654-4524
Ill	Oak Pk., Wasson-Gallagher	312-CO-1-7517
Ind	Indianapolis, Tech. Rep.	317-546-4967
Md	Baltimore, Callas Elctrns.	301-744-7711
Mass	Chelmsford, Underwood Sls.	617-256-8191
Mich	Grand Rapids, Elko Sls.	616-949-1451
Mich	Grosse Pt. Woods, Elko Sls.	313-884-7893
Minn	St. Paul, Cullen & Assocs.	612-646-7371
Mo	Kansas City, R. Burton	816-471-2850
NJ	Fanwood, King & Assocs.	201-561-5464
NY	Liverpool, George Corp.	315-457-1188
NY	New York, E. Glass Assocs.	212-JU-6-8440
NY	Rochester, J.L. Semple	716-342-1413
NC	Winston-Salem, C. Dula	919-723-4205
Ohio	Cincinnati, A. C. Wahl & Assocs.	513-821-3270
Ohio	Dayton, R.G. Siff	513-CR-8-4779
Tex	Richardson, Vista Engrg. Assocs.	214-AD-5-4547
Wash	Seattle, Bergford & Assocs.	206-937-6664

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GUILDLINE INSTRS., INC., 1997 Palmer Ave., Larchmont, N.Y., 10538, Tel: 914-834-8100; Sls. Mgr: E. Nemeroff

GULTON BATTERY CORP., 212 Durham Ave., Metuchen, N. J., 08840, Tel: 201-548-2800, TWX: 710-998-0592; Mktg. Mgr: J.J. Spanos; Mktg. Mgr: J.B. Schuster; Mktg. Mgr: P.L. Mendelsohn

GULTON INDS., INC., Elctrn. Comps. Div., Metuchen, N.J., 08840, Tel: 201-548-2800, TWX: 710-998-0592; Sls. Mgr: A. Currie

GULTON INDS., Connector Div., 822 Production Pl., Newport Bch., Cal., 92660, Tel: 714-642-0163, TWX: 910-596-1352; Dir. Mktg: D. Allen .....Vol 3•682,683

Local Sales Offices & Reps.

Ariz	Scottsdale, Barnhill Five	602-947-7841
Cal	Cupertino, P M Sls.	408-255-1771
Colo	Denver, Barnhill Five	303-934-5505
Conn	W. Simsbury, Anchor Engrg.	203-658-6261
Fla	Altamonte Springs, Wm. Assocs.	305-831-4645
Fla	Clearwater, Wm. Assocs.	813-446-0075
Fla	No. Palm Beach, Wm. Assocs.	305-848-9042
Fla	Pompano Beach, Wm. Assocs.	305-943-3092
Ga	Smyrna, Electro-Rep Assocs.	404-435-0079
Mass	Wellesley Hills, Anchor Engrg.	671-235-6330
Mich	Warren, KVA Assocs.	313-756-9070
Mo	Grandview, L. R. Harry & Assocs.	816-763-3634
NY	Huntington Sta., K/R Mktg.	516-549-1300
NC	Charlotte, Electro-Rep Assocs.	704-333-0451
Ohio	Centerville, Myers Assocs.	513-299-3215
Ohio	Dayton, A. D. Dircksen & Assocs.	513-256-0351
Tex	Hurst, Kentron Engrg. Sls. Co.	817-268-1155
Utah	Salt Lake City, Barnhill Five	801-487-1327

GULTON INDS., Piezo Prods. Div., Box 4300, Fullerton, Cal., 92634, Tel: 714-871-2150, TWX: 910-592-1247; Exec. V.P: D. Herzfeld; Pres: D.P. Faulk

GULTON INDS., Servonic/Instr. Div., 1644 Whittier Ave., Costa Mesa, Cal., 92626, Tel: 714-642-2400, TWX: 714-642-1346; Sales Mgr: S. Pope

GYROSYSTEMS, INC., 120 Marine St., Farmingdale, N.Y., 11735, Tel: 516-293-5240; Sls. Mgr: E. Sandfort

H-B INSTR. CO., American & Bristol Sts., Phila., Pa., 19140, Tel: 215-DA-9-9125; V.P: C.G. Roveran

H-P-M DIV., Koehring Co., Marion Rd., Mt. Gilead, Ohio, 43338, Tel: 419-946-0222; Sls. Mgr: T.G. Bishop

HACKENSACK CABLE CORP., 110 Orchard St., Hackensack, N.J., 07602, Tel: 201-487-1100; V.P-Sls: R.H. Wilson

HACKER INSTRS., INC., Box 646, Fairfield, N.J., 07006, Tel: 201-226-8450; Mktg. Mgr: I.E. Hills; Asst. V.P: K.S. Lange

HADRON INC., 800 Shames Dr., Westbury, N.Y., 11590, Tel: 516-334-4402; V.P: P. Ratoff; Mgr., Laser Prod: J.E. Dennis

Local Sales Offices & Reps.

Cal	Anaheim, Applied Inst.	714-535-6551
Cal	San Jose, Applied Inst.	415-941-5928
Ill	Hoffman Estates, Mist Engrg.	312-529-0170
NY	Hauppauge, Barnett Assoc.	516-724-0202
NY	Syracuse, Labtronics	315-454-9314
Ohio	Cleveland Hgts., Witt Sls.	216-752-0011

HALE INSTRS., INC., Box 7487, Houston, Tex., 77008, Tel: 713-861-7574

HALEX, INC., Box 2940, Torrance, Cal., 90509, Tel: 213-772-4461; Mgr.-Rep. Sls: M.J. Bergquist

HALLMARK STANDARDS, INC., 257 Washington St., Mt. Vernon, N.Y., 10551, Tel: 914-664-4288, TWX: 710-566-1104; Sls. Mgr: M. Steinberg

HALMAR ELCTRNS., INC., 1544 W. Mound St., Columbus, Ohio, 43223, Tel: 614-276-0131; Inside Sls: M. Hunt

HAMAMATSU CORP. (E), 120 Wood Ave., Middlesex, N. J., 08846, Tel: 201-469-6640; Pres: T. Hiruma; Exec. V.P: R. Eno .....Vol 2•1185,1186

Local Sales Offices & Reps.

Cal	Burlingame, California Eastern Labs	415-342-7744

HAMAMATSU TV CO., LTD., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan, Tel: 0534-34-3311; Sls. Mgr: M. Aiba

HAMILTON STANDARD, Div. United Aircraft Corp., Windsor Locks, Conn., 06096, Tel: 203-623-1621, TWX: 710-420-0584; Sls. Mgr: H.W. Weinberg

HAMILTON TECHNOLOGY, INC., a div. of HMW Industries Inc., Box 1707, Lancaster, Pa., 17604, Tel: 717-394-7161, TWX: 510-657-4444; Sls. Mgr: J.F. Biehle; Mgr. Cust. Serv: P.L. Payonk

Local Sales Offices & Reps.

Cal	Costa Mesa, Hamilton Tech., Inc.	714-546-0780
Cal	Los Angeles, E. A. Wilcox Co.	213-723-6436
Colo	Denver, Electro-Rep, Inc.	303-744-2655
Conn	W. Hartford, R. S. Pettigrew & Co.	203-233-8533
Ill	Chicago, Electro-Comp Sls., Inc.	312-763-3636
Mass	W. Newton, R. S. Pettigrew & Co.	617-969-5770
Minn	Navarre, MagCo, Inc.	612-471-8538
Mo	St. Louis, Holtgrieve & Co.	314-725-6602
NJ	Asbury Park, Lancaster Ind'l. Sls., Inc.	201-988-5401
NM	Albuquerque, Electro-Rep, Inc.	505-256-1749
Ohio	Cincinnati, A. C. Wahl & Assocs., Inc.	513-821-3270
Ohio	Grafton, A. W. Risser Co.	216-458-5091
Pa	Lancaster, Lancaster Ind'l. Sls., Inc.	717-397-2942
Tex	Dallas, D. V. Falk & Assocs.	214-369-3408
Wash	Seattle, E. A. Wilcox Co.	206-243-5450

HAMLIN, INC., Lake & Grove Sts., Lake Mills, Wisc., 53551, Tel: 414-648-2361, TWX: 910-260-3740; Sls. Mgr: K. Deans .....Vol 2•1068,1069; Vol 4•543*

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Cal	Encino, Cardinal Assocs.	213-787-5511
Cal	Los Angeles, C. Holmes	213-256-2255
Cal	Palo Alto, Testco Sls.	415-326-5320
Colo	Denver, Elctrn. Comp. Sls.	303-771-6200
Conn	Berlin, White Sls. Co.	203-224-0423
Fla	Miami, S.K. Wallace Assoc.	305-691-1654
Fla	Tampa, S.K. Wallace Assoc.	813-932-3568
Ga	Jonesboro, S.K. Wallace Assoc.	404-471-6297
Ill	Des Plaines, Lincoln, Hodges	312-297-3810
Iowa	Marion, Thomas & Modrcin	319-377-6261
Kans	Shawnee Mission, Thomas & Modrcin	913-432-2131
Md	Lutherville-Timonium, Nauclain Assocs.	301-252-5378
Mass	Needham, White Sls. Co.	617-444-3676
Mich	Dearborn, Villani-Pitcher	313-271-4600
Minn	Minneapolis, R-J, Inc.	612-922-1425
Mo	Hazelwood, Thomas & Modrcin	314-838-6446
NJ	Mount Laurel, Nauclain Assocs.	609-235-1801
NM	Albuquerque, Elctrn. Comp. Sls.	505-256-9831
NY	Hyde Pk., R. Kennedy	914-229-2269
NY	Manhasset, Win-Cor Elctrn.	516-627-9474
NY	Rochester, R. Kennedy	716-271-6322
NC	Greensboro, S.K. Wallace Assoc.	919-292-0487
NC	Kernersville, S. Wallace Assoc.	919-993-3993
Ohio	Bedford, G&H Sales Co.	216-248-8490
Ohio	Cincinnati, G & H Sls.	513-771-8231
Ohio	Grove City, G & H Sales Co.	614-878-1128
Tenn	Memphis, S. Wallace	901-682-2281
Tex	Dallas, Allied Comp., Inc.	214-348-6660
Tex	Houston, Allied Comp., Inc.	713-782-5406
Utah	Salt Lake City, Elctrn. Comp.	801-486-2317
Wash	Bellevue, Testco Sls.	206-454-7422
Wisc	Waukesha, Lincoln, Hodges	414-542-3087

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NJ	Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys.	609-662-4000

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Cal	San Mateo, J.E. Lape Co.	415-345-3021
Fla	North Miami, L. Haas Co.	305-949-9143
Mass	Waltham, Conti-Younger Assoc.	617-890-4582
Mich	Royal Oak, McAuliffe Sls.	313-545-7177
NJ	Haddonfield, Boenecke Assoc.	609-429-7449
NJ	Irvington, M. Gallagher Inc.	201-399-4350
NY	Pittsford, C. Daniels	716-334-3834
NY	Williamsville, W. S. Stamp & Assoc.	716-634-2240
Ohio	Euclid, Control Dynamics Corp.	216-692-2818
Tex	Dallas, Berthold Sls. Co.	214-526-8329

HANDY & HARMAN, 850 Third Ave., New York, N.Y., 10022, Tel: 212-752-3400, TWX: 212-867-4894; Sls. Mgr: R.E. Burke

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Cal	El Monte (Los Angeles), Handy & Harman	213-283-8181
Ill	Elk Grove Village (Chicago), Handy & Harman	312-437-3883
Mass	Attleboro, Handy & Harman	617-226-1000
Mich	Southfield (Detroit), Handy & Harman	313-356-5390
NY	New York, Handy & Harman	212-752-3400
Ohio	Cleveland, Handy & Harman	216-333-2166
Tex	Dallas, Handy & Harman	214-351-5890

HANSCOM, H.F. CO., INC., 225 Chapman St., Providence, R.I., 02905, Tel: 401-941-1456; Pres: J.F. Hanscom; V.P: W.E. Taplin

HANSEN MFG. CO., Div. P. R. Mallory & Co., Box 23, Princeton, Ind., 47670, Tel: 812-385-3415; Sls. Mgr: A.F. Bridger

HAPCO, Box 1205, Boulder, Colo., 80302, Tel: 303-447-0441; Sls. Mgr: J. Snyder

HARBISON IND'L. PRODS., INC., 7205 Hibbs La., Levittown, Pa., 19057, Tel: 215-943-9000; S/M: F.J. McCartny; Pres: R.J. Harbison

HARDER, DONALD C. CO., INC., 2580 "K" St., San Diego, Calif., 92102, Tel: 714-239-8021; Gen. Mgr: D.P. Ebenezer

HARDMAN INC., Belleville, N.J., 07109, Tel: 201-751-3000, TWX: (710) 995-4969; Mktg. Dir: G.M. Scales

HAROWE SERVO CONTROLS, 48 Westtown Rd., W. Chester, Pa., 19380, Tel: 215-692-2700, TWX: 510-663-0335; Mktg. Dir: W.J. Cuff

Local Sales Offices & Reps.

Ariz	Scottsdale, Fred Schoeffler Assoc. Inc.	602-948-3470
Cal	Hollywood, Westaironics	213-466-6201
Colo	Denver, Franklin Sls.	303-922-3623
Conn	Bloomfield, Zaslow Sls.	203-242-7781
Fla	Ormond Beach, Technology Mktg. Assoc.	904-672-2314
Ill	Chicago, Carlson Elctrn.	312-SP-4-4812
Ind	Ft. Wayne, McDonald Sls.	219-745-9214
Mass	Lowell, Zaslow Sls. Co.	617-458-8452
Minn	Minneapolis, Nortec Sls. Inc.	612-926-2855
Mo	St. Louis, Carlson Elctrn. Sls.	314-991-0262
NJ	Fairfield, Electra Mec. Assoc. Inc.	201-664-1241
NY	Jericho, Electro Rep.	516-938-0540
Ohio	Cleveland, Rockford Controls	216-731-5250
Ohio	Dayton, Rockford Controls	513-274-1931
Okla	Tulsa, Oklahoma Engineers Intl. Co.	918-747-0303
Tex	Dallas, Engineers Int'l.	214-352-2666
Exp:	D.C., Washington, Aeromaritime	202-659-8140
For:	Can., Pierrefonds, Que., Avotronics Ltd.	514-626-6511
For:	Can., Willowdale, Ont., Avotronics Ltd.	416-491-7941

HARREL, INC., 16 Fitch St., E. Norwalk, Conn., 06855, Tel: 203-866-2573; Sls. Mgr: J.C. Parry .....Vol 2•1163

Local Sales Offices & Reps.

Ala	Birmingham, McConnel Sls.	205-871-3501
Cal	Fountain Valley	714-776-4450
Cal	Walnut Creek, Viking Instr.	415-933-1221
Colo	Denver, Electro-Rep.	303-744-2821
Fla	Hialeah, Shaw Engrg. & Sls.	308-888-0835
Ill	Glen Ellyn	312-668-6622
NJ	Yardville	609-365-2171
NM	Albuquerque, Electro-Rep.	505-256-1749
NY	Cazenovia, P.M. Decew, Inc.	315-065-8602
Ohio	Willoughby	216-942-0920

HARRIS SEMICONDUCTOR, Box 883, Melbourne, Fla., 32901, Tel: 305-727-5430, TWX: 510-954-6259; Mktg. Comm. Mgr: J. Kompan

Local Sales Offices & Reps.

Ariz	Scottsdale, Harris Semiconductor	602-946-3556
Cal	Long Beach, Harris Semiconductor	213-426-7687
Cal	San Francisco, Harris Semiconductor	415-964-6443
Colo	Denver, Elmar Elctrns.	303-287-9611
DC	Washington, D.C., Harris Semiconductor	202-337-3170
Fla	Hollywood, Schweber Elctrns.	305-927-0511
Ga	Atlanta, Schweber Elctrns.	404-449-9170
Ill	Illinois, Semiconductor Specialists	312-279-1000
Ill	Schaumburg, Harris Semiconductor	312-894-8824
Ind	Indianapolis, Semiconductor Specialists	313-255-0300
Md	Rockville, Schweber Elctrns.	301-881-2970
Mass	Waltham, Impact Sales	617-893-2850
Mass	Wellesley Hills, Harris Semiconductor	617-237-5430
Minn	Minneapolis, Semiconductor Speacialists	612-854-8841
Mo	Kansas City, Semiconductor Specialists	816-452-3900
NM	Albuquerque, R.V. Weatherford	505-265-5671
NY	Melville, Harris Semiconductor	516-249-4500
NY	Syracuse, Harris Semiconductor	315-463-3373
Ohio	Dayton, Harris Semiconductor	
Pa	Wayne, Harris Semiconductor	215-687-6680
Tex	Richardson, Harris Semiconductor	214-231-9031
Wash	Seattle, R.V. Weatherford	206-243-6340

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Ariz	Phoenix, Liberty Electrns., 3612 N. 16th St.	602-264-4438
Cal	El Segundo, Liberty Elctrns., 124 Maryland St.	213-322-8100
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	San Diego, Western Radio, 1415 India St.	714-235-6571
Colo	Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave.	303-287-9611
Fla	Hollywood, Schweber Elctrns.	305-927-0511
Ga	Atlanta, Schweber Elctrns.	404-449-9170
Ill	Chicago, Schweber Elctrns.	312-593-2740
Ill	Chicago, Semiconductor Specialists, Inc.	312-279-1000
Md	Rockville, Schweber Elctrns.	301-881-2970
Mass	Waltham, Schweber Elctrns.	617-890-8484
Mich	Detroit, Schweber Elctrns.	313-583-9242
NJ	Somerset, Schweber Elctrns.	201-469-6008
NY	Rochester, Schweber Elctrns.	716-328-4180
NY	Westbury, Schweber Elctrns., Jericho Tpke	516-334-7474
NC	Raleigh, Schweber Elctrns.	919-832-8881
Ohio	Beachwood, Schweber Elctrns.	216-464-2970
Wash	Seattle, Liberty Elctrns., 5303 2nd Ave. S.	206-763-8200

HARSHAW CHEM. CO., 1945 E. 97th St., Cleveland, Ohio, 44106, Tel: 216-721-8300

HARTMAN ELECTRICAL MFG., Div. A-T-O, Inc., 175 N. Diamond St., Mansfield, Ohio, 44902, Tel: 419-524-1411, TWX: 810-448-2814; V.P.-Sls: O.C. Walley

HARTWELL CORP., 9035 Venice Blvd., Los Angeles, Calif., 90034, Tel: 213-870-3781, TWX: 910-340-6761; Sls. Mgr: R.E. Bryant; Prod. Mgr: David Bates

HARWIL CO., 903 Colorado Ave., Santa Monica, Calif., 90401, Tel: 213-394-4710; Pres: H. Hutchinson; V.P: W. Gregge

HATFIELD WIRE & CABLE DIV., Continental Copper & Steel Inds., Inc., 360 Hurst St., Box 558, Linden, N.J., 07036, Tel: 201-925-4000, TWX: 138-301; Mgr., Application Engrg: W.O. Hansen; Mgr. Comm. Prods: G.A. Lohsl; Mgr. Mining Prods: P. Hronich

HATHAWAY INDUSTRIES INC., 11616 51st St., Tulsa, Okla., 74145, Tel: 918-663-0110, TWX: 910-845-2129; S/M: C.H. Brunell; App. Eng: L.H. Spellman; App. Eng: Francis D. Leynaert
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Local Sales Offices & Reps.

RELAYS & SWITCHES

Ariz	Phoenix, Airsupply Co.	602-267-3916
Cal	Dublin, Airsupply Co.	415-829-0870
Cal	Gardena, Compar L.A.	213-327-6550
Colo	Denver, R & G Entprs.	303-744-2464
Conn	Wethersfield, Com/Pak	203-563-4784
Ga	Marietta, Airsupply Co.	404-422-8242
Ill	Berkeley, Airsupply Co.	312-544-7400
Ill	Chicago, Memac Sls. Co.	312-545-1033
Kans	Wichita, Airsupply	316-683-7518
Mass	Needham Hghts., Com/Pak	617-444-1259
Mich	Grosse Pointe Pk., Greiner Assoc.	313-499-0188
Minn	Minneapolis, M. Franklin Co.	612-835-6422
Mo	Bridgeton, Airsupply Co.	314-731-3011
NY	Huntington, Airsupply Co.	516-249-1410
NY	Syracuse, Naylor Elec.	315-472-9183
NC	Winston, Industrial Products, Inc.	919-725-5385
Ohio	Columbus, Airsupply Co.	614-861-1129
Ohio	Dayton, Airsupply Co.	513-224-0728
Pa	Landdowne, W.F. Satterthwaite Co.	215-623-5100
Pa	Valley Forge, Airsupply Co.	215-933-8924
Tex	Fort Worth, Airsupply Co.	817-335-4541
Va	Arlington, Airsupply Co.	703-525-1191
Wash	Bellevue, A. Smith Co.	206-746-6770
For:	Can., Downsview, Ont., Applied Tech.	416-636-8722

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Cal	Dublin, Airsupply Co.	910-343-6861
Cal	Santa Monica, Airsupply Co.	213-829-1781
Ga	Marietta, Airsupply Co.	404-422-8242
Ill	Berkeley, Airsupply Co.	312-544-7400
Ind	Indianapolis, Airsupply Co.	317-925-3528
Kans	Wichita, Airsupply Co.	316-683-7518
Mass	Medway, Airsupply Co.	617-533-2078
Minn	Bloomington, Airsupply Co.	612-884-8950
Mo	Bridgeton, Airsupply Co.	314-731-3011
NY	Clinton, Airsupply Co.	315-735-8341
NY	Huntington, Airsupply Co.	516-249-1410
Ohio	Columbus, Airsupply Co.	614-861-1129
Ohio	Dayton, Airsupply Co.	513-224-0728
Pa	Valley Forge, Airsupply Co.	215-933-8924
Tex	Fort Worth, Airsupply Co.	817-335-4541
Va	Arlington, Airsupply Co.	703-525-1191
Wash	Bellevue, Airsupply Co.	206-454-7922

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Cal	Santa Monica, Airsupply Co.	213-829-1781
Fla	Orlando, Von Kamecke Assoc.	305-423-3418
Ga	Marietta, Airsupply Co.	404-422-8242
Ill	Berkeley, Airsupply Co.	312-544-7400
Ind	Indianapolis, Airsupply Co.	317-925-3528
Kans	Wichita, Airsupply Co.	316-683-7518
Mass	Medway, Airsupply Co.	617-533-2078
Minn	Bloomington, Airsupply Co.	612-884-8950
Mo	Bridgeton, Airsupply Co.	314-731-3011
NY	Clinton, Airsupply Co.	315-735-8341
NY	Huntington Sta., Airsupply Co.	516-249-1410
Ohio	Columbus, Airsupply Co.	614-861-1129
Ohio	Dayton, Airsupply Co.	513-224-0728
Pa	Valley Forge, Airsupply Co.	215-933-8924
Tex	Fort Worth, Airsupply Co.	817-335-4541
Va	Arlington, Airsupply Co.	703-525-1191
Wash	Bellevue, Airsupply Co.	206-454-7922
For:	Can., Toronto, Ont., Wilson Entprs.	416-231-7536

HATHAWAY INSTRUMENTS, INC., 5250 E. Evans Ave., Denver, Colo., 80222, Tel: 303-756-8301, TWX: 910-931-0568; Sls. Mgr: M.M. Burgess
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HAWKEYE INSTRUS., INC., 3545 Third Ave., Marion, Iowa, 52302, Tel: 319-377-8241; Sls. Mgr: D. Meuler

HAYDON SWITCH & INSTR., 1500 Meriden Rd., Waterbury, Conn., 06720, Tel: 203-756-7441, TWX: 710-477-2580; V.P./Mktg: E.R. Kambrich

Local Sales Offices & Reps.

Cal	Los Angeles, Fetty/Schoenduve, Inc.	213-651-4050
Cal	Palo Alto, Fetty/Schoenduve, Inc.	415-321-7041
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Conn	Waterbury, Haydon Switch & Instr.	
Conn	Wolcott, Bennett Assocs.	203-879-2478
Fla	Fern Park, M.G. Assocs.	305-841-8793
Ill	Elk Grove Village, J. G. Twist Co.	312-593-0200
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Ind	Indianapolis, R. O. Whitesell & Assoc.	317-359-9283
Ind	Kokomo, R. O. Whitesell & Assoc.	317-453-6868
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Kans	Prairie Village, J. G. Twist Co.	913-236-4646
Ky	Louisville, R. O. Whitesell & Assocs.	502-893-7303
Md	Timonium, Heller Sls. Co.	301-252-4780
Mass	Woburn, All Star Engrg.	617-449-2634
Mich	Grand Rapids, R. O. Whitesell & Assocs.	616-451-8901
Mich	Southfield, R. O. Whitesell & Assocs.	313-358-2020
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Minn	Eden Prairie, F. Peterson Co.	612-941-5400
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Ohio	Cincinnati, R. O. Whitesell & Assoc.	513-521-2290
Ohio	Cleveland, R. O. Whitesell & Assoc.	216-228-7525
Ohio	Columbus, R. O. Whitesell & Assoc.	614-888-9396
Ohio	Dayton, R. O. Whitesell & Assoc.	513-298-9546
Pa	Pittsburgh, R. O. Whitesell & Assoc.	412-242-0100
Tenn	Bristol, R. O. Whitesell & Assocs.	615-968-4195
Wash	Bellevue, Willis Sls. Co.	206-454-3029
Wisc	Waukesha, J. G. Twist Co.	414-786-6330
Exp:	N.Y., New York, Aviquipo, Inc.	212-943-6580

HAYDON Local Distributors

Conn	Hamden, Arrow Elctrncs., 295 Treadwell St.	203-248-3801
Md	Baltimore, Arrow Elctrns., 5207 E. Drive	301-247-5200
Mass	Burlington, Arrow Elctrns., 15 A Street	617-273-0100
NJ	Moorestown, Arrow Elctrns., Pleasant Valley Rd.	609-235-1900
NJ	Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave.	201-797-5800
NY	Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110	516-694-6800
Ohio	Cleveland, Arrow Elctrns., 23945 Merchantile Rd.	216-464-2000
Ohio	Dayton, Arrow Elctrns., 3100 Plainfield Rd.	513-253-9176
Tex	Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St	817-335-6521

HAYSITE DIV., Synthane-Taylor, 5599 New Perry Hwy., Erie, Pa., 16512, Tel: 814-868-3691; Sls. Mgr: R.W. Amundsen

HB ENGINEERING CORP., 11511 Maryland Ave., Beltsville, Md., 20705, Tel: 301-937-5181; Dir. Mktg: F.E. Colonna; Pres: H.M. Baker

HEADWAY RESEARCH, INC., 3713 Forest La., Garland, Tex., 75042, Tel: 214-272-5431; Mktg. Mgr: R.L. Rich

HEATH CO., Dept. 180, Benton Harbor, Mich., 49022, Tel: 616-YU-3-3961, TWX: 616-983-3897; Sls. Mgr: C.A. Robertson

Local Sales Offices & Reps.

Ariz	Phoenix, Heathkit Electronic Center	602-279-6247
Cal	Anaheim	714-776-9420
Cal	El Cerrito	415-236-8870
Cal	La Mesa	714-461-0110
Cal	Los Angeles	213-749-0261
Cal	Pomona, Heathkit Electronic Center	714-623-3543
Cal	Redwood City	415-365-8155
Cal	Woodland Hills	213-883-0531
Colo	Denver	303-422-3408
Conn	Avon, Heathkit Electronic Center	203-678-0323
Fla	Hialeah, Heathkit Electronic Center	305-823-2280
Ga	Atlanta	404-252-4341
Ill	Chicago	312-583-3920
Ill	Downers Grove	312-852-1304
Ind	Indianapolis, Heathkit Electronic Center	317-257-4321
Kans	Mission, Heathkit Electronic Center	913-362-4486
Md	Baltimore, Heathkit Electronic Center	301-661-4446
Md	Rockville	301-881-5420
Mass	Wellesley	617-237-1510
Mich	Detroit	313-535-6480
Mich	East Detroit, Heathkit Electronic Center	313-772-0416
Minn	Hopkins	612-938-6371
Mo	St. Louis	314-638-5100
NJ	Fair Lawn	201-791-6935
NY	Amherst, Heathkit Electronic Center	716-837-3090
NY	Jericho	516-334-8181
NY	New York	212-765-4590
NY	Rochester, Heathkit Electronic Center	716-227-4750
Ohio	Cleveland	216-886-2590
Ohio	Woodlawn	513-771-8850
Pa	Philadelphia	215-288-0180
Pa	Pittsburgh	412-824-3564
Tex	Dallas	214-826-4053
Tex	Houston	713-623-2090
Wash	Seattle	206-682-2172
Wisc	Milwaukee	414-873-8250
Exp:	Mich., Benton Harbor	616-983-3961

HECON CORP., 31 Park Rd., New Shrewsbury, N.J., 07724, Tel: 201-542-9200; Adv. Mgr: W. Fuelleman
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Local Sales Offices & Reps.

Cal	Sherman Oaks, Hecon Western	213-788-3931
Colo	Denver, D. E. Bond Assocs.	303-756-1234
Fla	Maitland, Hutto-Hawkins-Peregoy	305-831-2474
Fla	Pompano Beach, Hutto-Hawkins-Peregoy	305-943-9593
Ga	Atlanta, Hecon Corp.	404-758-7306
Ill	Hanover Park, Hecon Corp.	312-289-2859
Kans	Prairie Village, Engrg. Svcs. Co.	913-649-4000
Mass	Boston, Hecon Corp.	617-262-5043
Mo	St. Louis, Engrg. Svcs. Co.	314-726-2233
NJ	Laurel Springs, Hecon Corp.	609-784-2334
NJ	Wayne, Hecon Corp.	201-839-5454
NY	Pennellville, Hecon Corp.	315-463-3661
Ohio	Port Clinton, Hecon Corp.	419-734-4556
Okla	Tulsa, Hecon Corp.	918-627-2774
Utah	Salt Lake City, e h distributing	801-277-9539
Va	Lynchburg, Royelec Sls. Assocs.	703-846-7117
Wash	Seattle, Fairman B. Lee Co.	206-244-7262
For:	Can., Rexdale, Ont., Hecon of Canada, Ltd.	416-678-2441

HECON Local Distributors

Ala	Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr.	205-539-2731
Cal	Mt. View, Powell Elctrns/California, Box 997, 411 Fairchild Dr.	415-964-0820
Fla	Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave	305-885-8761
Fla	Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way	305-859-1450
Md	Beltsville, Powell Elctrns/Washington, 10728 Hanna St.	301-937-4030
NY	Scarsdale, Logicomp Elctrns. Inc., Box 37H	914-723-3334
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080
Ohio	Warren, REM Elctrns. Supply Co., 264 W. Market St.	216-399-2777
Pa	Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave	215-365-1900
Pa	Pittsburgh, Cameradio Co., 2801 Liberty Ave.	412-391-7400
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	

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HEIMANN GMBH, 63 E. Sandford Blvd., Mt. Vernon, N.Y., 10550, Tel: 914-699-0050; Prod. Mgr: H.F. Maier

HEINEMANN ELEC. CO., 2636 Brunswick Pike, Trenton, N.J., 08602, Tel: 609-882-4800; Mktg. Mgr: B.A. Plesser
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Local Sales Offices & Reps.

Ala	Birmingham, J. Spader Co.	205-879-1366
Ariz	Phoenix, M. Richardson Assocs.	602-278-6296
Cal	Burlingame, Campbell & George	415-697-2965
Cal	Encino, Porter Co.	213-788-2350
Colo	Denver, P.A. Douden	303-744-1497

Fla Oviedo, Conley & Assocs., Inc. 305-365-3283
Fla Tampa, Conley 813 933-3183
Ill Chicago, D. Dolin Sls. 312-286-6200
Ind Marion, O. Bromberg 317-664-5384
Ky Louisville, O. Bromberg 502-245-8916
Md Ellicott City, McCourt 301-465-4515
Mass Boston, Elec. Apparatus 617-782-7440
Mich Dearborn, G. Horne 313-561-1360
Minn Minneapolis, H. Smith 612-335-8911
Mo St. Louis, Hill & Co. 314-621-1818
NJ Ridgewood, Ballou, Inc. 201-444-6990
NJ Trenton, Kriegner Sls. 609-882-6330
NY Binghamton, Canavan Scanlon 607-724-7220
NY Buffalo, Canavan-Scanlon 716-839-3373
NY Rochester, Canavan-Scanlon 716-442-0720
NY Syracuse, Canavan-Scanlon 315-437-1271
NC Charlotte, J. Rudisill Assocs., Inc. 704-377-6901
Ohio Cincinnati, O. Bromberg 513-381-5728
Ohio Cleveland, Brown Elect. Prod. 216-861-0114
Okla Tulsa, Comps. Inc. 918-583-9149
Pa Pittsburgh, Brown Elec. Equip. 412-563-4444
Tenn Memphis, Ransom Sls. 901-332-0036
Tex Dallas, Glidden Electro Equip. 214-363-6539
Tex Houston, Glidden Electro Equip. 713-681-1415
Wash Mercer Island, J. Andersen 206-232-0484
Wisc Milwaukee, E. Dickinson 414-CO-4-1080

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Fla Orlando, Hall-Mark Elctrn., 7233 Lake Ellenor Dr. 305-855-4020
Ill Elk Grove Vi, Hall-Mark Elctrns. Corp., 180 Crossen Ave 312-437-8800
Kans Lenexa, Hall-Mark Elctrn., 9006 Rosehill Rd. 913-888-4747
Minn Minneapolis, Hall-Mark Elctrns., 4555 W. 77th St. 612-925-2944
Mo St. Louis, Hall-Mark Elctrn. Corp., 6100 Madison Ave. 314-521-3800
NJ Cherry Hill, Hamilton/Avnet Elctrns. 609-662-9337
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Farmingdale, Hall-Mark Elctrns., 167 Marine St. 516-293-7500
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-9000
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Okla Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave. 918-835-8458
Pa Trevose, Hall-Mark Elctrns., Box 125 215-355-7300
Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
Tex Houston, Hall-Mark Elctrn., Box 36739 713-781-6100
Wisc Milwaukee, Hall-Mark Elctrns., 11925 Ripley Ave. 414-476-1270

HEITZ, KARL, INC., 979 Third Ave., New York, N.Y., 10022, Tel: 212-421-5220; Sls. Mgr: M. Schlapfer

HELI-COIL PRODS., Div. Mite Corp., Shelter Rock La., Danbury, Conn., 06810, Tel: 203-743-7651, TWX: 710-456-0336; Sls. Mgr: B.B. Morgan, Jr.

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Ga Atlanta, J. O. King, Inc. 404-355-7660
Ill Downers Grove, S. W. Anderson Co. 312-964-2600
Mich Detroit, A. A. Geisler Co. 313-255-1450
Tex Arlington, G. J. Fix Co. 817-261-8241
Exp: New York, N.Y., Resources & Facilities 212-687-4741

HELICAL PRODS. CO., INC., P.O. Box 4, Hermosa Beach, Cal., 90254, Tel: 213-374-9941; Pres: H.L. Merrell

HELIOTEK, Div. Textron, Inc., Box 4158, Sylmar, Calif., 91342, Tel: 213-365-4611, TWX: 910-496-1488; Aerospace Business Mgr: C.W. Quillin; Sls. Mgr. (Solar Cells): K. Eacrett; Sls. Mgr. (PV devices): R. Harper

HELIX SPRING CORP., 35-10 10th St., Long Island City, N.Y., 11106, Tel: 212-YE-2-0303; Sls. Mgr: S. Treibish

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Cal Los Altos, C. D. Buerki Co. 415-941-3343
Conn Bridgeport, Technical Instrs., Inc. 203-368-4582
Fla Clearwater, H. R. Gross & Co. 813-446-6649
Ill Des Plaines, Automated Process, Inc. 312-299-3656
Ind Cumberland, Automated Process, Inc. 317-251-0708
Kans Overland Park, Production Automation Corp. 913-236-6600
Mass Wilmington, Technical Instrs., Inc. 617-944-3930
Mich Detroit, Electro Entprs., Inc. 313-521-1500
Minn Minneapolis, Automated Process, Inc. 615-545-4481
Mo St. Louis, Production Automation Corp. 314-426-2331
NJ Saddle Brook, L & M Assocs., Inc. 201-843-8700
NY Brentwood, L & M Assocs., Inc. 516-231-8363
NY New York, L & M Assocs., Inc. 212-675-7486
NC Raleigh, F. G. Speidel 919-787-4521
Ohio Cleveland, Electro Entprs., Inc. 216-261-7670
Ohio Dayton, Electro Entprs., Inc. 513-426-6071
Ore Yamhill, Walsh-Ehlers, Inc. 503-662-3207
Pa Andalusia, L & M Assocs., Inc. 215-639-3100
Tex Dallas, R. W. Mureen Co. 214-350-8142
Wash Bellevue, Walsh-Ehlers, Inc. 206-454-2211
Wisc Milwaukee, Automated Process, Inc. 414-354-4370
Exp: New York, N. Y., E. D. Allmendinger, Inc. 212-269-0090

HENRY PRODS. CO., INC., 500 Bayview, Inwood, N.Y., 11696, Tel: 516-371-4100; Sls. Mgr: J. Dorino

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Ohio Dayton, Rixan Assocs., Inc. 513-278-4216

HENSCHEL CORP., 14 Cedar St., Amesbury, Mass., 01913, Tel: 617-388-1103; V.P. Mktg: G. Landers; Sls. Engr: F.L. Clark

HERMES PLASTICS, INC., 20 Cooper Square, New York, N.Y., 10003, Tel: 212-533-5100; V. P: Z. Kozak

HERMETIC SEAL CORP., 4232 Temple City Blvd., Rosemead, Cal., 91770, Tel: 213-283-0411, TWX: 910-587-3352; Engrg. Sls. Mgr: E.E. Harrison

HERTZ FILTER, 3 Aerial Way, Syosset, N.Y., 11791, Tel: 516-822-4770; Sls. Mgr: B. Dworkin

HEWLETT-PACKARD, 1501 Page Mill Rd., Palo Alto, Cal., 94304; Sls. Mgr: J. Petrak ..... Vol 1•695-698

HEWLETT-PACKARD Local Distributors
Ala Huntsville, Hall-Mark Elctrns., Box 1133 205-539-0691
Ariz Phoenix, Liberty Electrns., 3612 N. 16th St. 602-264-4438
Cal El Segundo, Liberty Elctrns., 124 Maryland St. 213-322-8100
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Fla Hollywood, Schweber Elctrns. 305-927-0511
Ga Atlanta, Schweber Elctrns. 404-449-9170
Ill Chicago, Schweber Elctrns. 312-593-2740
Kans Lenexa, Hall-Mark Elctrn., 9006 Rosehill Rd. 913-888-4747
Md Rockville, Schweber Elctrns. 301-881-2970
Mass Waltham, Schweber Elctrns. 617-890-8484
Mich Detroit, Schweber Elctrns. 313-583-9242
Mo St. Louis, Hall-Mark Elctrn. Corp., 6100 Madison Ave. 314-521-3800
NJ Somerset, Schweber Elctrns. 201-469-6008
NY Rochester, Schweber Elctrns. 716-328-4180
NY Westbury, Schweber Elctrns., Jericho Tpke 516-334-7474
NC Raleigh, Hall-Mark Elctrns., 3000 Indust. Dr. 919-832-4465
NC Raleigh, Schweber Elctrns. 919-832-8881
Ohio Beachwood, Schweber Elctrns. 216-464-2970
Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
Tex Houston, Hall-Mark Elctrn., Box 36739 713-781-6100
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200

HEXACON ELEC. CO., 621 W. Clay Ave., Roselle Park, N.J., 07204, Tel: 201-CH-5-6200, TWX: 138812; V-P, Mktg. & Sls: R.J. Benes ..... Vol 3•1238,1239

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Ariz Phoenix, MD. Rebco Sls. 301-592-8907
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Cal L.A., Dillon Stevens Co. 213-747-9221
Colo Denver, Bax & Co. 303-756-1804
Conn Woodstock, HDQ & HV Neff 203-974-1281
Fla Winter Pk., Young & Lawrence Assoc. 305-647-6929
Ill Chicago, EMF Co. 312-889-8323
Ind Carmel, R. Ribaudo 317-846-4021
Kans Kansas City, L.E. Bruns 913-287-5242
NJ Cherry Hill, Hunt Assoc. 609-428-6666
NY New Hartford, V. Clair 315-735-8122
NY New York City, Dunn & Bryan 212-964-8091
NY New York City, Lincoln Export Co. 212-344-0210
Ohio Berea, Mid American Mktg. 216-826-1033
SC Greenville, J.B. Jackson 803-244-2508
Tenn Memphis, H. Carson 901-398-6194
Tex Richardson, P.J. Scanlon 214-AD-1-4661
Wash Seattle, Latham Sls. Assoc. 206-284-5024
Wisc Milwaukee, Process Tech 414-464-6620-6621
Exp: Hato Rey, P.R., M. Anderson 809-722-1654
For: Can., Montreal W. P. Q., W. P. Q. Adtool 514-482-2548

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HI-G, Spring St. & Rte. 75, Windsor Locks, Conn., 06906, Tel: 203-623-2481, TWX: 710-420-0592; V.P. Mktg: R.R. Carroll ..... Vol 2•785-796

Local Sales Offices & Reps.
Ala Huntsville, Interep Assocs. 205-881-3677
Ariz Scottsdale, Barnhill Five 602-947-7841
Cal Menlo Pk., J.S. Heaton 415-369-4671
Cal Woodland Hills, Interstate Mktg. 213-883-4235
Colo Denver, Barnhill Five 303-934-5505
Fla Hialeah, Shaw Engrg. 305-888-0835
Fla Oviedo, Conley & Assocs. 305-365-3233
Fla Tampa, Conley & Assocs. 813-933-3183
Ill Chicago, Engineered Sls. 312-867-8434
Ind Ft. Wayne, The Given Corp. 219-432-5585
Md Timonium, Heller Assocs. 301-252-4780
Mass Lexington, J.E. Boeing Co. 617-862-2500
Mich Southfield, Rep Elctrn. Prods. 313-354-9066
Minn St. Paul, R. G. Ragon 612-488-0201
Mo St. Charles, Buse Sls. 314-739-1613
NM Albuquerque, Barnhill Five 505-265-7766
NY Jericho, HRC Assocs. 516-822-5550
NY Rochester, Canavan-Scanlon 716-442-0720
NY Syracuse, Canavan-Scanlon 315-463-9161
NC Bethania, Candor Co. 919-924-1480
Ohio Cincinnati, Comps., Inc. 513-721-2997
Ohio Cleveland, Comps., Inc. 216-842-2737
Ohio Dayton, P.E. Montplaisir 513-434-4316
Pa Ardmore, Freedman Assocs. 215-649-3679
Tex Dallas, Blackburn Assocs. 214-351-9991
Tex Dallas, Jacobsen Co. 214-363-7584
Wash Bellevue, Ruggles Tech. 206-455-2778
For: Can., Cooksville, Ont., Anbak Sls. 416-625-1061
For: Can., Ile Perrot Sud, Que., Anbak Sls. 514-453-6375

HI-G Local Distributors
Ariz Phoenix, Mirco Electrn. Dist., 2104 W. Peoria Ave. 602-944-2281
Cal Chatsworth, Westates Elctrns. Corp., 20151 Bahama St. 213-341-4411
Cal Goleta, Radio Prods. Sls., 350 S. Kellogg Ave 805-964-6823
Cal Hollywood, Hollywood Radio & Electr., 5250 Hollywood Blvd. 213-466-3181
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal San Carlos, Sterling Electronics, 1061 Industrial Rd. 415-592-2353
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Fla Orlando, Hall-Mark Elctrn., 7233 Lake Ellenor Dr. 305-855-4020
Ill Elk Grove Vi, Hall-Mark Elctrns. Corp., 180 Crossen Ave 312-437-8800
Ind Indianapolis, Graham Elctrncs., 133 S. Penn. St. 317-634-8480
Md Savage, Pyttronic Ind., 8200 Wellmoor Ct.
Mass Lexington, Harvey R & D Electrnc., 44 Hartwell Ave. 617-861-9200
Mass Watertown, DRW Electronics, 600 Pleasant St. 617-923-1900
Minn St. Paul, Ragon, 1136 W. Larpenteur St. 612-488-0201
Mo St. Charles, Lectronix, Inc., 214 N. 2nd St. 314-946-6424
NJ Fairfield, Delburn Electronics, 345 Kaplan Dr. 201-227-6200
NY Farmingdale, DRW Electronics, 100 Milbar Blvd. 516-249-2660
NY Vestal, Federal Elctrn., Vestal Pkwy.
NY Woodbury, Harvey Radio, 60 Crossways Park W. 516-921-8700
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
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Pa Montgomeryville, Pyttronic Inds. Inc., Stump Rd., Box 433 215-643-2850
Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
For: Can., Que., Montreal, Specialty Electrns. Ltd., 2690 Pitfield Blvd. 514-336-4500

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HICKOK ELECT. INSTR., 10514 Dupont Ave., Cleveland, Ohio, 44108, Tel: 216-541-8060, TWX: 810-421-8286; Mkt. Mgr: B.A. Weitz; Sls. Mgr: R.A. Bush Vol 1•345,452,453; Vol 4•339,407-411*

Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown 205-539-4411
Ariz Scottsdale, BFA 602-946-4215
Cal Los Angeles, FLW 213-877-5518
Cal Newport Beach, FLW, Inc. 714-540-4412
Cal Palo Alto, Coherent Mktg. 415-327-2217
Cal San Diego, FLW 714-277-0993
Colo Denver, BFA Corp. 303-744-3301
Conn Hamden, J & J Assocs. 203-624-7800
DC Wash., Powell-Pendergraph 301-656-4535
Fla Orlando, W.A. Brown 305-425-5505
Ga Atlanta, F.A. Brown 404-939-1674
Haw Honolulu, Precision Radio Ltd. 808-537-5291
Ill Chicago, Midwest Elctrn. Sls. 312-626-0030
Ind Indianapolis, Midwest Elctrn. Sls. 317-926-3736
Iowa Cedar Rapids, Midwest Elctrn. Sls. 319-362-4410
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Mass Burlington, J & J Assocs. 617-272-2606
Mich Detroit, B. Hocker 313-531-1403
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NM Las Cruces, BFA Corp. 505-523-0601
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NY Schenectady, Labtronics 518-372-6649
NY Syracuse, Labtronics 315-454-9314
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Tex Austin, A. Barnes 512-454-4371
Tex Dallas, A. Barnes 214-235-4541
Tex Houston, A. Barnes 713-523-7333
Va Richmond, Powell-Pendergraph 703-264-2341
Wash Seattle, Datacom Assocs. 206-329-2989
Wisc Waukesha, Midwest Elctrn. Sls. 414-542-5129
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For: Can., Ottawa, Whittaker Elctrns. 613-224-1221
For: Can., Toronto, Whittaker Elctrns. 416-247-7454
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Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370

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Cal Newport Beach, Fieldtec Incorp. 714-540-4000
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Haw Honolulu, The H. S. Gray Co., Ltd.
Md Bethesda, Bartlett Assocs., Inc. 301-656-3061
Mass Hingham, HVEC 617-749-9000
Minn Minneapolis, Bican Co. 612-827-4734
NY White Plains, Bartlett Assocs., Inc. 914-949-6476
Pa Wayne, Bartlett Assocs., Inc. 215-688-7325
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HIGH VOLTAGE ENGRG. CORP., S. Bedford St., Burlington, Mass., 01803, Tel: 617-272-1313, TWX: 710-332-0245

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NY Latham, L-Tron Corp. 518-785-5032
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NY Conklin, Ramcom, Inc. 607-775-0641
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Fla Palm Beach Gardens, Beacon Elctrns. 305-622-2770
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Md Lanham, Eastern Compts. 301-794-8610
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Mich St. Joseph, R. O. Whitesell & Assoc. 616-983-7337
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NY Fayetteville, M. P. Andrews, Inc. 315-637-3144
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Conn Westport 203-226-1051
Fla Jacksonville 904-396-6971
Fla Miami 305-573-1201
Fla Orlando 305-894-3131
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NC	Raleigh	919-787-0170
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Colo	Littleton, Aztec Entprs.	303-795-0250
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NC	Charlotte, J.L. Highsmith	704-333-7743
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Ohio	Loveland, Ridgway East	513-683-4350
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Va	Richmond, J. Highsmith	703-272-5888
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Ill	Milford, Howard Inds.	815-889-4105
Minn	Minnetonka, T.H. Ayres Assocs.	612-474-4125
Ohio	Dayton, Howard Inds.	513-434-9822

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Ohio	Cleveland, Pattison Supply Co., 4550 Willow Pkwy.	216-441-3000

HOWE RICHARDSON SCALE CO., 680 Van Houten Ave., Clifton, N.J., 07015, Tel: 201-GR-1-3400; V.P. Mktg: J. Giner

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Ind	Ft. Wayne, Val-Skol	219-742-9122
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Minn Mpls, R. Siedare 612-533-2294
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Cal Mountain View, R. Muenzer 415-964-0390
Cal Torrance, Mitronics Industries 213-323-7934
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Fla Ft. Lauderdale, Semquip 305-772-3002
Ill Chicago, Plosnich & Assocs.
Kans Shawnee Mission, Mid America Mktg. 913-236-4800
Md Baltimore, Callas Elctrns. 301-744-7711
NJ Nutley, D/R Assocs. 201-667-5900
NJ Upper Montclair, Controlyne 201-744-8378
NM Albuquerque, Thorson Co. 505-265-5655
Ohio Dayton, Micro Sls. 513-298-3033
Tex Dallas, Airep Elctrns. 214-363-5291
Wash Bellvue, General Elctrns. 206-885-4148

IMC MAGNETICS CORP., Corporate Offices, 570 Main St., Westbury, N.Y., 11591, Tel: 516-334-7070, TWX: 510-222-4469; V.P. Sls. Eastern Div: E. Egan; Sls. Mgr. N. Hampshire Div: R. Smith; Sls. Mgr. Western Div: E.W. Blair ..... Vol 2•649; Vol 3•1046

Local Sales Offices & Reps.
Cal Los Altos, Recht Assocs. 415-941-0336
Cal Los Angeles, Elcom Sls. 213-223-1351
Colo Denver, Lindberg Co. 303-758-9033
Conn New Haven, Gerber Sls. 203-777-6279
Fla Orlando, Duay Entprs. 305-277-3296
Fla Orlando, Gra-Mar, Inc. 305-894-3351
Ill Chicago, Berndt Assocs. 312-283-0713
Ill Chicago, Communications Engrs. 312-761-0548
Ill Rolling Meadows, Sumer, Inc. 312-392-7370
Ind Ft. Wayne, Waid & Assocs. 219-422-4344
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Mass E. Longmeadow, Gerber Sls. Co. 413-525-3059
Mass Waltham, Gerber Sls. 617-891-8040
Mich Dearborn, Villani-Pitcher 313-271-4600
Minn Minneapolis, Nortec Sls., Inc. 612-920-8414
Minn Minneapolis, Stack-Johnson 612-925-2111
Mo Kansas City, Harris-Hanson 816-444-9494
Mo St. Louis, Harris-Hanson 314-432-3611
NJ Haddonfield, Mesa Technical 609-429-9531
NM Albuquerque, Lindberg Co. 505-345-2489
NY Great Neck, Trionics Assocs. 516-466-2300
NY Rochester, Fowler-Beach 716-586-0468
Ohio Dayton, Bek Assoc. 513-278-6851
Ore Portland, Brett Assocs. 503-232-4184
Pa Pittsburgh, G. S. Root & Co. 412-561-4125
Tex Dallas, Hillman Entprs. 214-521-2070
Tex Richardson, Vista Assocs. 214-235-4547
Utah Salt Lake City, Lindberg Co. 801-364-6409
Wash Seattle, Brett Assocs. 206-935-8054
Wisc Wauwatosa, Larson Assocs. 414-258-0529
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IMC MAGNETICS CORP., New Hampshire Div., Rte. 16B, Rochester, N.H., 03867, Tel: 603-332-5300, TWX: 510-297-4466; Pres: K.E. Friese; Sls. Mgr: R. Smith **Vol 3•1047**

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Ala	Huntsville, Powertronics	205-852-6347
Ariz	Scottsdale, Fryco Engrg.	602-945-3281
Cal	Los Altos, Recht Assocs.	415-941-0336
Cal	Los Angeles, Elcom Sls. Co.	213-223-1351
Colo	Denver, Lindberg Co.	303-758-9033
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Fla	Orlando, Duay Entprs.	305-277-3296
Ill	Rolling Meadows, Sumer Inc.	312-392-7370
Ind	Ft. Wayne, Sumer Inc.	219-774-4331
Md	Baltimore, D.K. Jones & Assoc.	301-752-0577
Mass	E. Longmeadow, Gerber Sls. Co.	413-525-3059
Mass	Waltham, Gerber Sls. Co.	617-890-8040
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Minn	Minneapolis, Sumer Inc.	612-920-8414
NJ	Haddonfield, Mesa Technical Assocs.	609-429-9531
NM	Albuquerque, Lindberg Co.	505-345-2489
NY	Great Neck, Tronic Assocs.	516-466-2300
NY	Rochester, Fowler-Beach	716-586-0468
NC	Raleigh, Powertronics	919-787-9090
NC	Thomasville, Powertronics	919-476-4257
Ohio	Dayton, Bek Assocs.	513-278-1343
Ore	Portland, Shaffer & Nelson	503-234-7437
Pa	Pittsburgh, G.S. Root & Co.	412-561-4125
Tex	Dallas, Hillman Entprs.	214-521-9907
Utah	Salt Lake City, Lindberg Co.	801-364-6409
Wash	Seattle, Shaffer & Nelson	206-523-0664
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For:	Can., Willowdale, Ont., F.P. Taylor Ltd.	416-222-6924

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Utah	Salt Lake City, Standard Supply Co., 225 E. 6th So.	801-355-2971

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Cal	Los Angeles, El Com Sls.	213-223-1351
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Conn	New Haven, Gerber Sls.	203-777-6279
Fla	Orlando, Duay Entprs.	305-277-3296
Ga	Atlanta, Beacon Elctrn. Assocs.	404-351-3654
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Minn	Minneapolis, Stack-Johnson	612-925-2111
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Mo	St. Louis, Harris-Hanson	314-962-0111
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NY	Great Neck, Trionic Assocs.	516-466-2300
Ohio	Dayton, Bek Assocs.	513-278-6851
Ore	Portland, Shaffer & Nelson	503-234-7437
SC	Spartanburg, Beacon Elctrn. Assocs.	803-567-7462
Tex	Dallas, J. Oechsner	214-631-0402
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Va	Falls Church, Beacon Elctrn. Assocs.	703-534-1868
Wash	Seattle, Shaffer & Nelson	206-LA-3-0664

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INDIANA GENERAL, Magnet Prods., 405 Elm St., Valparaiso, Ind., 46383, Tel: 219-462-3131, TWX: 910-690-4890

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Ariz	Phoenix, Shepherd Comps.	602-934-0425
Cal	Los Altos, Frauman Assocs	415-941-0660
Cal	Van Nuys, Shepherd Comps.	213-787-4610
Colo	Denver, Connors Inc.	303-934-5829
Conn	W. Simsbury, Anchor Engrg. Corp.	203-658-6261
Fla	Indialantic, Comps. Sls. Corp.	305-727-2681
Fla	St. Petersburg, Comps. Sls.	813-360-7460
Ill	Chicago, K.D. Engle	312-539-1820
Kans	Leawood, Fixman Eng.	913-649-0679
Kans	Wichita, G. Fixman Engrg. Co.	316-MU-2-9433
Md	Baltimore, ME & Assocs.	301-825-1130
Mass	Wellesley Hills, Anchor Engrg.	617-235-6330
Mich	Oak Pk., W. Spenser	313-398-8005
Minn	Wayzata, G.A. Kelly	612-GR-3-7602
Mo	St. Louis, Fixman Engrg.	314-PA-5-5219
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NY	Albany, Niagara Electric Sls.	518-869-0130
NY	Buffalo, Niagara Elec. Sls.	716-TT-6-4000
NY	Manhasset, Kaelber & Mack, Inc.	516-MA-7-6620
NY	Rochester, Niagara Elec. Sls. Co.	716-BR-1-1223
NY	Syracuse, Niagara Electric Sls.	315-422-9177
Tenn	Chattanooga, Ind'l. Hardgoods Co.	615-267-0907
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Wash	Seattle, Fleehart & Sullivan	206-522-1533
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For:	Can., Windsor, Ont., W. Spenser Co.	519-969-1332

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Minn	Minneapolis, Elctrn Center Inc., 127 3rd Ave. N.	612-338-5881
Mo	St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave	314-MA-1-5000
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080
Okla	Tulsa, Oil Capitol Elec., 708 S. Sheridan	918-836-2541
Pa	Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave	
Pa	Erie, Mace Elctrn., 2631 W. 8th St.	814-838-3544
Utah	Salt Lake City, Standard Supply Co., 225 E. 6th So.	801-355-2971

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Colo	Denver, Checkmate	303-771-4920
Conn	North Haven, Kitchen & Kutchin	203-239-0212
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Kans	Overland Park, Ensco/Rep.	913-381-7557
Md	Rockville, Marktron	301-762-6210
Md	Towson, Marktron	301-825-8222
Mass	Lexington, Kitchen & Kutchin	617-862-8230
Mich	Detroit, L. Dickelman	313-255-3300
Minn	St. Paul, Magnuson	612-227-8495
Mo	St. Louis, Ensco/Rep.	314-567-3935
NM	Albuquerque, Data Handling	505-268-4364
NY	Buffalo, Ossmann Component	716-832-4271
NY	Great Neck, E.R.A.	516-482-9320
NY	Kingston, Ossmann Component	914-338-5505
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NY	Syracuse, Ossmann Component	315-454-4477
NY	Vestal, Ossmann Component	607-785-9949
Pa	Bala Cynwyd, Vantage Sales	215-667-0990
Pa	Pittsburgh, Russell Clark	412-242-9500
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Ariz	Phoenix, Luscombe Engrg., Co.	602-274-1542
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Ill	Wheaton, Engrg. Prods. Assoc.	312-653-6826
Ind	Indianapolis, Midwest Elctrn. Sls.	317-926-3736
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Minn	St. Paul, Engrg. Prods. Assoc.	612-646-8819
NY	Great Neck, Industron Assocs., Inc.	516-HU-7-2620
NC	Raleigh, Int'l. Sci. Instrs.	919-787-7244
Pa	Abington, Powell-Pendergraph	215-887-1135
Wisc	Waukesha, Midwest Elctrn. Sls.	414-542-5129
Exp:	N.Y., N.Y., Ad. Auriema	212-349-8516

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La	New Orleans, Ralph's, Inc., 4334 Stemway Dr.	504-242-2731
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Okla	Tulsa, Oil Capitol Elec., 708 S. Sheridan	918-836-2541
Pa	Pittsburgh, Cameradio Co., 2801 Liberty Ave.	412-391-7400
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	
Tex	Beaumont, Ralph's, Inc., 1270 Broadway	713-833-9443

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INFO-LITE CORP., 46-10 104 St., Corona, N.Y., 11368, Tel: 212-476-1287; Sls. Mgr: J. Cartelli ..... Vol 2•510

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Md	Baltimore, Kaufholz Assocs.	301-488-6561
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Tex	Houston, Glidden Electro Equip.	713-681-1415

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Cal	Los Angeles, IFM - South	213-321-4428
Mass	Burlgtn., Resch. Instrs.	617-272-1800
Va	Falls Church, Jay Co.	703-534-7800
Wash	Seattle, Assoc. Inds.	206-723-5600

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Conn Bethany, Representatives Corp. 213-393-0024
Ill Elk Grove Village, J. G. Twist Co. 312-593-0200
Ind Fort Wayne, R. O. Whitesell & Assocs. 219-432-5591
Ind Indianapolis, R. O. Whitesell & Assocs. 317-359-9283
Ind Kokomo, R. O. Whitesell & Assocs. 317-453-6868
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Kans Prarie Village, J. G. Twist Co. 913-236-4646
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Mich Grand Rapids, R. O. Whitesell & Assocs. 616-451-8901
Mich Southfield, R. O. Whitesell & Assocs. 313-358-2020
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Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021

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Mo St. Louis, Sci. Sls. 314-968-1133
NJ Harrington Pk., Metro Tech. Sls. 201-768-8495
NM Albuquerque, Vinson 505-298-7442
NY Buffalo, Telesco 716-834-1026
NY Jericho, Metro Tech. Sls. 516-935-3330
NY Vestal, Telesco Assoc. 607-729-6339
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Cal Palo Alto, O'Donnell Assocs. 415-327-9260
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NC Charlotte, McLean Sls. Co. 704-366-2675
Ohio Cincinnati, J.G. McLaughlin & Assoc. 513-561-2285
Tex Irving, Lee Sls. Co. 214-363-3831

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Cal Culver City, E. V. Roberts & Assoc. 213-870-9561
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Kans Shawnee Mission, Kathrinus, Kelly & Co. 913-722-0000
La Chalmette, Cartwright & Bean 504-279-4598
Me Denmark, Great Northern Elec. Co. 207-783-6131
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Minn Edina, M Foster Co. 612-941-7600
Mo St. Louis, Kathrinus, Kelly & Co. 314-962-5627
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NY Garden City, Comtronic Assoc. 516-741-8966
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NC Raleigh, Cartwright & Bean, Inc. 919-832-7128
Ohio Chagrin Falls, Elctrns. Salesmaster, Inc. 216-247-8201
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Pa Allison Park, Trinkle Sales, Inc. 412-487-1645
Tenn Memphis, Cartwright & Bean 901-276-4442
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For: Can., Toronto, Ont., Metermaster Div:/R.H.Nichols

JFD ELCTRNS., Components Div., 15th Ave. at 62nd St., Bklyn., N.Y., 11219, Tel: 212-331-1000, TWX: 710-584-2462; Sls. Mgr: G. Ollen ..... Vol 3•484

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Ala Huntsville, 20th Century Mktg. 205-772-9237
Ariz Tempe, Argus Sls. 602-947-8355
Cal Los Altos, Reoht Assocs. 415-941-0336
Cal Van Nuys, Riker-Maxson 213-785-0487
Colo Denver, Randy Smith Assoc. 303-399-1132
Fla Altamonte Springs, SemTronic Assocs. 305-831-8233

Fla Pompano Beach, SemTronic Assocs. 305-772-8735
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Ind South Bend, V. Schillinger & Assoc. 219-291-6258
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Minn Hopkins, Beta Engrg. Corp. 612-938-2551
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Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
NY Syracuse, Hamilton/Avnet Elctrns. 315-437-2642
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021

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Cal Menlo Pk., Straube Assocs. 415-323-2476
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Fla Orlando, Perrott Assocs., Inc. 305-275-1132
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Ind South Bend, Valentine & Schillinger 219-291-6258
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Mass Seekonk, J. Murphy Assocs. 617-761-7153
Minn Minneapolis, Stoss Assocs. 612-925-2757
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Pa Philadelphia, Professional Svc. Assocs. 215-722-8222
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Wash Seattle, R. Johnston Co. 206-524-5170
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Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070

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Ariz Mesa, J.B. Microelctrns., Inc. 602-834-0504
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Colo Boulder, Straube/Mountain States, Inc. 303-443-8600
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Md Silver Springs, Rep-Tron, Inc. 301-593-4844
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Ohio Cleveland, Electro-Com 216-886-2404
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Fla Maitland, Hutto, Hawkins, Peregoy 305-831-2474
Fla Pompano Beach, Hutto, Hawkins, Peregoy 305-943-9593
Ga Atlanta, Millar Elctrns. 404-261-6160
Ill Chicago, Ellinger Sls. 312-763-1570
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Kans Overland Park, T. L. Dowell Co. 913-649-6069
La Chalmette, Cartwright & Bean 504-279-4598
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Tenn Memphis, E.F.Johnson 901-396-4231
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Tex Houston, R.E. Nesbitt Co. 713-224-3633
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Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
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Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
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NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
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Ohio Cleveland, Farr Elctrns, 5403 Prospect Ave. 216-881-7403
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
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Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801
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Cal	Pasadena, Luscombe Engrg.	213-684-2000
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Cal	Pasadena, Luscombe Engrg.	213-684-2000
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NC	Winston-Salem, Int'l. Scien. Instrs.	919-722-1783
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Minn	St. Paul, De Beck Assocs.	612-690-1557
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Ore	Portland, W. S. Haynes Assoc.	503-236-2744
Tex	Dallas, General Power Equip. Co.	214-368-4655
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Mass	Burlington, Tekdata	617-273-0198
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Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971

KMC SEMICONDUCTOR CORP., Parker Rd., RD 2, Long Valley, N.J., 07853, Tel: 201-876-3811, TWX: 510-235-3350; Sls. Mgr: P. Breen, Jr

KNOWLES ELCTRNS., INC., 3108 N. Mannheim Rd., Franklin Park, Ill., 60131, Tel: 312-455-3600; Dir. Mktg: C.K. Apel

KOH-I-NOOR RAPIDOGRAPH, 100 North St., Bloomsbury, N.J., 08804, Tel: 201-479-4124, TWX: 510-235-3340; Sls. Mgr: R. La Barre

KOLLSMAN INSTR. CO., 575 Underhill Blvd., Syosset, N.Y., 11791, Tel: 516-921-4300, TWX: 510-221-2191; Quotations Dir: J. Mooney

KORRY MFG. CO., 223-8th Ave. N., Seattle, Wash., 98109, Tel: 206-624-4066, TWX: 910-444-2295; Sls. Mgr: J.A. Hevly

Local Sales Offices & Reps.
Ala Huntsville, Craft Assocs. 205-837-0221
Ariz Phoenix, Howe & Howe Sls., Inc. 602-264-7971
Cal Pico Rivera, Westrep 213-949-2551
Cal Santa Clara, Cal-Tronix, Inc. 408-296-1366
Conn Stratford, G. Rosen Co. 203-375-5456
Fla Maitland, Craft Assocs. Co. 305-645-2242
Ga Atlanta, Craft Assocs. Co. 404-252-5001
Ill Chicago, Engineered Sls. Co. 312-867-8434
Kans Overland Park, ENSCO-Rep. 913-381-7557
Md Glen Arm, Billis Sls. Co. 301-592-7047
Minn St. Paul, Northport Engrg., Inc. 612-698-3841
Mo St. Louis, ENSCO-Rep. 314-542-3935
NJ Cherry Hill, Billis Sls. Co. 609-428-3650
NY New Rochelle, Display Comps. Sls. Co. 914-636-4664
Ohio Dayton, Whelan Corp. 513-434-7551
Tex Fort Worth, W. Pat Fralia Co. 817-738-2394

KRATOS, 403 S. Raymond Ave., Pasadena, Cal, 91105, Tel: 213-449-3090, TWX: 910-588-3288; Pubs. Mgr: R. Blehr

Local Sales Offices & Reps.
Cal San Carlos, Electro-Pacific 415-776-8582
Fla Miami, Ludlum Assoc. 305-885-2514
Fla Orlando, Ludlum Assoc. 305-894-7761
Ga Smyrna, IMMCO, Inc. 404-435-0079
Ill Addison, R. Edward Stemm, Inc. 312-279-2440
Md Baltimore, Stemler Assoc. 301-944-8262
Md Lutherville-Timonium, Naudain Assoc. 301-252-5378
Mass Peabody, JSR Assocs. 617-532-0348
Minn St. Paul, Cullen & Assocs. 612-646-7371
Mo St. Louis, PEM Sales Co. 314-427-7200
NJ Cherry Hill, Stemler Assoc. 609-966-4070
NJ Mt. Laurel, Naudain Assoc. 609-235-1801
NY Great Neck, F. Tylinski Co. 516-466-9070
NY N. Massapequa, C. B. Hopkins Co. 516-796-0066
NY Syracuse, Labtronics, Inc. 315-454-9314
Ohio Cleveland, Imtech Corp. 216-382-9090
Ohio Dayton, L. Fedotin 513-275-9345
Tex Dallas, V. Sykes 214-243-2222
Va Alexandria, Stemler Assoc. 703-548-7818
Wash Bellevue, Doland Co. 206-454-4952

KRATOS PRECISION PRODS., 11161 W. Pico Blvd., Los Angeles, Cal., 90064, Tel: 213-478-0635; Gen. & Sls. Mgr: J.M. Phipps

Local Sales Offices & Reps.
Ariz Phoenix, Lange Assocs.
Cal Los Altos, Nickerson-Gray 415-941-5777
Cal Pasadena, Nurches Co. 213-681-8957
Colo Englewood, A-G Elctrns. 303-771-8805
Fla N. Miami, Barrett Assocs. 305-68-4957
Fla Orlando, Barrett Assocs. 305-277-2857
Ill Highland Pk., Feller Assocs. 312-433-3651
Md Baltimore, Stitzer Assocs. 301-823-2600
Mich Plymouth, Romarc Co. 313-455-0300
Minn Mpls., Tec Sls. 612-884-1180
NH Manchester, Engrg. Assoc. of New Eng.
NJ Collingswood, Burdette Co. 609-858-6768
NJ Livingston, Varrelman-Gorman 201-992-2505
NY Centerport, Varrelman-Gorman 212-463-5000
NY Liverpool, Varrelman-Gorman 215-458-4774
Ohio Cleveland, K.W. Elctrn. Sls.
Ohio Dayton, K.W. Elctrn. Sls. 513-890-2150
Pa Delmont, K.W. Elctrn. Sls. 412-468-4020
Pa Erie, K.W. Elctrn. Sls. 814-455-1615
Pa Paoli, Stitzer Assocs. 215-644-5500
Tex Ft. Worth, Dyna-Reps, Inc.
Tex Houston, Dyna-Reps 817-451-1392
Wash Seattle, Blum & Assocs. 206-782-1600
Exp: Can., Ottawa 4, Ont., Communications Sys.

KRECKMAN, HERB CO., Cresco, Pa., 18326, Tel: 717-595-2212; Sls. Mgr: H. Kreckman

KRL ELECTRONICS, 28 Bridge St., Manchester, N.H., 03101, Tel: 603-668-3210; Sls. Mgr: R.G. Leinsing Vol 3•1145

Local Sales Offices & Reps.
Cal El Monte, Western Controls 213-443-9376
Cal Fullerton, Magna-Com Inc. 714-579-9084
Cal Mountain View, Belmont Sls. 415-961-4775
Cal Mountain View, Tri-Rep, Inc. 415-965-1822
Colo Denver, Omega Ltd. 303-758-1508
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-2474
Fla Pompano Beach, C.B.C. Electronics, Inc. 305-782-0804
Fla Pompano Beach, Hutto-Hawkins-Peregoy 305-943-9593
Fla Tampa, Hutto-Hawkins-Peregoy 813-932-1800
Ill Palatine, C & C Elctrn. 312-359-9599
Ill Palatine, C & C Electronics Sls. 312-359-9599
Ind Fort Wayne, J & B Engrg. Sls. 219-483-2813
Md College Park, J & B Elctrns. 301-441-2457
Mass Burlington, Contact Sls., Inc. 617-273-1520
Mich Grand Rapids, R.P. Urban & Assocs. 616-245-0511
Minn Minneapolis, Heimann Co. 612-861-6051
NJ Shrewsbury, C. R. Hocker Assocs. 201-747-2797
NY Camillus, C. P. Dixon 315-471-6663
NY Camillus, C. P. Dixon Co., 315-471-6663
NY Port Washington, TMA 516-883-2432
NY Port Washington, T.M.A. Assocs. 516-883-2432
Ohio Reading, Sheridan Assocs. 800-543-7042
Ore Portland, J. J. Backer Co. 503-297-3776
Tex Houston, Engrg. Assocs. 713-729-0862
Tex Houston, Engrg. Assocs. 713-643-0460
Wash Lynwood, 9 Westcon Power Sys. 609-654-8209
For: Can., Scarborough, Ontario, Banke Elctrns., Ltd. 416-291-7529

KROHN-HITE, 580 Massachusetts Ave., Cambridge, Mass., 02139, Tel: 617-491-3211, TWX: 710-320-6583; Sls. Mgr: E.C. Lutfy; Applications Engr: D.J. Forsythe Vol 1•474; Vol 2•574

Local Sales Offices & Reps.
Ala Huntsville, Gentry Assoc., Inc. 205-534-9771
Alas Anchorage, H.J. Lang 279-5741
Cal Inglewood, L & M Engrg. 213-674-6850
Cal Santa Clara, L & M Engrg., Inc. 408-243-2891
Colo Littleton, Aztec Enterprises, Inc. 303-795-0250
Conn Glastonbury, Instr. Rep. 203-633-0777
Fla Orlando, Gentry Assoc., Inc. 305-894-4401
Ill Des Plaines, Cozzens & Cudahy, Inc. 312-298-3600
Ind Indpls, Cozzens & Cudahy 317-244-2456
Mass Lexington, Instr. Rep. 617-861-8620
Mich Detroit, Electro Sls. 313-526-8800
Minn So. Mpls, Cozzens & Cudahy 612-884-4336
Mo St. Louis, Cozzens & Cudahy, Inc. 314-423-1234
NJ Bordentown, Dyna Rep. Co. 609-298-6700
NM Albuquerque, Aztec Enterprises, Inc. 505-255-2440
NY Elmont, Crane & Egert 516-488-2100
NY Syracuse, Ossmann Instrs., Inc. 315-437-6666
NC Burlington, Gentry Assoc., Inc. 919-227-3639
Ohio Cleveland, Electro Sls. Assoc. 216-261-5440
Ohio Dayton, Electro Sls. Assoc. 513-426-5551
Pa Pittsburg, Electro Sls. 412-371-9449
Tex Dallas, R. Martin Assocs. 214-FL-6-3704
Tex Houston, R. Martin Assocs. 713-462-4077
Va Springfield, Dyna Rep. Co. 703-321-8630
Wash Seattle, Showalter-Judd 206-762-2310

KRYLON, Div. Borden, Box 390, Norristown, Pa., 19404, Tel: 215-279-1950, TWX: 510-660-0335; Sls. Srv. Mgr: R.R. Adams

KRYLON Local Distributors
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
NY Buffalo, Genesee Radio & Parts Co., 2550 Delaware Ave. 716-873-9661
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121

KRYSTINEL CORP., Fox Island Rd., Port Chester, N. Y., 10573, Tel: 914-937-5252, TWX: 914-937-5370; Sls. Mgr: Merle Breiland; Pres: S. Schwartz .....Vol 3•1019

KSC SEMICONDUCTOR CORP., KSC Way, Katrina Rd., Chelmsford, Mass., 01824, Tel: 617-256-3321, TWX: 710-343-0576; Sls. Mgr: J.Q. Adams Jr.

KSC Local Distributors

NY	New York, Midway Ind'l. Elec., 38 E. 29th St.	212-889-0370

KULITE SEMICONDUCTOR PROD., 1030 Hoyt Ave., Ridgefield, N.J., 07657, Tel: 201-945-3000; V.P., Mktg: A. Brosh; Sls. & Prod. Eng. Mgr: J.C. Kicks; Sls. Engr: J.W.G. Budd

KULKA ELEC. CORP., 520 S. Fulton Ave., Mt. Vernon, N.Y., 10551, Tel: 914-664-4024, TWX: 710-562-0104; Sls. Mgr: J.D. Murphy

Local Sales Offices & Reps.

Ariz	Phoenix, Shefler-Kahn Co.	602-258-7893
Cal	Los Angeles, E E Strassner	213-666-1511
Cal	Redwood City, Warren-Hickey Sls.	415-368-3849
Colo	Denver, Koether-Cox	303-733-5561
Conn	Waterbury, Coakley, Boyd & Abbett	203-756-8766
Fla	North Miami, Winfield Elctrns. Sls.	305-751-5566
Ga	Atlanta, Winfield Southeast	404-636-3023
Ill	Chicago, R.A. Hanke	312-528-5800
Ind	Fort Wayne, B. F. Homsher	219-432-1164
Kans	Overland Park, Lowell-Kangas & Assocs.	913-888-3200
La	Metairie, J. F. McKinney Sls.	504-887-1723
Md	Hyattsville, L.D. Lowery	301-773-4977
Mass	Needham, Coakley, Boyd & Abbett	617-444-5470
Mich	Ferndale, Shalco	313-547-4771
Mo	St. Louis, Lowell-Kangas & Assocs.	314-821-4050
NJ	South Orange, Simberkoff Sls.	201-763-7900
NM	Albuquerque, Shefler-Kahn	505-265-7077
NY	Buffalo, Telesco Assocs.	716-834-1026
NY	New York, Simberkoff Sls.	212-943-7023
NY	Ontario, Telesco Assocs.	716-872-6417
NY	Vestal, Telesco Assocs.	607-729-6339
Ohio	Dayton, Neal Bear	513-299-3566
Ohio	Richfield, Neal Bear	216-659-3131
Okla	Tulsa, J. F. McKinney Sls.	918-742-6791
Ore	Portland, Earl & Brown	503-292-9145
Pa	Broomall, L.D. Lowery	215-356-5300
Pa	Pittsburgh, Trymac Co.	412-823-8400
Tex	Bellaire, J. F. McKinney Sls.	713-665-3653
Tex	Dallas, J. F. McKinney Sls.	214-631-9450
Wash	Seattle, Earl & Brown	206-274-1121
Wisc	Milwaukee, A.J. Gaertner & Assocs.	414-273-6162
For:	Can., Ajax, Ont., Munro Elctrn. Comps.	416-364-6920

KULKA Local Distributors

Ariz	Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway	
Cal	Goleta, Radio Prods. Sls., 350 S. Kellogg Ave	805-964-6823
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Conn	Fairfield, Utronic Inc., 273 Linwood Ave.	203-255-4521
Conn	Hamden, Arrow Elctrncs., 295 Treadwell St.	203-248-3801
Ga	Atlanta, Hamilton/Avnet Elctrncs., 6700 1-85 Access Rd.	404-448-0800
Md	Baltimore, Arrow Elctrns., 5207 E. Drive	301-247-5200
Md	Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd.	301-823-0070
Md	Hyattsville, Milgray/Washington, 5405 Lafayette Pl.	301-864-1111
Mass	Burlington, Arrow Elctrns., 15 A Street	617-273-0100
Neb	Lincoln, Scott Elctrn Supply Corp., 4040 Adams St	403-434-8308
NJ	Moorestown, Arrow Elctrns., Pleasant Valley Rd.	609-235-1900
NJ	Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave.	201-797-5800
NY	Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave.	212-492-9590
NY	Elmsford, Melville Radio, 1 Nepperham Ave.	914-592-7100
NY	Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110	516-694-6800
NY	Lynbrook, Peerless Radio, 19 Wilbur St.	516-593-2121
NY	New York, Midway Ind'l. Elec., 38 E. 29th St.	212-889-0370
NY	Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd.	716-328-3230
Ohio	Cleveland, Arrow Elctrns., 23945 Merchantile Rd.	216-464-2000
Ohio	Cleveland, Pattison Supply Co., 4550 Willow Pkwy.	216-441-3000
Ohio	Dayton, Arrow Elctrns., 3100 Plainfield Rd.	513-253-9176
Pa	Erie, Mace Elctrn., 2631 W. 8th St.	814-838-3544
Pa	Philadelphia, Simco Inc., 3907-11 N. Broad St.	215-BA-9-1880
Pa	Pittsburgh, Cameradio Co., 2801 Liberty Ave.	412-391-7400
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	
Tex	Dallas, Hamilton/Avnet Elctrns., 2403 Farrington	

KURZ-KASCH INCORPORATED, 1421 South Broadway, Dayton, Ohio, 45401, Tel: 513-223-8161; Mktg. Mgr: T. Barth; Sls. Mgr: R. Novic .....Vol 1•475; Vol 4•415*

Local Sales Offices & Reps.

Ala	Birmingham, M. F. Taylor Co.	205-853-0336
Cal	Burlingame, W.J. Purdy Co.	415-347-7701
Cal	Los Angeles, W.S. Harmon Co.	213-937-1460
Colo	Denver, Walter Engineering	303-777-5585
Conn	Wallingford, Adams-McGregor, Inc.	203-269-5816
Fla	Casselberry, M. F. Taylor Co.	305-838-0821
Ill	Libertyville, R. Klipp Assoc.	312-362-4676
Iowa	Des Moines, KSW Associates	515-279-9235
Md	Catonsville, M. F. Taylor Co.	301-747-5718
Md	Silver Spring, M.F. Taylor Co.	301-589-4002
Mass	Scituate, Adams-McGregor, Inc.	617-545-2213
Mich	Farmington, Carter, McCormic & Peirce	313-477-7700
Minn	St. Paul, Skor	612-645-6461
Mo	Kansas City, KSW Assocs.	816-358-5240
Mo	St. Louis, KSW Associates	
NJ	Lake Pine, M. F. Taylor Co.	215-552-0383
NY	Great Neck, F. Tylinski Co.	516-466-9070
NY	Rochester, Marsey Sls., Inc.	716-442-9700
NC	Charlotte, M. F. Taylor Co.	704-537-4878
Ohio	Cleveland, Carter, McCormic & Pierce	
Ohio	Dayton, Carter, McCormic & Pierce	512-278-5873
Ore	Portland, D.G. Weber Co.	503-234-7671
Pa	Philadelphia, M. F. Taylor Co.	215-676-5332
RI	Lincoln, Adams-McGregor, Inc.	401-726-1300
Tex	Dallas, G. U. Peck Co.	214-328-3511
Tex	Houston, The Gordon V. Peck Co.	713-664-1435
Exp:	New York, N.Y., Singer Products Co.	

KURZ-KASCH Local Distributors

Ariz	Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway	
Cal	Garden Grove, Allied Elctrns., 12311 Industry St.	213-598-6605
Cal	Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave.	415-961-1500
Colo	Denver, Burstein-Applebee	303-244-3336
Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ill	Chicago, Burstein-Applebee	312-763-4848
Ill	Palatine, Ohm/Elctrns, 645 Vermont Ave	312-359-5500
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Kans	Kansas City, Burstein-Applebee	816-561-5460
Mo	Kansas City, Burstein Applebee	816-561-5460
Neb	Lincoln, Burstein Applebee	402-434-0678
NJ	Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22	201-376-8900
Pa	Philadelphia, Simco Inc., 3907-11 N. Broad St.	215-BA-9-1880
Tex	Ft. Worth, Allied Elctrns., 401 E. 8th St.	817-336-5401

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

KWIKSET POWDERED METAL PRODS., Kwikset Div-Emhart Corp., Box 3579, Anaheim, Cal., 92803, Tel: 714-535-8111; Sls. Mgr: J. Mikitka

KYBE CORP., 132 Calvary St., Waltham, Mass., 02154, Tel: 617-899-0012; VP-Sls: P. Garland

KYROS CORP., Box 406, Madison, Wisc., 53701, Tel: 608-238-3587; Sls. Mgr: E. Cox

L & L MFG. CO., 166 Conchester Rd., Twin Oaks, Pa., 19016, Tel: 215-HU-5-6334; Pres: S. Lewicki

LAB-LINE INSTRS., INC., 15th & Bloomingdale Aves., Melrose Park, Ill., 60160, Tel: 312-345-7400

L.A.B. CORP., Sub. Mech. Tech., 981 Onondaga St., Skaneateles, N.Y., 13152, Tel: 315-685-5781; Sls. Mgr: J.T. Hubbard; Field Sls. Engr: R.E. Whitman; Gen. Mgr: R.W. Mackey

LABCONCO CORP., 8811 Prospect, Kansas City, Mo., 64132, Tel: 816-363-6330; Sls. Mgr: J.N. McConnell; Exec. V.P: W.I. McGennes

LABELON CORP., 10 Chapin St., Canandaigua, N.Y., 14424, Tel: 315-394-6220; Sls. Mgr: R.O. Dill

LABORATORY DATA CONTROL, Div. M. Roy Corp., Box 10235, Riviera Beach, Fla., 33404, Tel: 305-844-5241; Sls. Mgr: R.M. Weller

Local Sales Offices & Reps.

Ala	Huntsville, Newcomb, Assoc.	205-852-0304
Cal	Palo Alto, Analytical Aids	415-321-6245
Del	Newark, Bonchmark	302-366-8797
Fla	Riviera Beach, Laboratory Data Control	305-844-5241
Ill	Joliet, Utopia Instr.	815-727-5431
Iowa	Ames, Midwest Instr.	515-292-5413
Mass	Boston, Richman Assoc.	
Mass	Holliston, Richman Assoc.	617-879-5011
Minn	Minneapolis, Midwest Inst.	612-333-0319
Mo	St. Louis, Gateway Scientific	314-725-3464
NJ	South Amboy, Laboratory Data Control	201-721-9331
NM	Albuquerque, Air Row Inc.	505-268-1733
NC	Raleigh, Newcomb Assoc.	919-893-5721
Pa	Pittsburg, Kurt Leskoe Co.	412-653-0800
Tex	Houston, Antek Instr.	713-691-2265
Wash	Seattle, VWR Scientific	206-682-3460

LAKE CHEMICAL CO., 250 N. Washtenaw Ave., Chicago, Ill., 60612, Tel: 312-826-1700; V.P. Sls: C. Kleiman

LA MARCHE MFG. CO., 106 Bradrock Dr., Des Plaines, Ill., 60018, Tel: 312-299-1193 .....Vol 1•759

Local Sales Offices & Reps.

Alas	Anchorage, J.P. Bagoy	809-277-0911
Ariz	Phoenix, B. Hartley	602-258-2552
Ark	El Dorado, L. Byrne	501-UN-3-9435
Cal	El Cerrito, B. Saletta	415-527-0557
Cal	Encino, R. J. Meyers	213-981-6552
Colo	Denver, Hensley Battery & Supply	303-455-3643
Fla	Jacksonville, B. Hines	904-725-5561
Fla	Juniper, J.L. Marsh	305-746-4911
Ga	Atlanta, H.P. Whitehead	404-252-5977
Ga	Atlanta, J. H. Chambers	404-875-8086
Ill	Wood Dale, T. Waters	312-595-0050
Md	Annapolis, P. Martini	301-267-7462
Mass	Dover, E. Hubert	617-235-6815
Mass	Melrose, W. Doggett	617-665-7404
Mich	Detroit, Webco	313-862-4673
Mich	Grand Rapids, J. Perry	616-949-0271
Minn	Minneapolis, W. Ruva Co.	612-721-7441
Mo	St. Louis, R. Link	314-966-3506
Mont	Billings, D.E. Parker	406-245-6349
Neb	Omaha, B. Kistler	402-553-2412
NJ	Collingswood, J. Wright	609-858-4887
NM	Albuquerque, E. T. Peek	505-265-8501
NY	Buffalo, W. Stamp	716-634-2240
NY	Pittsford, C.M. Daniels	716-334-3834
NY	Uniondale, A. Crowe	516-485-2622
NC	Raleigh, W. Rudd	919-834-2258
Ohio	Columbus, A. Ulrich	614-253-2705
Okla	Enid, R. Riddle	405-233-6562
Okla	Tulsa, L.W. Hubbell	918-RI-3-9851
Ore	Portland, B. Haynes	503-236-2744
Pa	Pittsburgh, L. Morris	412-561-8500
Tex	Dallas, D. Cooper	214-368-5881
Tex	Houston, E. Meyer	713-928-3181
Tex	Odessa, B. McEntyre	915-332-1429
Wash	Seattle, V. Roger	206-RO-2-3834
For:	Can., Scarborough, Ont., B. Preston	293-8716 A.C. 416
For:	Can., Vancouver, B.C., Simson Maxwell	736-5431 AC 604

LAMBDA ELCTRNS., 515 Brd. Hollow Rd., Melville, N.Y., 11746, Tel: 516-694-4200, TWX: 510-224-6484; Sls. Mgr: G. Albers ..... Vol 1•760; Vol 2•598

Local Sales Offices & Reps.

Ariz	Phoenix	602-996-1010
Cal	No. Hollywood	213-875-2744
Cal	Sunnyvale	408-738-2541
Fla	Largo	813-595-6500
Ill	Arlington Heights	312-593-2550
Md	Baltimore	301-243-0035
Mass	Lexington	617-861-8585
Minn	Minneapolis	612-332-6714
NY	Melville	516-694-4200
NY	Poughkeepsie	516-694-4200
NY	Rochester	716-454-6770
Ohio	Cleveland	216-771-7447
Pa	Norristown	215-279-5644
Tex	Dallas	214-341-5130
Tex	Houston	713-464-6554
Exp:	N.Y., Melville	516-694-4200
For:	Can., Pointe Claire, Que.	514-697-6520
For:	Can., Toronto, Ont.	416-486-0794

LAMINATED FABRICATORS, 1145 San Mateo Ave., San Bruno, Calif., 94066, Tel: 415-583-5092; Gen. Mgr: H.L. Jacobs

LAMINATED SHIM CO., INC., Sub MPB Corp., 48 Union St., Glenbrook, Conn., 06906, Tel: 203-325-2631, TWX: 203-327-1184; V.P., Sls. Mgr: M.E. Errico

LAMPS, INC., 19220 S. Normandie Ave., Torrance, Cal., 90502, Tel: 213-323-7578, TWX: 910-346-7038; Sls. Mgr: J.F. Delaney .....Vol 2•514-517

Local Sales Offices & Reps.

Ariz	Tempe, Argus Sls.	602-967-8709
Cal	Inglewood, Oak Inds.	213-678-4108
Cal	Los Altos, Oak Inds.	415-941-1237
Colo	Denver, I.W. Strong & Assocs.	303-292-6900

Conn Farmington, R. Perron 203-673-4825
Conn Old Greenwich, Hoffman Engr. 203-637-1719
Conn Trumbull, R. Perron 203-268-9631
Fla Lauderhill, Oak Inds. 305-735-4495
Ill Chicago, Engineered Sls. 312-867-8434
Md Baltimore, Callas Elctrns. 301-744-7711
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Mich Southfield, Rep Assocs. 313-354-9066
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LUMINATOR DIV., Gulton Inds., 1200 E. Dallas N. Pkwy., Plano, Tex., 75074, Tel: 214-235-8307; Sls. Mgr: R.P. Winks

LUNDY ELCTRNS. & SYS., INC., Robert La., Glen Head, N.Y., 11545, Tel: 516-OR-6-1440, TWX: 510-223-0605; Dir. Mktg: J. Snee

LVC INDS. INC., Co-Ord Switch Bloc-Lite Divs., 135-25 37th Ave., Flushing, N.Y., 11354, Tel: 212-939-9777; Sls. Mgr: L. Cartelli; Asst. Sls. Mgr: J. Norat Vol 2•513,1046

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LYON METAL PROD., INC., 47 Railroad Ave., Aurora, Ill., 60507, Tel: 312-892-8941; V.P. Sls: L.F. Tilly

M & H ELECTRONICS, 500 Naberal Ave., Long Branch, N.J., 07740, Tel: 201-229-0500; V.P. Mktg: John Hambor Vol 2•908-915

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Ore	Portland, Brett Assocs.	503-232-4184
Pa	Norristown, Holmes Assocs.	215-279-8210
Pa	Pittsburgh, West Penn. Controls	412-366-1144
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Tex	Houston, Pan Tech Engrg.	713-623-0640
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Tex	Dallas, Bouco Sales Assocs.	214-247-6708
Va	Falls Church, Beacon Elctrn. Assoc.	703-534-1673
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Local Sales Offices & Reps.

Cal	Los Altos, Hoeke-Reeser Assocs.	415-941-4080
Cal	Los Altos, Hoeke-Reeser Assocs.	415-941-4080
Fla	Satellite Beach, Walker-Barkman Assocs.	305-262-3551

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Pa	Philadelphia, Control Equip., Inc.	609-829-1447
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Ariz	Phoenix, Thorson Co.	602-956-5300
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Cal	Palo Alto, Thorson Co.	415-321-2414
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Cal	Sunnyvale, Moxon Elctrns.	408-734-4352
Cal	Tustin, Thorson Co.	714-544-5121
Colo	Denver, Thorson Co.	303-355-3521
Fla	Orlando, Lee Assoc.	305-241-4445
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Mich	Royal Oak, Satullo Co.	313-566-2375
Minn	Minneapolis, K. W. Meyers Co.	612-920-7080
Minn	Minneapolis, L.F. Green	612-781-1611
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NJ	Hasbrouk Hgts., Science Supply Corp.	201-288-6318
NM	Albuquerque, Shefler-Kahn Co., Inc.	505-265-7077
NY	Fayetteville, H.C. Johnson Agencies	315-637-9383
NY	Great Neck, Science Supply Corp.	516-487-1173
NY	Guilderland, H.C. Johnson Agencies	518-456-9681
NY	New York, Multi Parts, Inc.	212-944-4370
NY	Schenectady, H.C. Johnson Agcy.	518-882-9303
NY	Williamsville, H.C. Johnson Agcy.	716-632-7880
NC	Raleigh, Lee Assoc.	919-787-5818
Ohio	Dayton, Elliot-Sarles Co.	513-233-7074
Pa	Glenshaw, H.C. Johnson Agencies, Inc.	412-961-0414
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Cal	No. Hollywood, B.J. Wolfe Entprs.	213-877-5518
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NY	Huntington, C.R. Mayer Co.	516-921-7876
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Ill	Chicago, Lightner	312-774-1500
Mich	Detroit, R.S. Lohmann Co.	313-535-6145
Minn	Minneapolis, C.R. Gibb Co.	612-377-1200
NJ	Nutley, Falk-Baker Assocs.	201-661-2431
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Tex	Addison, Parvin Sls. Co.	214-239-9148

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Colo	Denver, Daniels-Padgett Assocs.	303-433-7181
Fla	Fort Lauderdale, R. F. Carlson Co.	305-733-0811
Ill	Downers Grove, Mica Corp.	312-852-7730
Mass	East Natick, Mica Corp.	617-653-0880
Mo	Chesterfield, Brig Inc.	314-469-1566
NJ	Princeton, Mica Corp.	609-921-2003
Tex	Dallas, Stevens Sls.	214-350-2476
Wash	Seattle, R Johnston Co.	206-524-5170

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Mo	St. Louis, Coombs Assocs.	314-542-3636
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Ohio	Dayton, R. P. Calhoun & Assocs.	513-299-4144
Pa	Norristown, DACOM	215-272-1444
Tex	Addison, Campion Sls. Co.	214-239-9196
Utah	Kearns, Leddy Assocs.	801-299-4382
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NY	Huntington Sta., Gray & Reed Assocs., Inc.	516-GE-3-3333

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Conn	Hartford	203-527-0178
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Mass	Bedford	617-275-2440
Mich	Southfield	313-352-1900
Minn	Minneapolis	612-835-5400
Mo	Creve Coeur	314-991-4100
Mo	Kansas City	816-358-4200
NJ	Westfield	201-233-9200
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NY	Rochester	716-461-1600
NY	Syracuse (Liverpool)	315-451-4000
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Ohio	Dayton	513-461-4480
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Pa	Kimberton, Microdata Corp.	215-933-0036
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NY	Great Neck, Robert L. Diamond, Inc.	516-482-8387
NC	Winston-Salem, The Candor Co., Inc.	919-924-1480
Pa	Montgomeryville, V P I, Inc.	215-474-3200
Tex	Houston, Barnhill Two, Inc.	713-621-0040
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Cal	Mountain View, Nor-Cal Assocs.	415-961-8121
Colo	Denver, Brown Tech.	303-233-0863
Fla	Orlando, G.F. Bohman Assoc.	305-855-0274
Fla	Palm Beach Gardens, G.F. Bohman Assocs.	305-842-7188
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Mass	Waltham, Impact Sls.	617-352-8881
Mich	Southfield, Sterling-Lowell	313-352-8881
Minn	Mpls., Bitronics Sls.	612-888-7044
Mo	Grandview, Centech. Sls.	816-763-2900
NJ	Livingston, Varrelman-Gorman	201-992-2505
NY	Liverpool, Varrelman-Gorman	315-458-4774
Ohio	Dayton, Gibson Elctrns.	513-433-3521
Pa	Ambler, Griffin-Campbell	215-646-7535
Tex	Richardson, Thornton-Leeper Elctrn. Sls.	214-231-6891
Wash	Seattle, Blair Hirsh Assocs.	206-SU-3-3423

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Cal	Sunnyvale, Waldman	408-245-2500
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Fla	Pompano Bch., Technology Mktg. Assoc.	305-942-0774
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Mass	Weymouth, Reptron	617-449-4141
NY	Rochester, F. Young Assoc.	716-482-1555
NC	Winston-Salem, Burgin-Kreh Assoc.	919-768-4174
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Pa	Fairview Vill., Danco	215-539-9300
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Local Sales Offices & Reps.

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Ariz	Scottsdale, F. Schoeffler	602-948-3470
Cal	Hawthorne, Sutherland Sls., Inc.	213-679-0757
Cal	Los Altos, Westec Elctrns.	415-948-8880
Colo	Denver, Gossard & Assocs.	303-985-0602
Fla	Miami Beach, Geartner Assocs.	305-861-3661
Fla	Orlando, Geartner Assocs.	305-299-1000
Ga	Decatur, F. Nickerson	404-377-1575
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Md	Baltimore, J.R. Daniel	301-825-3330
Mass	Newtonville, C. Segel Co.	617-969-6900
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NY Fishkill, Motorola Semiconductor Products Inc. 914-896-8970
NY Hauppauge, Motorola Semiconductor Products Inc. 516-231-9000
NY Rochester, Motorola Semiconductor Products Inc. 716-381-7220
NY Syracuse, Motorola Semiconductor Products Inc. 315-454-9373
NC Raleigh, Motorola Semiconductor Products Inc. 919-782-7604
Ohio Cleveland, Motorola Semiconductor Products Inc. 216-461-3160
Ohio Dayton, Motorola Semiconductor Products Inc. 513-294-2231
Ore Portland, Motorola Semiconductor Products Inc. 503-297-2236
Pa Ft. Washington, Motorola Semiconductor Products Inc. 215-643-4500
SC Columbia, Motorola Semiconductor Products Inc. 803-788-0585
Tex Houston, Motorola Semiconductor Products Inc. 713-688-4583
Tex Richardson, Motorola Semiconductor Products Inc. 214-235-8385
Wash Bellevue, Motorola Semiconductor Products Inc. 206-455-3700
Wisc Wauwatosa, Motorola Semiconductor Products Inc. 414-476-5554

MOTOROLA SEMICONDUCTOR Local Distributors

Ala Huntsville, Hall-Mark Elctrns., Box 1133 205-539-0691
Ariz Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave. 602-269-1391
Ariz Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd. 602-273-7331
Cal Culver City, Hamilton Electro Sales 213-870-7171
Cal El Segundo, Liberty Elctrns., 124 Maryland St. 213-322-8100
Cal Hollywood, Hamilton/Avnet Elctrncs. 305-925-5401
Cal Los Angeles, WESCO Elctrns.-L.A., 5650 Jillson St. 213-685-9525
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal Mt. View, Hamilton/Avnet Corp., 340 Middlefield Rd. 415-961-7000
Cal Palo Alto, Kierulff-Palo Alto, 3969 E. Bayshore Rd. 415-968-6292
Cal San Diego, Hamilton/Avnet Corp., 5569 Kearny Villa Rd. 714-279-1550, 279-2421
Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Colo Denver, Burstein-Applebee 303-244-3336
Colo Denver, Hamilton/Avnet Electronics 303-534-1212
Colo Denver, Kierulff-Denver, 10890 E. 47th Ave. 303-343-7090
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Conn North Haven, Cramer/Conn., 35 Dodge Ave. 203-239-5641
Fla Hollywood, Cramer/Ew Hollywood, 4035 North 29th Avenue 305-923-8181
Fla Hollywood, Schweber Elctrns. 305-927-0511
Fla Orlando, Cramer/Ew Orlando, 345 North Graham Avenue, Box 20214 305-894-1511
Ga Atlanta, Hamilton/Avnet Elctrncs., 6700 1-85 Access Rd. 404-448-0800
Ga Atlanta, Schweber Elctrns. 404-449-9170
Ill Chicago, Burstein-Applebee 312-763-4848
Ill Chicago, Schweber Elctrns. 312-593-2740
Ill Chicago, Semiconductor Specialists, Inc. 312-279-1000
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ill Schiller Park, Hamilton-Avnet Elctrs., 3900 N. 25th Ave.
Kans Kansas City, Burstein-Applebee 816-561-5460
Kans Lenexa, Hall-Mark Elctrn., 9006 Rosehill Rd. 913-888-4747
Kans Prairie Village, Hamilton/Avnet Elctrncs., 3500 W. 75th St. 913-362-3250
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Md Gaithersburg, Cramer/Ew Washington, 16021 Industrial Drive 301-948-0110
Md Hanover, Hamilton/Avnet Elctrns. 301-796-5000
Md Rockville, Schweber Elctrns. 301-881-2970
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Burlington, Hamilton/Avnet Elctrns. 617-273-2120
Mass Newton, Cramer Elctrn. Inc., 85 Wells Avenue 617-969-7700
Mass Newton, Cramer/International, 85 Wells Ave. 617-969-7700
Mass Waltham, Schweber Elctrns. 617-890-8484
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mich Detroit, Schweber Elctrns. 313-583-9242
Mich Livonia, Hamilton/Avnet Elctrns. 313-522-4700
Mich Muskegon, Western Elctrn Supply, 1781 5th St 616-722-7628
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Edina, Cramer/Bonn, 7275 Bush Lake Road 612-835-7811
Minn Minneapolis, Hamilton/Avnet Elctrns. 612-854-8400
Mo Hazelwood, Hamilton/Avnet Electronics 314-731-1144
Mo Kansas City, Burstein Applebee 816-561-5460
Neb Lincoln, Burstein Applebee 402-434-0678
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-239-0800
NJ Cherry Hill, Hamilton/Avnet Elctrns. 609-662-9337
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NJ Somerset, Schweber Elctrns. 201-469-6008
NM Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E. 505-247-1055
NY East Syracuse, Cramer/Syracuse, 6716 Joy Road 315-437-6671
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Hauppauge, Cramer/Systems, 29 Oser Ave. 516-231-5682
NY Hauppauge, L.I., Cramer/Long Island, 29 Oser Avenue 516-231-5682
NY Rochester, Cramer/Rochester, 3259 Winton Road South 716-275-0300
NY Rochester, Schweber Elctrns. 716-328-4180
NY Syracuse, Hamilton/Avnet Elctrns. 315-437-2642
NY Westbury, Hamilton-Avnet Electrns., 70 State St.
NY Westbury, Schweber Elctrns., Jericho Tpke 516-334-7474
NY Woodbury, Harvey Radio, 60 Crossways Park W. 516-921-8700
NC Raleigh, Schweber Elctrns. 919-832-8881
Ohio Beachwood, Schweber Elctrns. 216-464-2970
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Okla Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave. 918-835-8458
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
Tex Dallas, Hamilton/Avnet Elctrns., 2403 Farrington
Tex Houston, Hall-Mark Elctrn., Box 36739 713-781-6100
Tex Houston, Hamilton/Avnet Elctrns., 1216 W. Clay
Utah Salt Lake City, Cramer/Utah, 391 West 2500 South 801-487-3681

Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-262-8451
Wash Seattle, Hamilton/Avnet Elctrncs., 2320 6th Ave. 206-624-5930
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200
Wisc Milwaukee, Hall-Mark Elctrns., 11925 Ripley Ave. 414-476-1270
For: Can., Montreal, Hamilton/Avnet Elctrns. 514-735-6393
For: Can., Ottawa, Ont., Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl.
For: Can., Toronto, Ont., Hamilton/Avnet Elctrns. 416-789-1838

MPB CORP., Precision Park, Keene, N.H., 03431, Tel: 603-352-0310, TWX: 710-366-1801

MPC PRODS. CORP., 4200 W. Victoria Ave., Chicago, Ill., 60646, Tel: 312-583-5100, TWX: 910-221-2576; Dir. of Mktg: A.V. Trozzo; Section Mgr.-Sls: R.T. Roeser; Sls. Mgr: F. Choromanski

MSI ELECTRONICS, INC., 34-32 57th St., Woodside, N.Y., 11377, Tel: 212-672-6500; Pres: A. Lederman; V.P: D. Scaringella

MU-DEL ELCTRNS., 2426 Linden La., Silver Spring, Md., 20910, Tel: 301-587-6087; Pres: I. Kuzminsky; Dir., Mktg: I. Lieberman

MUELLER ELEC. CO., 1589H E. 31st St., Cleveland, Ohio, 44114, Tel: 216-771-5225; Sls. Mgr: E.H. deConingh Jr. ..... Vol 3•702,703

Local Sales Offices & Reps.
Ariz Phoenix, Maddox Sls. 602-274-3807
Cal Los Angeles, Maddox Sls. 213-269-7291
Cal San Francisco, Maddox Sls. 415-431-2953
Colo Denver, L.B. Putnam 303-825-5066
Fla Orlando, Cartwright & Bean 305-425-8284
Fla Plantation, Cartwright & Bean, Inc. 305-791-3989
Ga Atlanta, Cartwright & Bean 404-237-2273
Ill Libertyville, R. Klipp & Assoc. 312-362-4676
La Chalmette, Cartwright & Bean 504-279-4598
Md Baltimore, E-K-P Assocs. Inc. 301-788-6498
Mass Lynn, Keene Sls. Co. 617-595-2300
Mich Ferndale, Hilltronics 301-398-5556
Minn Mpls., A.S. Miller 612-866-6677
Mo Kansas City, K & M Sls. 816-471-1355
NY Buffalo, R.W. Mitscher 716-854-2517
NY Port Washington, Joseph Assocs. 516-883-7770
NC Cary, Cartwright & Bean 919-832-7128
NC Charlotte, Cartwright & Bean 704-537-7965
Ohio Columbus, Mandabach & Assocs. 614-235-0265
Ore Portland, R. Legg Co. 503-292-8824
Pa Easton, E-K-P Assocs. Inc. 215-258-6477
Tenn Memphis, Cartwright & Bean 901-276-4442
Tex Waco, Sanders-Willis Co. 817-776-1742
Utah Salt Lake City, L.B. Putnam 801-277-0375
For: Can., Toronto, Ont., W. H. Cooper & Co. 416-630-3900

MUELLER Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Goleta, Radio Prods. Sls., 350 S. Kellogg Ave 805-964-6823
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Colo Denver, Burstein-Applebee 303-244-3336
Ga Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW 404-355-2223
Ill Chicago, Burstein-Applebee 312-763-4848
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Kans Kansas City, Burstein-Applebee 816-561-5460
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Minn Minneapolis, Elctrn Center Inc., 127 3rd Ave. N. 612-338-5881
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Ann, Interstate Ind Elctrn, 10525 St. Charles Rock Rd 314-428-8522
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Reading, Barbey Elctrn., 333 N. 4th St.,
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

MULTICORE SALES CORP., Div. Avnet, Long Island Expwy., Westbury, N.Y., 11590, Tel: 516-334-7450, TWX: 510-222-2219; Sls. Mgr: M. Baranick; Tech. Dtr: J. Tarnowsky

Local Sales Offices & Reps.
Mo Kansas City, Forristal-Young Sls. Co. 316-358-6771

MULTICORE Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
La Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094 318-423-6131
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Pattison Supply Co., 4550 Willow Pkwy. 216-441-3000
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021

MULTIMETRIC INDUSTRIES, Div. Daysam Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y., 11418, Tel: 212-441-4240; Sls. Mgr: R.W. Tramposch; Pres: P. Basse ..... Vol 2•576

Local Sales Offices & Reps.
Ala Huntsville, Scientific Devices, SE, Inc. 205-536-1969
Ariz Phoenix, R. A. Mayes Co. 602-279-5243
Cal Mountain View, Gado Instr. Sls. 415-961-2222
Cal Torrance, Saber Entprs. 213-534-2876
Colo Broomfield, R. A. Mayes Co. 303-466-6311
Conn Hamden, J & J Assocs. 203-624-7800
Fla Orlando, Scientific Devices, SE, Inc. 305-424-7932
Ill Schaumburg, Electronic Instrument Assocs., Inc. 312-882-7140
Ind Indianapolis, Electronic Instrument Assocs., Inc. 317-257-7231
Mass Burlington, J & J Assocs. 617-272-2606
NJ Hazlet, Mer-Mon Electronic Instrumentation 201-264-1851
NM Albuquerque, R. A. Mayes Co. 505-265-7989
NY Plainview, Eastern Metro Assocs., Inc. 516-WE-1-1414
NC Burlington, Scientific Devices, S.E., Inc. 919-584-8311
Pa Mt. Penn, Mer-Mon Electronic Instrumentation 215-779-1640
Tex Houston, R. A. Mayes Co. 713-466-8325
Tex Richardson, R. A. Mayes Co. 214-235-3043
Va Annandale, J. Hopkins Assocs. 703-280-2086
Wash Bellevue, Hudson Co. 206-455-0773
For: Can., Don Mills, Ont., Componetics, Ltd. 416-445-3230
For: Can., Montreal, Que., Componetics, Ltd. 514-342-4117

MUPAC CORP., 646 Summer St., Brockton, Mass., 02402, Tel: 617-588-6110; V.P: B. Leary; Mktg. Mgr: A. Largey

MURA CORP., 50 S. Service Rd., Jericho, N.Y., 11753, Tel: 516-334-2700, TWX: 96-7879; V.P. Sls: E. Weisl; OEM Sls: R. Lerner

MURA Local Distributors
Cal San Francisco, Zach Elctrns., 1444 Market St. 415-626-1444
Cal Van Nuys, C.H. Mitchell, 14614 Raymer St. 213-994-9466
Colo Denver, Fistells Elctrn., 1001 Bannock St. 303-244-4691
Conn Hartford, Hatry Elctrn. Entpr., 500 Ledyard St. 203-527-1881
Fla Miami, Elctrn. Equip. Co., 2701 NW 42nd Ave. 305-871-3500
Ga Atlanta, Specialty Distributing, 763 Juniper St. N.W. 404-873-2521
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
La Lafayette, Ralph's Inc., 3004 Cameron St. 318-234-4507
La Shreveport, Ind'l. Elctrn Supply, 2422 Southern Ave 318-422-9459
Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mich Detroit, RS Elctrns., 12775 Lyndon St. 313-491-1000
Miss Jackson, Ellington Elec. Supply, 1425 Terry Rd. 601-355-0561
Mo St. Louis, Olive Ind'l Elctrns., 6662 Olive Blvd. 314-863-7800
NJ Edison, William Elctrnc. Supply, 1863 Woodbridge Ave. 201-985-3700
NY Hempstead, Elctrn. Equip., 741-757 Peninsula Blvd. 516-538-5510
NC Winston-Salem, Kirkman Elctrns., Inc., 901 W. Second St. 919-724-0541
Ohio Cleveland, RPC Elctrns., 749 Miner Rd. 216-461-4700
Ohio Fremon, J & B Elctrn., 820 E. State St. 419-332-9334
Okla Oklahoma City, Trice Wholesale Electr., 4701 No. Stiles 405-524-4411
Ore Portland, Central Dist., 955 N.E. Union 503-234-0711
Ore Portland, J W Elctrn., 2030 S.E. 7th 503-232-1104
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
SC Charleston, Wholesale Radio Supply, 515 E. Bay St. 803-722-2634
Tenn Memphis, Bluff City Distr. Co., Box 418, 234 East St. 901-725-9500
Tex Dallas, Wholeslae Elctrns., 2809 Ross Ave. 214-824-3001
Va Arlington, Arlington Elctrnc., 3636 Lee Hwy.
Wash Seattle, Western Elctrn., 717 Dexter Ave. N. 206-284-0200

MURATA CORP. OF AMERICA, 2 Westchester Plaza, Elmsford, N.Y., 10523, Tel: 914-592-9180; Sls. Mgr: J. Alterescu ..... Vol 2•434,575

MURATA MFG. CO. LTD., Nagaoka-shi, Kyoto, Japan, Tel: 075-921-9111; Mgr., Export: S. Horie Vol 2•434,575

Local Sales Offices & Reps.
NY Elmsford, Murata Corp. of America 914-592-9180

MYSTIK TAPE, DIV. BORDEN CHEM., Borden Inc., Box 189, Winnetka, Ill., 60093, Tel: 312-446-4000; Prod. Mgr: R.E. Madden; Prod. Mgr: W. Gemas

NANOTRON RELAY CO., Sub. Veradyne Corp., 330 N. Victory, Burbank, Cal., 91502, Tel: 213-849-3123; Sls. Mgr: J. Ashford

NARDA MICROWAVE CORP., Plainview, N.Y., 11803, Tel: 516-433-9000, TWX: 510-221-1867; Mgr.-Sls. Adm: R.E. Nopper

Local Sales Offices & Reps.
Cal Menlo Pk., Straube Assocs. 415-323-2476
Cal Woodland Hills, Interstate Mktg. Assocs. 213-883-7606

Fla Orlando, E.G. Holmes & Assocs. 305-894-8901
Ga Chamblee, E.G. Holmes & Assocs. 404-451-6161
Haw Honolulu, Industrial Elctrns., Inc. 533-6095
Ill Chicago, Scientific Sls. Co. 312-775-7594
Ind Indianapolis, Scientific Sls. Co. 317-253-4606
Kans Shawnee Mission, EIR Co. 913-362-0919
Md Kensington, Electronic Mktg. Assocs. 301-881-5300
Mass Burlington, Tri-Tek, Inc. 617-272-4550
Mich Detroit, Micro Sls. Corp. 313-482-1229
Minn Bloomington, Scientific Sls. Co. 612-881-3300
Mo Hazelwood, EIR Co. 314-895-4100
NJ Merchantville, Megargel/Himmelstein Assoc. 215-629-1072 & 609-662-3081
NJ Westfield, Gray & Reed Assoc., Inc. 201-233-6116
NY E. Syracuse, Ossmann Instrs., Inc. 315-437-6666
NY Huntington Sta., Gray & Reed Assoc. 516-433-3333
NY Rochester, Ossmann Instrs. 716-328-2230
NY Vestal, Ossmann Instrs., Inc. 607-785-9947
NY Wappingers Falls, Ossmann Instrs., Inc. 914-297-7777
Ohio Cleveland, Micro Sls. Corp. 216-371-0522
Ohio Dayton, Micro Sls. Corp. 513-298-3033
Okla Norman, Data Mktg. Assocs. 405-364-8320
Tex Dallas, Data Mktg. Assocs. 214-358-4643
Tex Houston, Data Mktg. Assocs. 713-686-9627
Tex San Antonio, Data Mktg. Assocs. 512-828-0937
Va Virginia Beach, E.G. Holmes & Assocs. 703-340-6556
Wash Seattle, Showalter-Judd, Inc. 206-762-2310
For: Can., Downsview, Ont., Electronetic Sys., Ltd. 416-661-3673
For: Can., Montreal, Que., Electronetic Sys., Ltd. 514-342-4112
For: Can., Ottawa, Ont., Electronetic Sys., Ltd. 613-733-3781

NATIONWIDE ELCTRN. SYS., See NES

NATEL ENGRG. CO., 8944 Mason Ave., Canoga Pk., Cal., 91306, Tel: 213-882-9620, TWX: 910-494-1959; Sls. Mgr: J. Naster ..... Vol 1•360,361

Local Sales Offices & Reps.
Ala Huntsville, Incotech, Inc. 205-837-6061
Cal Encino, Cardinal Assocs. 213-788-4540
Cal San Carlos, Elctrn. Engrg. 415-593-2189
DC Washington, Scientific Systems Sls. 202-726-4161
Fla Clearwater, Perrott Assocs. 813-531-5513
Fla Orlando, Perrott Assocs. 305-275-1132
Mass Burlington, Scientific Sys. Sls. 617-273-1660
Mich Detroit, WKM Assocs., Inc. 313-892-2500
Minn Hopkins, Waytec Co. 612-935-5243
Mo St. Louis, G. Fixman Engrg. Co. 314-725-5219
NJ Willingboro, Scientific Systems Sls. 609-877-4422
NM Albuquerque, Klein Aerospace 505-344-8020
NY Great Neck, Scientific Sys. Sls. 516-466-0053
Ohio Cleveland, WKM Assocs., Inc. 213-267-0445
Ohio Dayton, WKM Assocs., Inc. 513-434-7500
Pa Pittsburgh, WKM Assocs., Inc. 412-892-2953
Tex Dallas, Synthenetics 214-631-1740

NAT'L. BAND & TAG, 721 York St., Newport, Ky., 41072, Tel: 606-261-2035; Sls. Mgr: E. Haas, Jr.

NATIONAL BERYLLIA CORP., Greenwood Ave, Haskell, N.J., 07420, Tel: 201-839-1600, TWX: 710-988-5363; Sls. Mgr: H.F. Schmit

NAT'L. CERAMIC CO., 500 Southard St., Trenton, N.J., 08602, Tel: 609-394-5373; Sls. Mgr: E.A. Domber

NATIONAL ELCTRNS., A Varian Sub., Box 269, Geneva, Ill., 60134, Tel: 312-232-4300, TWX: 910-237-1685; Mgr. Mktg. Adm: W.W. Bishop

NATIONAL ELCTRNS. Local Distributors
Cal Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way 213-685-5511
Cal Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave. 415-961-1500
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Geophysical Supply Co., Box 52230 713-224-0621
Wash Seattle, Kierulff - Seattle, 5940 6th Ave. S. 206-763-1550
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801

NATIONAL LEAD, See NL Inds.

NATIONAL METAL CRAFTERS INC., Belgrade & Oxford Sts., Phila., Pa., 19125, Tel: 215-423-0804; Sls. Mgr: K.M. Pulasky; Pres: W. Shelden

NATIONAL POWER PRODS. INC., Box 292, Haverhill, Mass., 01830, Tel: 617-374-0777, TWX: 710-347-0269; Natl. Sls. Mgr: J.F. Arrigo; Dir. Mktg: J.T. Parent Vol 1•769-773

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Wash	Seattle, Associated Ind.	206-723-5600

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NEW ERA PRODUCTS, 4480 Broadview Rd., Cleveland, Ohio, 44109, Tel: 216-351-1097; Pres: G.W. Vest; Sls. Mgr: K.A. Styskel

NEW HAMPSHIRE BALL BEARINGS, INC., Peterborough, N.H., 03458, Tel: 603-924-3311, TWX: 710-364-1805; Sls. Mgr: D. Berg

NEW PROD. ENGRG., Sub. Wabash Magnetics, Box 708, Wabash, Ind., 46992, Tel: 219-563-2191, TWX: 810-290-2722; Sls. Mgr: W.E. Haase .....Vol 2•838-840

Local Sales Offices & Reps.

Ariz	Scottsdale, Argus Sales	602-947-8355
Cal	Burlingame, J. Logan & Assocs.	415-697-6100
Cal	Santa Ana, Calif. Elctrn. Mktg.	714-835-2702
Cal	Woodland Hills, Calif. Elctrn. Mktg.	213-884-7867
Colo	Denver, Walter Engrg.	303-777-5585
Fla	Ormond Beach, Tech. Mktg. Assoc.	904-672-2314
Fla	Pompano Beach, Tech. Mktg. Assoc.	305-942-0774
Ill	Mt. Prospect, M.J. Petersen Assocs.	312-253-3510
Mass	Needham, DeVeer Sls. Co.	617-444-4200
Mich	Detroit, A. Blumenberg	313-557-1934
Minn	St. Paul, Skor	612-645-6461
NJ	Clark, Dolan Assocs.	201-382-2797
NY	Syracuse, Upstate Comp. Sls.	315-437-7536
NC	Winston Salem, L.G. White Southern	919-725-3612
Ohio	Dayton, Neal Bear Corp.	513-299-3566
Ohio	Richfield, N. Bear Corp.	216-659-3131
Ore	Portland, J.J. Backer Co.	503-297-3776
Pa	Doylestown, Bucks Assocs	215-348-8223
Tex	Ft. Worth, W. Fralia	817-738-2002
Tex	Houston, W.P. Fralia Co.	713-721-0230
Va	Annandale, Allied Sls. Corp.	703-573-7837
Va	Richmond, Allied Sls. Corp.	703-288-0124
Wash	Seattle, J.J. Backer Co.	206-285-1300

NEW-TRONICS CORP., 15800 Commerce Pk. Dr., Brookpark, Ohio, 44142, Tel: 216-267-3150; Sls. Mgr: W.C. McNeil

NEW-TRONICS Local Distributors

Minn	Duluth, Northwest Radio, 123 E. First St.	218-727-1565
Va	Norfolk, Priest Elctrn., 6431 Tidewater Dr.	703-855-2021

N.Y. TESTING LABS., INC., 81 Urban Ave., Westbury, N.Y., 11590, Tel: 516-334-7770

NEWCOMB AUDIO PRODS. CO., 12881 Bradley Ave., Sylmar, Calif., 91342, Tel: 213-367-1921; Pres: R. Newcomb; Sls. Mgr: B. McKnight

Local Sales Offices & Reps.

Ala	Birmingham, M. F. Taylor Co.	205-853-0336
Cal	Burlingame, W. J. Purdy Co.	415-347-7701
Colo	Colorado Springs, Norris & Co.	303-635-9319
Fla	Winter Haven, M. F. Taylor Co.	813-294-2941
Iowa	Des Moines, K.S.W. Assocs.	515-279-9235
La	New Orleans, Crockett Sls. Co.	504-486-4590
Md	Silver Spring, M. F. Taylor Co.	301-589-4002
Mass	Belmont, Albert Reinherz	617-484-7784
Mich	Ferndale, Shalco, Inc.	313-547-4771
Minn	Minneapolis, Stan Olsen	612-929-6121
Mo	Kansas City, K.S.W. Assocs.	816-363-5651
NJ	Teaneck, S. Fisher Sls. Corp.	201-836-6661
NY	Grand Island, L.J. McTaggart	716-773-9222
NC	Charlotte, M. F. Taylor Co.	704-537-4878
Ohio	Mansfield, Ken White	419-756-3363
Pa	Pittsburgh, M. F. Taylor Co.	412-823-8400
Tenn	Memphis, Crockett Sls. Co.	901-388-5410
Tex	Dallas, Crockett Sls. Co.	214-748-8209
Wash	Bellevue, Vantage Corp.	206-455-3460

NEWCOMB Local Distributors

Minn	Duluth, Northwest Radio, 123 E. First St.	218-727-1565
Neb	Omaha, J-B Distributing Co., 1616 Cass St	402-341-5525

NEWPORT LABS., INC., 630 E. Young St., Santa Ana, Cal., 92705, Tel: 714-540-4914, TWX: 910-595-1787; Prom. Dir: L. Kinney; Mktg. Mgr: M. Culverhouse Vol 4•416-419*

Local Sales Offices & Reps.

Ala	Huntsville, W.A. Brown Instr.	205-539-4411
Ariz	Scottsdale, Meas. Consts., Ltd.	602-946-7252
Cal	Pasadena, A-F Sls. Engrg.	213-681-5631
Cal	Sunnyvale, RDP Instrs.	408-735-9040
Colo	Bouder, Meas. Conslts., Ltd.	303-449-5294
Conn	West Hartford, Instr. Assocs.	203-525-9367
Fla	Ft. Lauderdale, W.A. Brown Instr.	305-566-5697
Fla	Ft. Walton Beach, W.A. Brown Instr.	904-243-6424
Fla	Orlando, W.A. Brown Instr.	305-425-5505
Ga	Tucker, W.A. Brown Instr.	404-939-1674
Ill	Chicago, Dalec	312-283-0300
La	Gretna, W.A. Brown Instrs.	504-366-5766
Md	Rockville, MESA, Inc.	301-881-8430
Mass	Bedford, Instr. Assocs.	617-275-0700
Mich	Southfield, Data-Tron	313-354-6421
Minn	Minneapolis, Dalec	617-786-9666
Mo	St. Louis, C.B. Fall Co.	314-241-2433
NJ	Pennsauken, Megargel & Himmelstein	609-662-3081
NM	Albuquerque, Measurement Conslts., Ltd.	505-344-3575
NC	Winston-Salem, W.A. Brown Instr.	919-768-3600
Ohio	Cleveland, Data-Tron	216-585-8421
Ohio	Dayton, Data-Tron	513-223-8421
Ore	Portland, Showalter-Judd, Inc.	206-762-2310
Tex	Dallas, Remtek, Inc.	214-396-8146
Tex	Houston, Remtek, Inc.	713-664-2113
Wash	Seattle, Showalter-Judd, Inc.	206-762-2310

NH RESEARCH, INC., 1510 S. Lyon St., Santa Ana, Calif., 92705, Tel: 714-835-1616; V. P: V. Shaker

NICOLET INSTR. CORP., 5225 Verona Rd., Madison, Wisc., 53711, Tel: 608-271-3333, TWX: 910-286-2713; Sls. Mgr: R.E. Penrod .....Vol 1•490

Local Sales Offices & Reps.

Cal	Palo Alto, Nicolet Instr. Corp.	415-969-1258
Colo	Littleton, Nicolet Instr. Corp.	303-798-3561
Ill	Elk Grove, Nicolet Instr. Corp.	312-956-0404
Md	Rockville, Nicolet Instr. Corp.	301-762-8440
Mass	Auburndale, Nicolet Instr. Corp.	617-969-7420
Mo	St. Charles, Nicolet Instr. Corp.	314-723-2031
NY	Old Bethpage, Nicolet Instr. Corp.	516-249-6360

NIKON, INC., Instr. Div., Ehrenreich Photo-Optical Ind., 623 Stewart Ave., Garden City, N.Y., 11530, Tel: 516-248-5200; Sls. Mgr: I.H. Feldman

NIPPERT CO., 825 Pittsburgh Dr., Delaware, Ohio, 43015, Tel: 614-363-1981; V.P: J.E. Nippert; V.P: D.E. Breese

NIPPON ELECTRIC/NEC AMERICA, 200 Park Ave., N.Y., N.Y., 10017, Tel: 212-661-3420; Asst. Sls. Mgr: T. Imamiya; Sr. Engr: H. Chiyoda .....Vol 2•523

Local Sales Offices & Reps.

Cal	Los Angeles, NEC America Inc.	213-776-5923
Ill	Chicago, NEC America Inc.	312-828-9494
Va	Falls Church, NEC America Inc.	703-560-2010

N.J.E. CORP., Sub. Technical Development, Box 50, Culver Rd., Dayton, N.J., 08810, Tel: 201-329-4616, TWX: 710-480-5674; V/P Mktg: R. Hoeffler

Local Sales Offices & Reps.

Ala	Huntsville, Col-Ins. Co.	205-539-1771
Ariz	Phoenix, Moxon Elctrns.	602-273-7363
Cal	Newport Beach, Moxon Elctrns.	714-833-2000
Cal	San Diego, Moxon Elctrns.	714-292-4820
Cal	Sunnyvale, Moxon Elctrns.	408-734-4352
Colo	Denver, B.F.A. Corp.	303-744-3301
Conn	Hamden, Instr. Conslts.	203-288-5246
Fla	Orlando, Col-Ins-Co., Inc.	305-423-7615
Ill	Chicago, Carter Elctrns., Inc.	312-585-5485
Ind	Indianapolis, Carter Elctrns., Inc.	317-293-0696
Kans	Lenex, S. Stirling Co.	913-888-2995
Md	Rockville, Mesa, Inc.	301-881-8430
Mass	Waban, Instr. Conslts.	617-969-9881
Mich	Farmington, Sheridan Assoc.	313-477-3800
Minn	Minneapolis, Carter Elctrns.	612-544-9393
Mo	Florissant, Sheridan Assoc.	314-837-5200
NJ	Fort Lee, Tech. Mktg. Assoc.	201-224-6911
NJ	Pennsauken, Megargel/Himmelstein	609-662-3081
NM	Albuquerque, B.F.A. Corp.	505-296-8303
NY	Depew, Labtronics, Inc.	716-685-4111
NY	Endicott, Labtronics	607-748-0509
NY	Syracuse, Labtronics, Inc.	315-454-9314
NY	Ulster Park, Labtronics, Inc.	518-372-6649
NC	Raleigh, Col-Ins-Co., Inc.	919-834-6591
Ohio	Cincinnati, Sheridan Assocs.	513-761-5432
Ohio	Dayton, Sheridan Assocs., Inc.	513-277-8911
Okla	Tulsa, Kemp Eng. Co.	918-628-0309
Pa	Monroeville, Sheridan Assoc.	412-373-1070
Tex	Dallas, Kemp Eng. Co.	214-357-6663
Tex	Houston, Kemp Eng. Co.	713-688-1431
Wash	Belleview, Seattle, Brennan Assoc.	206-454-9332
Wisc	Milwaukee, Carter Elctrns., Inc.	414-464-5555
For:	Can., Montreal, Que., Megatronix	514-488-0404
For:	Can., Weston, Ont., Megatronix	416-748-8015

NL INDS., INC., Elctrns. Dept., Box 420, Hightstown, N.J., 08520, Tel: 609-448-3200; Sls. Mgr: D.B. McCulloch Vol 2•1170,1171

Local Sales Offices & Reps.

Ala	Huntsville, Murphy & Cota	205-529-8476
Cal	Santa Clara, JB Microelectronics, Inc.	408-739-9150
Cal	Sun Valley, Weightman & Assocs.	213-768-5750
Colo	Wheat Ridge, RMS Sls.	303-423-6693
Fla	St. Petersburg, Lynch-Gentry Assocs.	813-347-5131
Ill	Chicago, D. Dolin Sls. Co.	312-286-6200
Ind	Greenwood, V. Schillinger & Assocs.	317-888-2260
Ind	South Bend, V. Schillinger & Assocs.	219-291-6258
Md	Baltimore, R. A. Wafer Assocs.	301-744-1133
Mass	Newton, Normell Assocs.	617-969-5478
Mich	Detroit, Burcaw Co. & Assocs.	313-533-7700
Minn	St. Paul, R.G. Ragon, Inc.	612-488-0201
Mo	Kansas City, Nevco, Inc.	816-421-1751
NJ	Fairlawn, G. Harris & Assocs.	201-796-5200
NJ	Haddonfield, Thomas Assocs., Inc.	609-854-3011
NY	Syracuse, W.A. Franklin Sls. Corp.	315-474-2954
NY	Whitesboro, W.A. Franklin Sls. Corp.	315-736-5460
NC	Winston-Salem, Murphy & Cota	919-723-1001
Ohio	Cleveland, Jay Engrg. Co.	216-252-0486
Ohio	Dayton, Jay Engrg. Co.	513-253-2151
Okla	Tulsa, Norvell Assocs., Inc.	918-663-1247
Tex	Dallas, Norvell Assocs., Inc.	214-350-6771
Tex	Houston, Norvell Assocs.	713-774-2568
Wash	Seattle, D. Smith Sls. Co.	206-633-3160

NL INDS., INC., Metal Div., 111 Broadway, New York, N.Y., 10006, Tel: 212-732-9400; Mktg. Mgr: T.R. Zanardi

N L INDS., INC., Paint Div., 111 Broadway, New York, N. Y., 10006, Tel: 212-732-9400

N L INDS., INC., Steel Package Div., 15th & State Sts., Granite City, Ill., 62040, Tel: 618-451-9760

NOBEX DIV., Griffith Plastics Corp., 1027 California Dr., Box 4365, Burlingame, Cal., 94010, Tel: 415-344-7691, TWX: 910-374-2840 ..... Vol 2•500-505

Local Sales Offices & Reps.

Ala	Montgomery, F. Wamble Sls.	205-542-5889
Ariz	Scottsdale, Leddy Assocs.	602-947-4379
Cal	Burlingame, J. Logan & Assocs.	415-697-6100
Cal	Inglewood, V & L Assocs.	213-671-7688
Colo	Littleton, Leddy Assocs.	303-795-1973
Fla	Delray Beach, F. A. Cullman Co.	305-276-5071
Ill	Chicago, Comm. Engrs.	312-761-0548
Ind	Ft. Wayne, McDonald Sls. Co.	219-745-9214
La	Metairie, McKinney Sls. Co.	504-887-1723
Md	Baltimore, M/E Assocs.	301-825-1130
Mass	N. Scituate, W.A. Hendrickson Co.	617-545-0652
Minn	Minneapolis, Wenco Sls.	612-866-3639
NJ	Cherry Hill, M/E Assocs.	609-667-6110
NY	Bayside, W. Jay Assocs.	212-762-4238
Okla	Tulsa, McKinney Sls. Co.	918-742-6791
Tex	Bellaire, McKinney Sls. Co.	713-665-3653
Tex	Dallas, McKinney Sls. Co.	214-631-9450
Va	Richmond, M/E Assocs.	703-266-3457
Wash	Seattle, Carlyle Tech. Sls.	206-632-4290

For Local Source Data Call Toll-Free 800-645-9200 (in N.Y. State Call 516-294-0990 Collect)

NORELCOM INDS., INC., 200 Allen Blvd., Farmingdale, N.Y., 11735, Tel: 516-249-7245; V.P: R. E. Thaw; Oper. Mgr: H. Adams

NORDEN DIV., United Aircraft Corp., Helen St., Norwalk, Conn., 06851, Tel: 203-838-4471, TWX: 710-468-0788; Sls. Mgr. Encoders: J.J. Cronan Vol 4•342-352*

Local Sales Offices & Reps.

Conn	Thomaston, Nelson & Schoonmaker	203-283-5959
Fla	Orlando, F. Fausett & Co.	305-424-0701
Ga	Smyrna, F. Fausett & Co.	404-436-5169
Ill	Des Plaines, Martec Assocs.	312-296-3331
Ind	Ft. Wayne, D. C. Flanagan	219-748-1594
Kans	Overland Pk., Palatine Eng. Sls.	913-262-5643
Mass	Arlington, Nelson & Schoonmaker	617-643-5454
Mich	Southfield, Sterling-Lowell Co.	313-354-6130
Minn	Minneapolis, M. Franklin Co.	612-920-8014
Mo	St. Louis, Palatine Eng. Sls.	314-426-7055
NJ	Phillipsburg, Tronix Inc.	201-859-3944
NY	New York, Haber-Ramp	212-799-4040
NY	Skaneateles, Nelson & Schoonmaker	315-685-5836
SC	Greenwood, F. Fausett & Co.	803-451-7847
Va	Henry, F. Fausett & Co.	703-365-5221
Wash	Seattle, J. B. Jolly	206-938-4166
Exp:	Conn, E. Hartford, United Aircraft Intl.	203-565-3394
For:	Can., Longeuil, U.A.C., Ltd.	514-677-9411

NORPLEX DIV. UOP, Norplex Dr., LaCrosse, Wisc., 54601, Tel: 608-784-6070; Dir. of Sls: C.J. Williams; Sls. Mgr: J. Parker

NORSAL INDUSTRIES, INC., 34 Grand Blvd., Brentwood, N.Y., 11717, Tel: 516-231-4040; Pres: N. Spector

NORTEC ELCTRNS. CORP., 3697 Tahoe Way, Santa Clara, Cal., 95051, Tel: 408-732-2204; Sls. Mgr: M. Sanjideh

NORTH AMERICAN PHILIPS CONTROLS CORP., Cheshire Industrial Park Box E, Cheshire, Conn., 06410, Tel: 203-272-0301, TWX: 710-455-4048; Adv. Mgr: L.J. Torok ..... Vol 2•357

Local Sales Offices & Reps.

Ala	Huntsville, W.A. Brown Components	205-539-4411
Cal	North Hollywood, No. Amer. Philips Controls	213-877-0536
Cal	Palo Alto, Harris Engrg.	415-328-3370
Colo	Englewood, Simpson Assocs.	303-798-8439
Conn	Thomaston, Nelson & Schoonmaker, Inc.	203-283-5959
Fla	Ft. Lauderdale, W.A. Brown Comps.	305-564-8000
Fla	Orlando, W.A. Brown Comps.	305-425-5505
Ill	Rolling Meadows, Sumer	312-394-4900
Ind	Ft. Wayne, Temple Engrg.	219-744-4331
Md	Lutherville, L.D. Lowery	301-823-2172
Mass	Millis, Selmark Assocs.	617-376-2914
Mich	Dearborn Heights, Temple Engrg.	313-565-6330
Minn	Mpls, Nortec Sls.	612-835-7414
Mo	Hazelwood, Dy-Tronix Inc.	314-731-4677
Mo	Kansas City, Dy-Tronix Inc.	816-761-6543
NJ	Livingston, A.A. Budde	201-994-1210
NY	Forest Hills, Malin Assocs.	212-268-9122
NY	Rochester, Woodams-Montbach	716-544-8721
NC	Winston-Salem, W.A. Brown Comps.	919-725-5384
Ohio	Cleveland, C. Robinson Co.	216-381-9049
Ohio	Dayton, C. Robinson Co.	513-275-2412
Pa	Broomall, L.D. Lowery	215-528-5170
Tex	Dallas, R. Kimball Co.	214-231-3447
Va	Charlottesville, L.D. Lowery	703-973-6672
For:	Can., Toronto, Ont., Philips Elctrns. Inds., Ltd.	416-425-5161

NORTH AMERICAN PHILIPS CONTROLS, Frederick Div., E. Church & 2nd Sts., Frederick, Md., 21701, Tel: 301-663-5141, TWX: 710-862-0901; Sls. Mgr: B.L. Reeder Vol 2•841

Local Sales Offices & Reps.

Ala	Huntsville, W. Brown	205-539-4411
Cal	No. Hollywood, North Amin. Philips Controls Corp.	213-877-0536
Cal	San Jose, Allgood-North	408-288-6731
Colo	Denver, Williams-Assocs.	303-388-4391
Conn	Thomaston, Tygren	203-283-8722
Fla	Ft. Lauderdale, W. Brown	305-564-8000
Fla	Orlando, W. Brown	305-425-5505
Ill	Oakbrook, Whitmore Assoc.	312-325-4727
Ind	Ft. Wayne, Temple Engrg.	219-744-4331
Md	Towson, J-H Elctrn. Sls. Co.	301-825-4440
Mass	Braintree, Tygren Co.	617-848-1477
Mich	Dearborn Heights, Temple Engineering	313-565-6330
Minn	Mpls., Nortec Sls.	612-835-7414
Mo	Hazelwood, Dy-Tronix	314-731-4677
Mo	Kansas City, Dy-Tronix	816-761-6543
NJ	, Wilson Assoc.	201-385-7447
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	New York, Wilson Assoc.	212-889-0370
NY	Rochester, Woodams-Montbach	716-544-8721
NC	Winston-Salem, W. Brown	919-725-5384
Ohio	Cleveland, C. Robinson	216-381-9049
Ohio	Dayton, C. Robinson	513-275-2412
Pa	Ambler, G.M.C. Assocs.	215-646-7535
Tex	Richardson, R.F. Kimball	214-231-3447
Exp:	NY, N.Y., Frathom Co.	212-687-9390
For:	Can., Toronto, Ont., Pye-Tmc	416-249-7044

NORTH Local Distributors

NY	New York, Midway Ind'l. Elec., 38 E. 29th St.	212-889-0370

NORTH ATLANTIC INDS., 200 Terminal Dr., Plainview, N.Y., 11803, Tel: 516-681-8600, TWX: 510-221-1879; VP & Gen. Mgr: F.G. Roberts; Regional Sls. Mgr: F. Karas Vol 1•364,365

Local Sales Offices & Reps.

Ala	Huntsville, BCS Assocs.	205-881-6220
Ariz	Phoenix, Techn. Consultants	602-266-7422
Cal	Los Angeles, Scientific Devices	213-641-4800
Cal	Mountain View, Scientific Devices-CA	415-964-4230
Cal	North Hollywood, North Atlantic Dist. Off.	213-982-0442
Cal	San Diego, Scientific Devices-CA	714-279-6642
Conn	Hamden, J & J Assocs.	203-624-7800
Fla	Fort Lauderdale, BCS Associates Inc.	305-735-7641
Fla	Orlando, BCS Assocs.	305-843-1510
Ga	Atlanta, BCS Assocs.	404-874-9925
Ill	Chicago, P. Lind	312-774-1246
Kans	Merriam, Techn. Reps.	913-432-4110
Md	Baltimore, Dyna Rep. Co.	301-879-2586
Mass	Burlington, J & J Assocs.	617-272-2606
Mich	Milford, Scientific Devices	313-363-2282
Minn	Circle Pines, P. Lind	612-786-5770
Mo	Hazelwood, Tech. Reps.	314-524-6900
NC	Greensboro, BCS Assocs.	919-273-1918
Ohio	Cleveland, Scientific Devices	216-261-2000
Ohio	Dayton, Scientific Devices	513-298-9904
Pa	Exton, Scientific Mktg.	215-363-7377
Tex	Houston, Scien. Sls.	713-781-2711
Tex	Richardson, Sci. Sls.	214-231-6542
Va	Springfield, Dyna Rep.	703-321-8630
Va	Williamsburg, BCS Assocs.	703-245-1786
Wash	Bellevue, Sci. Devices N.W.	206-454-0900
Wisc	Milwaukee, P. Lind Elctrns. Co.	ENterprise 1611
Exp:	N.Y., Plainview, North Atlantic	516-681-8600
Cal	North Hollywood, Elect. Standards Repair Svc.	213-765-4224
Fla	Fort Lauderdale, BCS Assocs., Inc.	305-735-7641
Fla	Orlando, BCS Assocs.	305-843-1510

NORTH ELECTRIC CO., Electronetics Div., Box 688, Galion, Ohio, 44833, Tel: 419-468-8100, TWX: 419-464-4860; Mktg. Analyst: K. Gregg; Mktg. Analyst: H. Sunnucks

Local Sales Offices & Reps.

Colo	Denver, Franklin Sls.	303-922-3623
Haw	Honolulu, Aloha Assoc.	808-922-3819
Ill	Berkeley, Schuten Assocs.	321-449-7655
Mass	Lexington, R. Purinton, Inc.	617-475-7055
Minn	Mpls., R. J. Siedare	612-533-2294
Neb	Lincoln, Mktg. Assocs.	402-434-5244
NJ	Cherry Hill, Benco Sls.	609-429-5515
NJ	Fair Lawn, Bixon Assoc.	201-797-5356
NY	Webster, E.A. Kershaw	716-671-6365
Tex	Seabrook, Stolle-Hamilton Co.	713-474-3155
Va	Oakton, Prod. Mgt. Co.	301-948-0493
For:	Can., Ottawa, Ont., Whittaker Elec.	613-224-1221

NORTH HILLS ELCTRNS., INC., Alexander Pl., Glen Cove, N.Y., 11542, Tel: 516-671-5700; Sls. Mgr: V. Macri Vol 1•366,768; Vol 2•358,359; Vol 3•533,1268

Local Sales Offices & Reps.

Cal	Los Angeles, Sodaro Co.	213-478-7733
Colo	Englewood, Klein Aerospace, Inc.	303-781-4967
Conn	East Hartford, Measurement Equip. Co.	203-528-8192
Fla	Melbourne, Reynolds & Assocs., Inc.	305-727-3205
Md	Kensington, Aeron Assocs.	301-946-0070
Mass	Wakefield, Measurement Equip. Co.	617-245-4870
Mich	Clawson, George Instr. Co.	313-435-3400
Minn	Minneapolis, Heimann Co.	612-861-6051
NY	DeWitt, DB Assocs.	315-446-0220
NY	Great Neck, Industron Assoc.	516-HU-7-2620
Ohio	Cleveland, Weschler Elec. Corp.	216-251-4609
Ohio	Dayton, Weschler Elec. Corp.	513-274-6972
Tex	Arlington, Kentron Engrg. Sls. Co.	817-265-8292

For Local Source Data Call Toll-Free 800-645-9200 (in N.Y. State Call 516-294-0990 Collect)

NORTHEAST SCIENTIFIC CORP., 30 Wetherbee St., Acton, Mass., 01720, Tel: 617-263-2711; Chief Engr: Dr. C. Moritz

NORTHERN ENGRG. LABS., 357 Beloit St., Burlington, Wisc., 53105, Tel: 414-763-3591; Sls: D. Griebel Vol 2•435

Local Sales Offices & Reps.

Cal	Palo Alto, R. W. Thompson Assocs.	415-493-7388
Cal	Pasadena, P. Nurches	213-796-5844
Colo	Aurora, Robbins & Assocs.	303-399-6618
Fla	Orlando, W. B. Wimberly	305-425-3083
Ill	Chicago, E. Schmeichel	312-524-0307
Kans	Overland Park, B. Rush Assocs.	913-831-4259
Mass	Needham, Hatch Assocs.	617-444-3310
NJ	Bergenfield, H. Gray	201-384-3643
NY	Syracuse, Naylor Elec. Co.	315-472-9183
Ohio	Wickliffe, W. J. Brauer	216-943-0601

NORTHERN PRECISION LABS., INC., 202 Fairfield Rd., Fairfield, N.J., 07006, Tel: 201-227-4800, TWX: 710-734-4301; Sls. Mgr: T. Monaco

NORTHFIELD PRECISION INSTR. CORP., 4400 Austin Blvd., Island Pk., N.Y., 11558, Tel: 516-431-1112; S.M: M. Farber ..... Vol 2•658

Local Sales Offices & Reps.

Cal	Mondrovia, Electro-Mechanical Instr., Inc.	213-358-1881

NORTON ASSOCS., INC., 10 Di Tomas Ct., Copiague, N.Y., 11726, Tel: 516-842-4666; Pres: R.S. Norton Vol 1•316

NORTON COATED ABRASIVE & TAPE DIVS., Dept. 7312, Troy, N.Y., 12181, Tel: 518-273-0100; Abras. Ad. Mgr: J.P. Burke; Tape Ad. Mgr: W.G. Kestner

NORTRONICS, 8101 10th Ave., N., Mpls., Minn., 55427, Tel: 612-545-0401; Mktg. Mgr: M. Kronfeld

NORTRONICS Local Distributors

Cal	Goleta, Radio Prods. Sls., 350 S. Kellogg Ave	805-964-6823
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Ill	Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.	
Mo	St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave	314-MA-1-5000
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080

NOVA ELECTRIC MFG. CO., 263 Hillside Ave., Nutley, N.J., 07110, Tel: 201-NO-1-3434; Dir. Mkt: J.M. Essner; Pres: L. Gottlieb ..... Vol 1•775-777

Local Sales Offices & Reps.

Cal	Mountain View, Gado Instr.	415-961-2222
Cal	San Gabriel, Rochette & Assocs.	213-285-1251
Colo	Boulder, A.L.S. Elctrns.	303-447-2436
Conn	Hamden, J & J Assocs.	203-624-7800
Fla	Maitland, Rowe Engrg. Sls.	305-834-2700
Ill	Crystal Lake, Power Conversion Prods.	815-459-9100
Md	Silver Spgs., Gawler-Knoop	301-589-4406
Md	Towson, Gawler-Knoop Co.	215-348-4646
Mass	Burlington, J & J Assocs.	617-272-2606
Minn	Minneapolis, R-J Inc.	612-992-1425
NJ	Roseland, Gawler-Knoop Co.	201-226-4545
NM	Albuquerque, A.L.S. Elctrns.	505-268-9600
NY	Guilderland, Electro-Modular	518-456-2665
Ohio	Worthington, Ohio Instr.	614-885-0743
Tex	Dallas, R. Martin Assoc	214-358-3704
Tex	Houston, R. Martin Assoc.	713-462-4077
Wash	Seattle, Datacom Assocs.	206-329-2989
Exp:	N.Y., N.Y., Henley & Co.	212-986-5544
For:	Can., Calgary, Alberta, Canadian Dynamics	403-243-2018

For: Can., Toronto, Ont., Electrodesign Ltd 416-787-0991
For: Can., Vancouver, B.C., Canadian Dynamics 604-325-3201
For: Can., Vanier, Ont., Electrodesign Ltd 613-745-0541
For: Can., Ville La Salle, Que., Electrodesign Ltd 514-363-5120

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

NOVATRONICS, INC., Box 878, Pompano Beach, Fla., 33061, Tel: 305-942-5200, TWX: 510-956-9878; Mgr. Cust. Req: J. Cianciarulo

NU-CONCEPT COMPUTER SYS., 306 W. Logan St., Norristown, Pa., 19401, Tel: 215-275-3200; VP: J. Moretz; VP: T. Dvorak

NUCLEAR DATA, 1330 E. Golf Rd., Palatine, Ill., 60067, Tel: 312-529-4600; Sls. Mgr: C.J. Long

NUCLEAR MEAS. CORP., 2460 N. Arlington Ave., Indianapolis, Ind., 46218, Tel: 317-546-2415, TWX: 810-341-3137; Sls. Mgr: L.G. Vaughn; Asst. Sls. Mgr: M. Hansen

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Mass Marblehead, Nucleonic Div. M. M. Newman Corp. 617-631-7100
NM Albuquerque, C. W. Fowler Co. 505-299-7676
NY Syosset, Scientific Sys. Sls. Corp. 516-921-3737
NC Charlotte, MacGuire & Crawford Inst. Co. 704-366-3454
Pa Pittsburgh, Scientific Pittsburgh 412-655-2880
Tenn Knoxville, Pulcir, Inc. 615-693-3641
Tex Houston, Luoto Assocs. 713-524-8271
Va Fairfax, Hildenbrand Co., Inc. 703-280-2330
Wash Bellevue, C. W. Fowler Co. 206-454-8600

NUCLEAR RESCH. CORP., Street Rd. & 2nd St. Pike, Southampton, Pa., 18966, Tel: 215-357-5015; Sls. Mgr: D.S. Pollock

NUCLEAR SYS., 2613 Industrial Lane, Garland, Tex., 75041, Tel: 214-278-3545; In-House Sls: J.D. Bleakley

NUCLEONIC PRODS., Box 1454, Canoga Pk, Cal., 91303, Tel: 213-887-1010, TWX: 910-494-1954; V.P: C. Kaiden; Prod. Mgr: H. Nierenberg

NUCOR CORP., Power Supply Div., 2 Richwood Pl., Denville, N.J., 07834, Tel: 201-627-4200, TWX: 710-987-8487; Sls. Mgr: D.A. Alatary; Sls. Engr: E. Palwick ..... Vol 1•778,779

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Cal Long Beach, Cairns Engrg. Sls. 213-432-7444
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Ill Chicago, Electro-Tech Mktg. Assoc. 312-588-4535
Mass Burlington, R.J. Sickles Assoc. 617-272-7285
Mich Warren, DEM Elctrn. Sls. 313-755-6660
Mo St. Louis, G. Fixman Engr. Co. 314-725-5219
NY Cortland, R.J.C. Associates 607-753-3909
NY Huntington Station, Addem Group 516-567-5900
Okla Tulsa, Vista Engrg. 918-627-7557
Pa Ambler, Wm. Associates 215-643-4119
Pa Springhouse, DeShawn Assocs. 215-643-1737
Tex Richardson, Vista Engrg. 214-235-4547

NURAD, INC., 2165 Druid Pk. Dr., Baltimore, Md., 21211, Tel: 301-462-1700; Sls. Mgr: H. Rutstein

NUSONICS, INC., Box 248, Paramus, N.J., 07652, Tel: 201-265-2400; Sls. Mgr: J.W. Torrance

NVF CO., Box 68, Yorklyn, Del., 19736, Tel: 302-239-5281; Sls. Mgr: G. Le Van; Asst. Sls. Mgr: T. Workman

NWL TRANSFORMERS, Nothelfer Winding Labs., Box 455, Trenton, N.J., 08603, Tel: 609-882-2500; Sls. Mgr: R. Graham; Chief Elec. Eng: D. Singh; Pres: J.P. Seitz Vol 3•1267

Local Sales Offices & Reps.
Tex Dallas, Titan Reps 214-357-8266

NYE, WILLIAM F., INC., P.O. Box G-927, New Bedford, Mass., 02742, Tel: 617-996-6721; Sls. Mgr: G.B. Mock

NYLOK CO. DIV., USM Corp., 611 Industrial Ave., Paramus, N.J., 07652, Tel: 201-261-9400, TWX: 710-990-6212; Sls. Mgr: R.W. Rundle

NYTRONICS, INC., Darlington Div., Orange St., Darlington, S.C., 29532, Tel: 803-393-5421, TWX: 810-665-2182; V.P. Mktg: P.W. Shatusky; Prod. Sls. Mgr: M. Windham; Cust. Svc. Mgr: M. Parnell

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Kans Wichita, Thunderbird Tech. Sls. 316-684-3941
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Mich Ann Arbor, H. C. Heym 313-971-6552
Minn St. Paul, Wagner Comp. Conslts. 612-698-0331
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NYTRONICS, INC., Essex Elctrns. Div., Orange St., Darlington, S.C., 29532, Tel: 803-393-5421, TWX: 810-665-2182; V.P. Mktg: P.W. Shatusky; Prod. Sls. Mgr: M. Windham; Cust. Svc. Mgr: M. Parnell

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NY Syracuse, W.A. Franklin Sls. 315-446-1120
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NY Whitesboro, W. A. Franklin Sls. 315-736-0323
Ohio Wickliffe, W. J. Brauer Assoc. 216-943-0601
Okla Tulsa, H.J. Daly 918-627-4159
Pa Narberth, J. Bresson 215-839-6770
Tex Dallas, R. Matthews Elctrns. 214-341-7989

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La Metairie, J. McKinney Sls. 504-887-1723
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NJ Haddonfield, Gray Assocs. 609-429-5300
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NY New York, H. G. Richter, Inc. 212-962-5820
NY Rochester, E. Schomburg 716-244-0920
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Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Minn Minneapolis, Hall-Mark Elctrns., 4555 W. 77th St. 612-925-2944
Minn Minneapolis, ICI-Industrial Comps. Inc., 612-927-9991 991
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Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
Tex Houston, Hall-Mark Elctrn., Box 36739 713-781-6100
Wisc Milwaukee, Hall-Mark Elctrns., 11925 Ripley Ave. 414-476-1270

OAKTRON INDS., Monroe, Wisc., 53566, Tel: 608-325-2121; Sls. Mgr: J. Disch; Ch. Eng: D. Havercamp ..... Vol 4•310*

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Colo Boulder, Straube Assoc. 303-443-8600
Conn West Hartford, R. Smith Co. 203-523-0512
Fla No. Miami, Winfield Elect. 305-945-6544
Ga Atlanta, Millar Elect. 404-261-6160
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Pa Pittsburgh, Tanner Co. 412-561-4687
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Wash Seattle, M.K. Widdekind Co. 206-284-8020

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Ga Atlanta, Winfield Elctrn. Sls. Co. 404-636-3023
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La Chalmette, Cartwright & Bean. 504-279-4598
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NY Canandaigua, Telesco Assoc. 716-872-6417
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Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
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Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Ill Chicago, Burstein-Applebee 312-763-4848
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
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Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
Mich Muskegon, Western Elctrn Supply, 1781 5th St 616-722-7628
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Ann, Interstate Ind Elctrn, 10525 St. Charles Rock Rd 314-428-8522
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Cinnaminson, Wilshire Elctrns/Phila., 855 Industry Hwy 609-786-8990
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
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NY Buffalo, Radio Equip. Corp., 196 Vulcan St 716-874-2690
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Elmsford, Melville Radio, 1 Nepperham Ave. 914-592-7100
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
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Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
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Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
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Mo St. Peters, K.M. & B. Tech. Sls. 314-278-3159
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NY Syracuse, Mike Antil 315-463-0266
NC Greensboro, Reynolds & Assocs. 919-275-3725
Ohio Medina, McShane, Inc. 216-725-4568
Pa Ambler, W & M Assocs. 215-643-4119
Tex Dallas, Bouco Sls. Assocs. 214-247-6708
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Exp: Pa., Lemoyne, Elctrns. Int'l. 717-737-8858
For: Can., Vancouver 9, Cal-Tron Elctrn. Sls., Ltd.

OVENAIRE, Div. Walter Kidde & Co., 706 Forrest St., Charlottesville, Va., 22901, Tel: 804-293-5148, TWX: 510-587-5461; VP Frequ. Prods: N. Broadbent; Mgr. Temp. Prods: R. VanDerveer .....Vol 2•436-439

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Cal Van Nuys, R.L. Assocs. 213-780-1666
Fla Maitland, Ellis & Assocs. 305-645-1101
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Mass Sherborn, Naton Assocs., Inc. 617-235-1966
Mich Southfield, Scott Elctrns., Inc. 313-357-2088
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NY Buffalo, Quality Comps. 716-839-4170
NY Smithtown, TX Sls., Inc. 516-979-8750
NC Greensboro, L & D, Inc. 919-292-3201
Ohio Cincinnati, Scott Elctrns., Inc. 513-791-2513
Ohio Cleveland, Scott Elctrns. 216-291-2600
Ohio Columbus, Scott Elctrns., Inc. 614-228-2313
Ohio Dayton, Scott Elctrns. 513-223-2652
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Exp: New York, N.Y., C. Tennant, Sons & Co. Electronic Div. 212-889-8530

OWATONNA TOOL CO., 395 Eisenhower Dr., Owatonna, Minn., 55060, Tel: 507-451-5310; V.P. Mktg: J.A. Mullenmaster

OXFORD INSTR. CORP., 100 Cathedral St., Annapolis, Md., 21401, Tel: 301-268-2350; G.M: J.E. Templeton

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PACE WIRE & CABLE CORP., 3590 Oceanside Rd., Oceanside, N.Y., 11572, Tel: 516-678-2275; Sls. Mgr: S. Stadlen

PACIFIC COMMUNICATIONS, Box 10392, Santa Ana, Cal., 92711, Tel: 714-546-0147; V. P: K. Fowler; Engr: W. Cormey

PACIFIC ELECTRONIC ENTERPRISES, 2643 N. San Gabriel Blvd., Rosemead, Cal., 91770, Tel: 213-573-1686; M/M: S. Tullock .....Vol 1•780

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Ga Chamblee, Lee Assocs. 404-457-7117
Ill Chicago, Carter Elctrns. 312-585-5485
Ind Indianapolis, Carter Elctrns. 317-293-0696
Mass Newtonville, H. J. Schuft Co. 617-527-5304
Minn Minneapolis, Carter Elctrns. 612-544-9393
Mo Hazelwood, Carter Elctrns. 314-731-2237
NJ Union, SBM 201-687-8737
NY Pleasantville, SBM 914-769-1811
NY Rochester, SBM 716-266-1400
NC Raleigh, Lee Assocs. 919-787-5818
Wisc Milwaukee, Carter Elctrns. 414-464-5555

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Ill Chicago, Scientific Sls. 312-775-7594
Ind Indianapolis, Scientific Sls. 317-253-4606
Kans Shawnee Mission, EIR Co. 913-362-0919
Mass Waltham, MC Bar Assocs. 617-890-0233
Minn Bloomington, Scientific Sls. 612-881-3300
Mo Hazelwood, EIR Co. 314-837-0597
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NY East Syracuse, Ossmann Instrus. 315-437-6666
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Pa Hatboro, Damon/Engel Inc. 215-922-3270
Tex Dallas, Crockett Engrg. Co. 214-637-6120
Va Annandale, Nine Assocs. 703-256-9105

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Mich Lexington, Instrument Reps., Inc. 617-861-8620
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NC Charlotte, J. Rudisill Assocs., Inc. 704-377-6901
Okla Tulsa, Telstar Instrument Corp. 918-628-1011
Pa Latrobe, Measurement & Control Assocs. 412-539-8200
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NC Raleigh, Cartwright & Bean Co. 919-832-7128
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Conn Hamden, Connecticut Electro Sls., 1601 Dixwell Ave. 203-288-8266
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Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
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Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
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PANAMETRICS INC., 221 Cresent St., Waltham, Mass., 02154, Tel: 617-899-2719

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PEERLESS RADIO CORP., 19 Wilbur St., Lynbrook, N.Y., 11563, Tel: 516-593-2121, TWX: 510-225-8422; Natl. Sls. Mgr: T. Griffin; Pres: A. Shankman .....Vol 3•1089

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Mich Royal Oak, Stillings Instr. Sys. 313-549-6030
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Pa Downingtown, Reinbrecht 215-265-6180
Pa Pittsburgh, W. Wells 412-833-1632
Tex Houston, Wilson-Mohr Inc. 713-781-2768
Va Richmond, Instrument Technical Representatives 703-288-7198

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Ill Chicago, B. Finder & Assocs. Inc. 312-262-2020

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NY	Rochester, L. Hart Assoc., Inc.	716-244-3253
Ohio	Cincinnati, Tri-State Mktg., Inc.	513-761-7993

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PLESSEY ELECTRO-PRODUCTS, 3860 Centinela Ave., Los Angeles, Cal., 90066, Tel: 213-390-3585, TWX: 910-343-6483; Dir. Sls: M. Mintz ..... **Vol 2•360**

PLESSEY ENVIROMENTAL SYS., 3939 Ruffin Rd., San Diego, Cal., 92112, Tel: 714-278-6500; Mktg. Mgr: E.K. Dean

PLESSEY SEMICONDUCTORS, 170 Finn Ct., Farmingdale, N.Y., 11735, Tel: 516-694-7377; Mktg. Mgr: B.R. Erde ..... **Vol 2•600-604**

Local Sales Offices & Reps.

Cal	Santa Ana, Plessey Memories	714-540-9945
Fla	St. Petersburg, Kirkwood Assocs.	813-894-8240
Ill	Chicago, LGS Assocs.	312-622-8183
Tex	Dallas, Thorson Co.	214-233-5744
Tex	Houston, Thorson Co.	713-771-3504

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

PLYMOUTH RUBBER CO., INC., Canton, Mass., 02021, Tel: 617-828-0220, TWX: 617-828-4546; Mgr: N.J. Lenihan

PLYMOUTH Local Distributors

Tex	Houston, Geophysical Supply Co., Box 52230	713-224-0621

PMC DESIGNING, See Proto Matic Co.

PODGOR, JOSEPH CO., 7895 Browning Rd., Pennsauken, N.J., 08109, Tel: 609-NO-3-7878; Sls. Mgr: F.C. Kline; Pres: J.E. Podgor

SELF-ORGANIZING SYS., See Cosar Corp.

POLARAD ELCTRN. INSTRS., 5 Delaware Dr., Lake Success, N.Y., 11040, Tel: 516-328-1100, TWX: 510-223-0414; V.P. Mktg: E. Feldman; Cust. Svc: A. Hartig

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Alas	Anchorage, Arva, Inc.	907-272-5231
Ariz	Scottsdale, Inter-Mountain Engrg. Co.	602-947-7379
Cal	Cupertino, T. Snitzer	408-257-8333
Cal	Del Mar, T. Snitzer	714-454-2191
Cal	Los Angeles, T. Snitzer	213-836-6170
Colo	Littleton, Intermountain Engrg. Co.	303-794-9111
DC	Wash., Eastern Instr.	202-333-8880
Fla	Orlando, J. Highsmith	305-293-5202
Ill	Chicago, L. Green	312-286-6824
Ind	Indpls., L. Green	317-253-2087
Kans	Prairie Vlg., Engrg. Svcs.	913-649-4000
Md	Lanham, Brimberg Assocs., Inc.	301-552-2200
Mass	Needham, Addelco Corp.	617-444-4754
Mich	Detroit, H. Teplitz	313-537-9058
Minn	Mpls., L. F. Green	612-781-1611
Mo	St. Louis, Engrg. Svcs.	314-726-2233
NM	Albuquerque, Inter-Mountain Engrg. Co.	505-344-2212
NY	Great Neck, Meas. Tech.	516-482-3500
NY	Liverpool, R&D Assocs.	315-622-2350
Ohio	Cleveland, H. Teplitz	216-371-2044
Ohio	Dayton, H. Teplitz Co.	513-277-6531
Okla	Tulsa, Data Applications Corp.	918-622-3753
Pa	Phila., East Instrumentation Phila. Inc.	215-927-7777
Tex	Houston, Data Applications	713-622-2820
Tex	Richardson, Data Applications	214-231-4846
Tex	San Antonio, Data Applications	512-732-7176
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Conn	Wilton, Talbe, Inc.	203-762-0577
Fla	Orlando, Triflex, Inc.	305-841-5440
Ill	Lemont, Talbe, Inc.	312-739-7844
NC	Bethania, Candor Co.	919-924-1480
Ohio	Dayton, Talbe, Inc.	513-253-5351
Okla	Tulsa, Carey, Wolf & Assocs.	918-622-9233
Tex	Fort Worth, Carey, Wolf & Assoc.	817-738-1702
Va	Lynchburg, Candor Co.	703-239-5265

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Ala	Huntsville, South Eastern Assoc.	205-539-9816
Ariz	Phoenix, H.A. Moore Sls. Co.	602-CR-4-0060
Ariz	Scottsdale, DeAngelo, Rothman & Cheever, Inc.	602-947-8626
Cal	Beverly Hills, Intercontinental Aviation	213-274-7578
Cal	Culver City, DeAngelo,Rothman	213-398-6239
Cal	La Selva Bch., Belchamber & French	408-722-0444
Cal	Palo Alto, Engineering Assoc.	415-DA-6-7842
Cal	Pasadena, P. Nurches	213-681-8957
Colo	Aurora, AES, Inc.	303-EM-6-0208
Fla	No. Miami, L. Haas	305-949-9143
Ill	Lincolnwood, W.M. Linz	312-677-2000
Ind	Indianapolis, Blind & Assoc., Inc.	317-251-1249
Mass	Sharon, A Appell Assoc.	617-SU-4-3439
Mich	Kentwood, C. Geer	616-534-9449
Minn	Mpls., Northern States	612-866-3468
Mo	Crestwood, NEVCO	314-843-7406
Mo	Kansas City, NEVCO, Inc.	816-421-1751
NY	Flushing, Tobias	212-886-2020
Ohio	Cleveland, P. Lohse	216-381-4424
Pa	Philadelphia, D.S. Linz	215-ES-9-0734
SC	Greenville, H. C. Norman	803-244-6254
Tex	Dallas, Techno Assocs.	214-FL-7-9213
Wash	Seattle, R.K. Squibb	206-632-2450
For:	Can., Downsview, Ont., Electronetic Sys.	416-661-3673
For:	Can., Montreal, Que., Electronetic Sys.	514-342-4112
For:	Can., Ottawa, Ont., Electronetic Sys.	613-733-3781
For:	Can., Vancouver, B.C., A Deskin Sls. Corp.	604-324-6331

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Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave.	415-961-1500
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	Mt. View, Powell Elctrns/California, Box 997, 411 Fairchild Dr.	415-964-0820
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Cal	San Diego, Shanks and Wright Inc., 2045 Kettner Blvd.	714-239-0176
Cal	San Diego, Western Radio, 1415 India St.	714-235-6571
Cal	San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.	
Conn	Fairfield, Utronic Inc., 273 Linwood Ave.	203-255-4521
Fla	Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave	305-885-8761
Fla	Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way	305-859-1450
Ill	Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.	
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
Md	Beltsville, Powell Elctrns/Washington, 10728 Hanna St.	301-937-4030
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Minn	Minneapolis, Elctrn Center Inc., 127 3rd Ave. N.	612-338-5881
Mo	St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave	314-MA-1-5000
Neb	Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St.	402-341-7700
NJ	Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys.	609-662-4000
NJ	Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22	201-376-8900
NY	Farmingdale, Harrison Elctnc., 20 Smith St.	516-293-7990
NY	Lynbrook, Peerless Radio, 19 Wilbur St.	516-593-2121
Ohio	Akron, Sun Radio Co., 110 E. Market St.	216-HE-4-2171
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080
Ore	Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd	503-292-3534
Pa	Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave	215-365-1900
Pa	Philadelphia, Simco Inc., 3907-11 N. Broad St.	215-BA-9-1880
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Wisc	Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd.	414-545-6500

PORTER, H.K., INC., 74 Foley St., Somerville, Mass., 02143, Tel: 617-776-8200; V.P-Mktg: H.M. Webster

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Cal	Canoga Park, Balzer/Wolf Assocs. Inc.	213-888-7432
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Fla	Miami Beach, Geartner Assocs.	305-861-3661
Ill	Evanston, Rendell Sls. Co.	312-866-8060
Md	Baltimore, W. S. Warrington & Assoc.	301-823-8759
Mich	Warren, DEM Elctrn. Sls.	313-755-6660
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Mo	Weldon Springs Hghts., Buckman Assocs.	314-623-4766
NJ	E. Orange, Masin-Esco, Inc.	201-674-6505
NJ	Moorestown, C & B Assocs.	609-546-4787
NY	Syosset, Masin-Esco, Inc.	516-364-0310
Ohio	Dayton, Myers Assoc.	513-435-1309
RI	Warwick, Schumacher & Yarrington	401-884-5671
Tex	Richardson, Zonk Engrg. Co.	214-238-7651

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Cal	Los Altos, Recht	415-941-0336
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Cal	San Diego, Black, Ekizian, Strong, Inc.	714-278-2150
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Colo	Littleton, Simpson Assocs.	303-798-8439
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Fla	Orlando, Irby & Connolly, Inc.	305-894-8471
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Ill	LaGrange Pk., Bierhaus Sls.	312-354-5100
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Ind	Indpls, R. O. Whitesell	317-359-9283
Ind	Kokomo, R. O. Whitesell & Assoc., Inc.	317-453-6868
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Kans	Wichita, Penzner-Mankus Assocs.	316-522-4101
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NY	Syracuse, Ossmann Comp. Sls.	315-454-4477
NY	Vestal, Ossmann Comp. Sls. Corp.	607-785-9949
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NC	Raleigh, Cartwright & Bean	919-832-7128
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Ohio	Columbus, Scott Elctrns.	614-236-8619
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Pa	Pittsburgh, Scott Elctrns.	412-781-3112
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Cal	Irvine, Cramer/L. A., 17201 Daimler St.	714-979-3000
Cal	Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave.	415-961-1500
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	Mt. View, Hamilton/Avnet Corp., 340 Middlefield Rd.	415-961-7000
Cal	San Diego, Hamilton/Avnet Corp., 5569 Kearny Villa Rd.	714-279-1550, 279-2421
Cal	San Diego, Western Radio, 1415 India St.	714-235-6571
Cal	San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.	
Cal	Sunnyvale, Cramer/San Fran., 720 Palomar Ave.	408-739-3011
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Colo	Denver, Burstein-Applebee	303-244-3336
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Fla	Hollywood, Schweber Elctrns.	305-927-0511
Fla	Orlando, Cramer/Ew Orlando, 345 North Graham Avenue, Box 20214	305-894-1511

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Ga Atlanta, Schweber Elctrns. 404-449-9170
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Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
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Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
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NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NJ Somerset, Schweber Elctrns. 201-469-6008
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NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY East Syracuse, Cramer/Syracuse, 6716 Joy Road 315-437-6671
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Hauppauge, Cramer/Systems, 29 Oser Ave. 516-231-5682
NY Hauppauge, L.I., Cramer/Long Island, 29 Oser Avenue 516-231-5682
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NY Rochester, Cramer/Rochester, 3259 Winton Road South 716-275-0300
NY Rochester, Schweber Elctrns. 716-328-4180
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
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NY White Plains, Westchester Elctrns., 602 Mamaroneck Ave. 914-949-2400
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Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
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Tex Beaumont, Ralph's, Inc., 1270 Broadway 713-833-9443
Tex Dallas, Cramer/Texas, 2970 Blystone Lane 214-350-1355
Tex Dallas, Hamilton/Avnet Elctrns., 2403 Farrington
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
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Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
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Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-262-8451
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
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Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801
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Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500
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RDF CORP., 23 Elm Ave., Hudson, N.H., 03051, Tel: 603-882-5195, TWX: 710-228-1882; Sls. Mgr: R.S. Warnick; Mgr. Spec. Prod: D.J. O'Connor

RE-EL CIRCUITS, INC., 520 Victor Street, Saddle Brook, N.J., 07662, Tel: 201-843-3738; V.P. Sls: G. Snedecor Vol 1•320

Local Sales Offices & Reps.
NY E. Northport, Jarms Assoc. 516-368-4096

RECORDER SYSTEMS DIV., Gulton Inds., Inc., Gulton Industrial Park, E. Greenwich, R.I., 02818, Tel: 401-884-6800, TWX: 710-387-1500; Sls. Mgr: T. Tuccillo Vol 1•541

RECORDER Local Distributors

Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Okla	Tulsa, Oil Capitol Elec., 708 S. Sheridan	918-836-2541
Pa	Pittsburgh, Cameradio Co., 2801 Liberty Ave.	412-391-7400

RECTIFIER COMPS. CORP., 1112 Lousons Rd., Union, N.J., 07083, Tel: 201-687-5410; Sls. Mgr: E.H. Pollacek Vol 2•925; Vol 4•527*

Local Sales Offices & Reps.

Ill	Chicago, Lightner	312-SP-4-1500
Ill	Chicago, M & S Sls.	312-992-1053
Md	Phoenix, Cunningham & Assoc.	301-823-4220
Mass	Needham Hgts., Todino Engrg.	617-HI-4-7925
Mich	Detroit, A. Blumenberg	313-557-1934
NJ	Haddonfield, Gray Assoc.	609-429-5300
NJ	Ridgewood, Ballou	201-444-6990
NY	Syracuse, N. Matchuk	315-488-3251
Wash	Seattle, W. Spaulding Co.	206-282-9173

RED POINT CORP., 105 W. Spazier, Burbank, Calif., 91503, Tel: 213-842-4895; Sls. Mgr: R.P. Craig

REDACTRON CORP., 100 Parkway Dr. S., Hauppauge, N.Y., 11787, Tel: 516-543-8700; OEM Sls. Mgr: T. Reantillo; OEM: S. Glasser

REDINGTON COUNTERS, INC., 130 Addison Rd., Windsor, Conn., 06095, Tel: 203-688-6207; Sls. Mgr: T. Nelson

REED DEVICES, INC., 21 W. 183 Hill Ave., Glen Ellyn, Ill., 60137, Tel: 312-858-2050; Sls. Mgr: H.J. Roeser Vol 3•769

Local Sales Offices & Reps.

Ariz	Tempe, G. R. McKnight Co.	602-949-0809
Ark	Little Rock, Ransom Sls. Co.	501-225-7332
Cal	Menlo Park, G. R. McKnight Co.	415-325-2844
Cal	Woodland Hills, Cummings	213-340-6035
Fla	Tampa, S. K. Wallace Assoc.	813-932-3568
Ga	Atlanta, A. Brown Assoc.	404-457-6381
Ill	Glen Ellyn, Rockford Controls	312-469-6016
Kans	Wichita, Avionics	316-264-6201
Mich	Brighton, H. H. Barnum Co.	313-229-2961
Mich	Lowell, H. H. Barnum Co.	616-897-9686
Minn	Minneapolis, Automated Controls	612-377-7727
Miss	Jackson, Ransom Sls. Co.	601-353-0707
Mo	St. Louis, Miller Assocs.	314-355-1642
NH	Nashua, Bell Controls	603-882-6984
NJ	Clifton, Grimm, Siegel Assoc.	201-546-5010
NY	Buffalo, H.C. Johnson Ags.	716-632-7880
NY	Fayetteville, H.C. Johnson Ags.	315-637-9383
NY	Guilderland, H.C. Johnson Ags.	518-456-9681
NY	Plainview, Grimm, Siegel Assoc.	516-938-9721
NY	Rochester, H.C. Johnson Ags.	716-482-3000
NC	Greensboro, S. K. Wallace Assoc.	919-292-0487
Ohio	Columbus, Rockford Controls Ohio	614-231-5890
Ohio	Dayton, Rockford Controls Ohio	513-278-7362
Ohio	Euclid, Rockford Controls Ohio	216-731-5250
Pa	Elkins Park, K. B. Erdman Co.	215-224-1833
Tenn	Memphis, Ransom	901-332-0036
Tex	Dallas, Carey & Assoc.	214-363-7813
Tex	Houston, Carey & Assoc.	713-869-3623
Utah	Salt Lake City, D. W. Stuart & Co.	801-466-8605
Wash	Seattle, R. Johnston & Co.	206-524-5170

REED Local Distributors

Ark	Little Rock, Carlton-Bates Co., 6821 Scott Hamilton Dr	501-562-9100
Cal	Los Angeles, Electro Component Dist., 122 S. Mission Blvd	213-264-7100
Colo	Denver, Mundix Co., 5495 Marion	303-893-2390
Conn	Hartford, Hartford Elec. Supply Co., 571 New Park Ave	203-233-3694
Fla	Davie, Newark Elctrns, 7200 Griffin Rd.	305-587-2372
Ga	Macon, Wilson Elec. Co., 557 Pine	912-746-5654
Ill	Chicago, Newark Elctrns, 500 N. Pulaski Rd.	312-638-4411
Ill	Chicago, Revere Elec. Supply Co., 2501 W. Washington Blvd	312-738-3636
Ill	Peoria, Klaus Radio & Elec. Co., 8400 N. Pioneer Pkwy	309-691-4840
Ill	Rockford, Mid-West Associated, 225 S. 6th St	315-964-4657
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Iowa	Moline, Otis, Jim & Assocs. Inc., 4520 River Dr.	309-762-9311
Kans	Wichita, Interstate Elec. Supply Co., Box 2018, 230 IDA	316-264-6317
La	Shreveport, Ind'l. Elctrn Supply, 2422 Southern Ave	318-422-9459
Mass	Cambridge, Apollo Elctrns, Inc., 101 Binney St	617-868-3120
Mich	Augusta, Great Lakes Elctrns, Box 217	616-731-4156
Mich	Oak Park, Newark-Detroit Elec., Inc., 20700 Hubbell Ave.	313-548-0250
Minn	Minneapolis, Control Design, Inc., 3433 E. 25 St	612-721-1629
Mo	Kansas City, Barr-Thorpe, 2601 Madison Ave	816-531-8840
Mo	St. Louis, Olive Ind'l Elctrns Inc, 6662 Olive Blvd	314-863-7800
Neb	Lincoln, Scott Elctrn Supply Corp., 4040 Adams St	403-434-8308
NJ	Jersey City, Cuny-Guerber, Inc., 3468 Kennedy Blvd	201-227-7722
NJ	So. Plainfield, Brownell-Electro Inc., 500 Hadley Rd. & Durham Ave	201-753-4600
NY	No. Syracuse, Control Comps., 401 Fay Rd.	315-458-6709
NY	Rochester, Requa Elec Supply Co., 2005 Brighton Henrietta	716-442-2020
NY	Schenectady, Adirondack Elctrns Inc., Box 147, Brandywine Sta.	518-346-4717
NC	Winston-Salem, Kirkman Elctrns., Inc., 901 W. Second St.	919-724-0541
Ohio	Akron, Akron Elctrn. Supply, 107 S. Arlington St	216-762-8818
Ohio	Cincinnati, Mytronics, 1843 N. Reading Rd	513-733-1661
Ohio	Columbus, E/M Equipment Co., 3492 E. Fulton St	614-236-0880
Ohio	Dayton, ESCO, 221 Crane St.	513-224-9192
Ohio	Dayton, J. A. Becker Co., 1341 E. 4th St.	513-224-1071
Ohio	Dayton, Stotts-Friedman Co., 108 N. Jefferson St	513-224-1111
Ohio	Solon, REPCO, 6835 Cochran Rd.	216-248-8900
Okla	Tulsa, Radio Inc., 1000 S. Main St.	918-587-9123
Ore	Eugene, Vitus Elec. Supply Co., 140 E. Fifth Ave	503-345-4377
Ore	Portland, Consolidated Elec Distr., Inc., 2053 NW Upshur	503-224-3200
Ore	Portland, Platt Elec. Supply Co., 1305 N.W. Davis	503-222-9633
Tex	Dallas, All State OEM, 510 S. Good Latimer	214-651-0242
Tex	Denison, Denison Radio Supply, 310 W. Woodard St	214-465-2336
Tex	Houston, Lenert Co., Box 2184	713-225-1465
Tex	Houston, Nunn Elec Supply, 2221 Canada Dry	713-928-5511
Utah	Salt Lake City, Standard Supply Co., 225 E. 6th So.	801-355-2971
Utah	Salt Lake City, Stuart Elec Supply Co., 2999 South 2nd W	801-466-8605
Wash	Seattle, Radar Electric Co., 168 Western Ave., W.	206-282-2511
Wash	Spokane, Industrial Instr. Supply, E. 2121 Riverside	509-534-9353
WVa	So. Charleston, Allied Controls Co., 4842 Mac Corcle Ave. SW	304-768-7313
Wisc	Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd.	414-545-6500
Wisc	Milwaukee, Parts Mart, 1314 N. 7th	414-276-4160

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

REED SWITCH DEV. CO., 34 Lincoln Ave., Greenwich, Conn., 06830, Tel: 203-661-9410; Pres: J.S. Hammond

REEVES-HOFFMAN DIV., Dynamics Corp. of Amer., 400 W. North St., Carlisle, Pa., 17013, Tel: 717-243-5929, TWX: 510-650-3510; VP Sls: J.D. Harlin Vol 2•444,445

Local Sales Offices & Reps.

Cal	Hollywood, Westaironics	714-831-2369
Cal	Santa Clara, L & M Assocs.	408-243-2891
Fla	Winter Park, Semtronics Assocs.	
Ill	Deerfield, Hutchinson Assocs.	
Iowa	Cedar Rapids, Seltec Sls.	
Md	Baltimore, R. F. Assocs.	
Mass	Wakefield, H. Jappe Co.	
Mich	Farmington, W. R. Hummon & Assoc.	
Mo	St. Louis, Engrg. Svcs. Co.	
NJ	Ridgefield, G. M. Moch Co.	
NY	E Aurora, E.A. Kershaw & Co.	
NC	Bethania, Candor Co.	
Ohio	Cincinnati, Tri-State Mktg.	
Pa	Philadelphia, C.H. Newson & Assoc.	
Tex	Dallas, G. Weinreich & Assoc.	

REGENCY ELCTRNS., INC., 7707 Records St., Indianapolis, Ind., 46226, Tel: 317-547-3581; V.P. Sls. Mgr: A. Harling

REGENCY Local Distributors

Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
Minn	Duluth, Northwest Radio, 123 E. First St.	218-727-1565

RELAY SERVICE CO., 1310 N. Pulaski Rd., Chicago, Ill., 60651, Tel: 312-AL-2-2700; Sls. Mgr: C. H. Badger

RELAY SPECIALTIES INC., 1300 Plaza Rd., Fair Lawn, N.J., 07410, Tel: 201-797-3313; Adv. Mgr: J.G. Sauer; Sls. Mgr: S. Gershberg

RELCO PRODS., 5594 E. Jefferson Ave., Denver, Colo., 80237, Tel: 303-756-1143; Pres: R.A. Ruehle

RELCOM (DIV. WATKINS-JOHNSON), 3333 Hillview Ave., Palo Alto, Calif., 94304, Tel: 415-326-8830, TWX: 910-379-6979; Sls. Mgr: J.B. Cochrane

Local Sales Offices & Reps.

Cal	Los Angeles, Cain & Co.	213-476-2251
Va	Fairfax, Schibley Assocs.	703-591-3008

RELIANCE ELEC. CO., 24701 Euclid Ave., Cleveland, Ohio, 44117, Tel: 216-266-7000, TWX: 216-486-5630; Advtg. Mgr: A.G. Conway

REMEX, Ex-Cell-O Corp., 1733 Alton St., Santa Ana, Cal., 92705, Tel: 714-557-6860, TWX: 910-595-1715; Gen. Sls. Mgr: W.E. Walker

Local Sales Offices & Reps.

Ala	Huntsville, Gentry	205-536-5306
Ariz	Scottsdale, BFA Corporation of Arizona	602-946-4215
Cal	Irvine, Moxon, Inc.	714-833-2000
Colo	Denver, BFA Corp. of Ariz.	303-744-3301
Conn	Hartford, Victor Assoc.	203-246-5643
Fla	Orlando, Gentry Assocs.	305-894-4401
Ill	Chicago, SEA, Inc.	312-282-6694
Ind	Carmel, SEA, Inc.	317-846-2593
Kans	Leavenworth, Midwest Mktg. Assoc.	913-651-2929
Md	Silver Spring, Ron Davies Assoc.	301-587-3910
Mass	Framingham, Victor Assoc.	617-879-5710
Mich	Livonia, Dietrich & Assocs.	313-961-4540
Minn	Mpls., SEA, Inc.	612-425-4455
Mo	Florissant, Midwest Mktg. Assoc.	314-831-0342
NJ	Ridgewood, Hansen Assocs.	201-652-7055
NM	Las Cruces, BFA Corp. of Arizona	505-523-0601
NY	New York, Hansen Assocs.	212-947-0379
NY	Ogdensburg, Whittaker Elctrns., Ltd.	315-393-0710
NY	Rochester, Ossmann Instrs.	716-328-2230
NY	Syracuse, Ossmann Instr.	315-437-6666
NY	Vestal, Ossman Instrs.	607-785-9947
NY	Wappinger Falls, Ossmann Instr.	914-297-7777
Ohio	Cleveland, Dietrich & Assocs.	216-781-1885
Ohio	Dayton, Dietrich & Assocs.	513-223-6042
Pa	Pittsburgh, Dietrich & Assocs.	412-892-2992
Pa	Wayne, Emlen-Peterson	215-687-3535
Tex	Dallas, Data Mktg.	214-358-4646
Tex	Houston, Data Mktg.	713-686-9627
Tex	San Antonio, Data Mktg.	512-344-3993
Utah	Denver, BFA Corp. of Ariz.	303-744-3301
Wash	Seattle, R. Drake	206-763-2755
Wisc	Waukesha, S-E-A, Inc.	414-547-6637
For:	Can., Downsview, Ont., Whittaker Elctrns.	416-247-7454
For:	Can., Ottawa 5, Ont., Whittaker Elctrns	613-224-1221
For:	Can., Roxboro, Que., Whittaker Elctrns.	514-683-3621
For:	Can., W. Vancouver, B.C., Whittaker Elctrns., Ltd.	604-926-3411

RENBRANDT, INC., 6 Parmelee St., Boston, Mass., 02118, Tel: 617-445-8910; Sls. Mgr: M. Rogers

RENCO CORP., 26 Coromar Ave., Goleta, Cal., 93017, Tel: 805-968-1525, TWX: 910-334-1180; Mktg. Mgr: R. Hotchin ..... Vol 1•370

Local Sales Offices & Reps.

Ala	Huntsville, Technical Sls.	205-881-1750
Cal	Concord, Dunfred Tech. Prods.	415-682-5038
Cal	Sante Fe Sps., Sls. Engrs.	213-921-4337
Ill	Chicago, Electro Tech Mktg. Assoc.	312-588-4535
Ind	Ft. Wayne, McDonald Sls.	219-745-9214
Ind	Indpls., Holsapple & Assoc.	317-894-0513
Mass	Andover, Mech-Tron Co.	617-475-1766
Mich	Detroit, Ridgway East	313-538-3940
Ohio	Chagrin Falls, Ridgway East	216-247-4845
Ohio	Loveland, Ridgway East	513-683-4350
Tex	Dallas, IBL Engrg. & Sls.	214-363-2921
Wash	Seattle, Thorson Co.	206-632-0710
Exp:	Schenectady, NY, EMB Elctrns.	518-372-5841

REON RESISTOR CORP., 420 Lincoln Highway, Frazer, Pa., 19355, Tel: 215-647-5420, TWX: 510-668-8463; Prod. Sls. Mgr: N. Lukens; Tech. Oper: J. Mulqueen; Nat'l. Sls. Mgr: Edw. L. Beaudry ..... Vol 4•503*

Local Sales Offices & Reps.

Cal	Culver City, DeAngelo & Rothman	213-398-6239
Fla	Ft. Lauderdale, G. F. Bohman Assoc.	305-564-3081
Fla	Orlando, G. F. Bohman Assoc.	305-855-0274
Ill	Des Plaines, Coombs Assoc., Inc.	312-298-4830
Ind	Ft. Wayne, Coombs Assoc.	219-747-0402
Iowa	Cedar Rapids, Reid Assoc., Inc.	319-362-6302
Md	Towsen, J. A. Dougherty	301-823-0431
Mass	Canton, New England Elctrn. Sls.	617-828-4835
Mo	St. Louis, Coombs Assoc.	314-567-3399

NJ Englewood Cliffs, Sprung/Nussbaum 201-947-6767
NM Albuquerque, C. T. Carlberg Assoc. 505-265-1579
NC Winston-Salem, L. G. White Southern, Inc. 919-725-3612
Ohio Cincinnati, Components, Inc. 513-721-2997
Ohio Cleveland, Components, Inc. 216-842-2737
Ore Portland, J. V. BeLusko Co. 503-222-4279
Pa Phila., PSA 215-722-8222
Tex Dallas, Stasco 214-239-5054
For: Can., Etobicoke, Space Elctrns. 416-677-5172
For: Can., Montreal, Space Elctrns. 514-735-1108
For: Can., Montreal, Que., Space Elctrns. 514-735-1108
For: Can., Ottowa, Space Elctrns. 613-745-6300

REON Local Distributors
Md Hanover, Hamilton/Avnet Elctrns. 301-796-5000

REPUBLIC ADVANCED SYSTEM TECHNOLOGY GROUP, 9754 Deering St., Chatsworth, Calif., 91311, Tel: 213-341-9200; Sls. Mgr: W. Morgan

REPUBLIC ELCTRNS. CORP., 176 E. 7th St., Paterson, N.J., 07524, Tel: 201-279-0300, TWX: 710-988-5908; Sls. Mgr: G. Wolter .....Vol 3•495

Local Sales Offices & Reps.
Cal Los Angeles, Trepco 213-641-7411
Cal Mount View, Melchior/Wesley Assoc. 415-964-2321
Cal Santee, Advanced Tech. Sls. 714-448-8986
Fla Miami Beach, Geartner 305-861-3661
Fla Orlando, Geartner 305-299-1000
Ill Chicago, Ropek & Cahill 312-287-7292
Ind LaFontaine, Kirsch Sls. 317-981-2801
Iowa Cedar Rapids, J.R. Sales Engrg. 319-377-8211
Kans Leawood, Vasen Sls. 913-649-0679
Md Bethesda, W. Mount Co. 301-657-9312
Mass Cambridge, Vector Sls. 617-491-5700
Minn Hopkins, Grayden & Flemmer 612-941-1120
NJ Paterson, Mucon Corp. 201-279-0300
NJ Wallington, Comp-Tech Sls. 201-935-5454
NY Liverpool, J.L. Semple Assoc. 315-457-1188
NY New Hyde Park, Comp-Tech. Sls. 516-593-2628
NY Rochester, J.L.Semple Assoc. 716-342-1413
NC Charlotte, J. Rudisill Assocs. 704-377-6901
Ohio Columbus, T. Mulligan & Assoc. 614-457-2242
Okla Tulsa, H.J. Daly Co. 918-627-4159
Pa Ardmore, Rothenheber & Wurts 215-649-6300
Wash Seattle, Blum & Assoc. 206-782-1600

REPUBLIC Local Distributors
Cal No. Hollywood, Distro Inc., 12517 Burbank Blvd. 213-980-8888

RESDEL CORP., Bldg. #22-County Airport, Rio Grande, N.J., 08242, Tel: 609-886-1111; Pres: W. Taylor

RESDEL ENGRG. CORP., 300 E. Live Oak Ave., Arcadia, Cal., 91006, Tel: 213-684-2600, TWX: 910-582-3219; Sls. Mgr: W.C. Neil, Jr.

RESEARCH DEVICES, 616 Springfield Ave., Berkeley Heights, N.J., 07922, Tel: 201-464-0668; Sls. Mgr: B.G. Cohen

RESEARCH, INC., Box 24064, Minneapolis, Minn., 55424, Tel: 612-941-3300, TWX: 612-292-4066; Sls. Mgr: J.M. Law

RESEARCH PRODS. CORP., 1015 E Washington Ave., Madison, Wisc, 53701, Tel: 608-257-8801; Sls. Mgr: V.J. Hellenbrand

RESISTANCE PRODS., 914 S. 13th St., Harrisburg, Pa., 17104, Tel: 717-236-5081, TWX: 510-650-4920; Ch. Eng: G. Wachtman; Prod. Eng: G. Schmutz Vol 3•1160-1162

Local Sales Offices & Reps.
Ariz Scottsdale, Fred Board Assocs. 602-949-9561
Cal Mountain View, G.C. Woempner 415-964-5454
Cal San Marino, Van Gott & Assoc. 213-282-1125
Colo Denver, Walter Engrg. Assoc. 303-777-5585
Ill Bellwood, Fiat Engrg. Assoc. 312-547-6200
Ind So Bend, Valentine-Schillinger Co. 219-291-6258
Kans Leawood, Vasen Sls. Co. 913-649-0679
Mass Canton, New England Elec. Sls. Co. 617-828-4835
Minn St. Paul, Furber Sales 612-861-1518
Mo St. Louis, Vasen Sls. Co. 314-725-5219
NY Floral Park, Mos Assocs. 516-694-5923
NY Syracuse, C. W. Floring & Assoc., Inc. 315-478-2149
Ohio Wickliffe, D. Steffen Assocs. 216-944-8080
Pa Flourtown, Avenir 215-836-4400
Tex Dallas, MMS Comps. 214-357-6893
Wash Seattle, D. Smith Sls. Co. 206-633-3160
Exp: N.Y., Westbury, Minthorne Int'l. Co., Inc. 516-334-3303
For: Can., Markham, Ont., Wilson Enterprises 416-231-7536
For: Can., Roxboro, Que., Wilson Ent. 514-684-0383

RESISTORS, INC., 5226 W. 26th St., Chicago, Ill., 60650, Tel: 312-652-7555 .....Vol 3•1168

Local Sales Offices & Reps.
Cal Los Angeles, W. S. Harmon Co. 213-937-1460
Cal Palo Alto, W. Tompkins 415-DA-6-7940
Conn Berlin, White Sls. Co. 203-224-0423
Ill Chicago, L-Tec, Inc. 286-1500
Iowa Cedar Rapids, J.R. Sls. Engrg. 319-EM-5-2864
Kans Overland, Penzner Assocs., Inc. 913-DE-1-0004
Mass Needham, White Sls. Co. 617-444-3676
NJ Moorestown, A. Foley Assocs. 609-663-4545
NY Buffalo, J.J. Glass 716-TL-6-9272
NY N.Y., Symon Assocs. 212-PL-7-3638
Ohio Vandalia., W. Brauer & Assocs. 513-898-1224
Ohio Wickliffe, W. Brauer & Assocs. 216-943-0601
Pa Pittsburgh, W. Brauer & Assocs. 412-921-3213
Tex Garland, Whiteside Sls. Co. 214-BR-6-8382
Wisc Milwaukee, Honkamp Sls. 414-463-2530

RESISTORS, Local Distributors
NY Buffalo, Genesee Radio & Parts Co., 2550 Delaware Ave. 716-873-9661

REVERE COPPER AND BRASS, INCORPORATED, 605 Third Ave., New York, N.Y., 10016, Tel: 212-687-4111, TWX: 710-581-6718; V.P: R.C. Baynes

REVERE ELCTRN. DIV., Neptune Meter Co., 845 N. Colony Rd., Wallingford, Conn., 06492, Tel: 203-269-7701, TWX: 710-476-3197; V. P: G.W. Grace

REYNOLDS INDS., INC., Box 1170, Marina Del Rey, Cal., 90291, Tel: 213-823-5491; Salesman: J. Densmore; Salesman: J. Spratt; Salesman: J. Korbel

Local Sales Offices & Reps.
Mass Stow, Musello Assocs. 617-369-5900
NJ Moorestown 609-234-0613
Tex Dallas, Elcom Co. 214-352-5006

REYNOLDS METALS CO., Box 27003, Richmond, Va., 23261, Tel: 703-282-2311, TWX: 710-956-0112; Mkt. Mgr: G.E. Lennox; Prod. Dir: G.J. Wirth

RF INTERONICS, 100 Pine Aire Dr., Bay Shore, N.Y., 11706, Tel: 516-231-6400, TWX: 510-227-6233; Sls. Adm: R.W. Fitzpatrick .....Vol 2•578

Local Sales Offices & Reps.
Ariz Scottsdale, Williams-Assocs. 602-947-4297
Cal Alhambra, M.W. Riedel & Co. 213-283-7694
Cal San Mateo, Melvin Sls. 415-349-7444
Colo Denver, Williams-Assocs. 303-343-2911
Fla Hollywood, Tech-Rep Assocs. 305-962-8860
Fla Indian Rocks Bch., Tech-Rep. 813-595-2834
Fla Melbourne, Tech-Rep. Assoc. 305-723-0140
Ga Huntsville, Tech-Rep Assocs. 205-881-5925
Ill Oak Park, J. Popp Sls. Co. 312-626-3711
Ind Ft. Wayne, Ryan Sls. 219-483-9567
Kans Overland Pk., ENSCO-REP 913-381-7557
Md Rockville, Mechtronics 301-340-2130
Mass Wakefield, Measurement Equip. Co. 617-245-4870
Mich Cleveland, Forrest G. Mahannah 216-561-3024
Mo St. Louis, ENSCO-REP 314-542-3935
NJ Cherry Hill, H. J. White Co. 609-428-4544
NM Albuquerque, Williams-Assocs. 505-255-1638
NY Great Neck, Trionic Assoc. 516-466-2300
NY Syracuse, W.A. Franklin 315-474-2954
NY Whitesboro, W.A. Franklin 315-736-0323
Ohio Tipp City, TEC-COM 513-667-1216
Tex Richardson, The Mero Corp. 214-234-3365
Exp: New York, N.Y., Ad. Auriema, Inc. 212-466-2516

RF SYSTEMS, INC., 155 King St., Cohasset, Mass., 02025, Tel: 617-383-1200; V. Pres.-Sls: J.E. Hayes; V. Pres. Adm: R.E. Gallinger

RFL INDS., Comms. Div., Powerville Rd., Boonton, N.J., 07005, Tel: 201-334-3100, TWX: 710-987-8352; Sls. Mgr: R. Treible

RFL INDS., Instr. Div., Powerville Rd., Boonton, N.J., 07005, Tel: 201-334-3100, TWX: 710-987-8352; Sls. Mgr: R. Schmehl .....Vol 1•497

Local Sales Offices & Reps.
Ala Huntsville, Lee Assocs. 205-883-2530
Ariz Scottsdale, Williams 602-947-4297
Cal San Pedro, IFM Inc. 213-547-0829
Colo Denver, Williams Assocs. 303-388-4391
Fla Ft. Lauderdale, Lee Assocs. 305-771-3761
Fla Orlando, Lee Assocs. 305-241-4445
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Ga Stone Mountain, A. Stayton 404-469-2779
Haw Honolulu, J. Chang 808-537-6787
Ill Chicago, D. Abo 312-327-9642
Ill Des Plaines, R. Davis 312-298-7689
Kans Prairie Village, A. Bender 913-362-0243
La Metairie, H. McGuffee 504-885-4635
Md Greenbelt, M. Needle 301-345-8026
Mich Warren, R. Waring 313-756-3837
Mo Blue Springs, D. Coe
Mo Florissant, Sound Mktg. 314-839-3639
Neb Omaha, K. Magnuson 402-556-8583
NJ River Edge, R. Schwartz 201-262-4687
NY Bardonia, I. Gudin 914-623-5560
NY Coram, L. Cohen 516-732-3113
NY Munsey, R. Hibshman 914-356-3067
NY Poughkeepsie, Tidal Sls. 914-471-6230
Ohio N. Royalton, R. Rechisky 216-237-8243
Ore Greshaw, G. Sanden
Pa Philadelphia, L. Feinstein 215-677-6497
Pa Pittsburgh, S. Schindel 412-366-1481
Tenn Knoxville, J. Dickens 615-947-8068
Tex Dallas, S. Awner 214-361-6424
Tex San Antonio, Vantage Sls.

SCANBE MFG. CORP., 3445 Fletcher Ave., El Monte, Cal., 91731, Tel: 213-579-2300, TWX: 910-587-3437; Sls. Mgr.-Sys: D.M. Miller; Prod. Sls. Mgr. Sockets: B.F. Emmons ..... Vol 3•772,773

Local Sales Offices & Reps.
Ariz Scottsdale, BFA Corp. 602-946-4215
Cal Los Altos, Ewing-Foley 415-941-4525
Cal San Diego, Earl Assocs. 714-278-5441
Colo Arvada, Arrowhead Sls. 303-423-5556
Conn Watertown, R. P. Mahan 203-274-2363
Fla Clearwater, WMM Assocs. 813-726-8871
Ill Chicago, L-Tec, Inc. 312-286-1500
Kans Mission, Inland Assocs. 913-362-2366
Mass Wellesley, R.P. Mahan Co. 617-237-1040
Mich St. Clair Shores, J. M. Thorpe 313-779-6363
Minn Minneapolis, Electro-Serv. Co. 612-827-2907
NM Albuquerque, BFA Corp. 505-296-8303
NY DeWitt, Tri-Tech Elctrns., Inc. 315-446-2881
NY Great Neck, H. J. Krasner 516-487-0690
Ohio Akron, A. Natalino 216-725-6087
Tex Dallas, Techno Assocs. 214-357-9213
Wash Seattle, Datacom Assocs. 206-285-2526
For: Can., Montreal, J. G. Weiss Co., Ltd. 514-489-6887

SCANBE Local Distributors
Ariz Phoenix, Moltronics, Inc., 2746 W. Palm LA. 602-272-7951
Cal San Diego, Moltronics, Inc., 7969 Engineer Rd. 714-278-5020
Cal Santa Clara, Moltronics, Inc., 337 Mathews St. 408-244-7600
Cal South Gate, Moltronics, Inc., 5610 E. Imperial Hwy. 213-773-6521
Colo Denver, Elctrn. Parts Co., 1212 S. Broadway 303-744-1992
Fla Orlando, Hall-Mark Elctrn., 7233 Lake Ellenor Dr. 305-855-4020
Minn Minneapolis, Industrial Components, Inc., 4004 W. 78th St. 612-927-9991
Mass Watertown, QPL Elctrns., 75 N. Beacon St. 617-924-4100
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Minneapolis, ICI-Industrial Comps. Inc., 612-927-9991 9991
Mo St. Louis, Olive Ind'l Elctrns., 6662 Olive Blvd. 314-863-7800
NJ Moorestown, Arrow/Angus, Pleasant Valley Ave. 609-235-1900
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
Ohio Cincinnati, Hughes-Peters, Inc., 4865 Duck Creek Rd. 513-351-2000
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

SCHAEVITZ ENGRG., U.S. 130, Union Ave., Pennsauken, N.J., 08110, Tel: 609-662-8000, TWX: 710-892-0714; Sls. Mgr. Reg: J.R. Volin; Sls. Mgr: R. Anderson

Local Sales Offices & Reps.
Ala Huntsville, INCOTECH 205-837-6061
Ariz Phoenix, Measurment Consultants 602-948-8410
Cal San Carlos, Elctrn. Engrg. 415-593-2189
Cal S. Pasadena, Schaevitz Tech. 213-681-3463
Colo Boulder, Meas. Consit. 303-449-5294
Fla Orlando, Datarep 305-843-5224
Ill Northfield, Torkelson Assoc. 312-446-9085
Ind Indianapolis, Torkelson Assoc. 317-244-7867
La Metairie, MG Elctrns. & Equip. 504-834-6002
Mass Needham, Addelco Corp. 617-444-4754
Mich Farmington, Anderson Elctrns. 313-476-9161
Minn Mpls., Industra 612-929-6224
Mo St. Louis, Ozark Elctrn. 314-423-7200
NJ Cherry Hill, Markey Engrg. 609-667-3809
NJ Frenchtown, Schuler Engrg. 201-782-0497
NM Albuquerque, Meas. Consits. 505-265-6471
NC Winston-Salem, Radco Co. 919-722-9671
Ohio Columbus, Meas. Instrs. 614-488-9753
Tenn Knoxville, Tool Crib, Inc. 615-525-6195
Tex Houston, Concept Sales 713-771-4470
Wash Bellevue, A. Smith 206-746-6770
For: Can., Weston, Ont., Megatronix Ltd. 416-742-8015

SCHAUER MFG. CORP., 4516 Alpine Ave., Cincinnati, Ohio, 45242, Tel: 513-791-3030; Sls. Mgr: S.E. Wright

Local Sales Offices & Reps.
Cal Burbank, Lingtronics 213-848-8372
Cal Palo Alto, Ellis Ent. 415-328-5151
Conn Meriden, Eagle Assocs. 203-235-9036
Fla Orlando, F. Fausett 305-894-6071
Ga Smyrna, F. Fausett & Co. 404-436-5169
Ill Chicago, Ellinger 312-763-1570
Mich Detroit, Rathsburg 313-882-1717
Minn Mpls., C. Gibb 612-377-1200
Mo Kansas City, NEV Co., Inc. 816-421-1751
NY Woodside, D. Tobias 212-726-4551
Ohio Cleveland, J. Olsen 216-752-5444
Pa Phila., K.B. Erdman 215-224-1833
Pa Pittsburgh, E.A. Snefsky 412-179-2550
Pa Pittsburgh, R.A. Stone 412-241-8391
Tex Dallas, J. Schoonmaker 214-357-8481
Wash Seattle, D. Miller 206-784-6800

SCHAUER Local Distributors
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544

SCHJELDAHL, G.T. CO., Advanced Programs Div., Box 170, Northfield, Minn., 55057, Tel: 507-645-5633, TWX: 910-565-2180; Mktg. Mgr: E.S. Lyman

SCHNEIDER INSTR. CO., 8115 Camargo Rd., Madeira, Cincinnati, Ohio, 45243, Tel: 513-561-6803

SCHONSTEDT INSTR. CO., 1775 Wiehle Ave., Reston, Va., 22090, Tel: 703-471-1050; Sls. Mgr: E.O. Schonstedt

SCHRACK ELEC. SLS., 1140 Broadway, New York, N.Y., 10001, Tel: 212-MU-3-0790; Sls. Mgr: H. Siegell Vol 2•872-874

Local Sales Offices & Reps.
Cal Palo Alto, Engrg. Assocs. 415-326-7042
Cal Sherman Oaks, R. Hopkins 213-788-5501
Colo Denver, A-G Elctrns. 303-722-5814
Conn Old SayBrook, M.L. Assocs. 203-388-9718
Fla Miami, S. Wallace 305-691-1654
Fla Tampa, S. Wallace 813-932-3568
Ga Jonesboro, S.K. Wallace 404-471-6297
Ill Chicago, Ringland M. Krueger Co. Inc. 312-282-8444
Md Silver Spring, H. Sieber 301-589-9110
Mass Marlboro, M.L. Assocs. 617-485-6190
Mich Jackson, Norwood Scroggs 517-782-5211
Minn Minneapolis, Pilot Sls. & Engr. 612-546-4328
NY Glen Cove, S. Glassman 516-676-1039
NY Sodus, A.E. DeCew Agency 315-483-3261
NC Greensboro, S. Wallace 919-292-0487
NC Kernersville, S. Wallace 919-993-3993
Ohio Cleveland, Ad-El-Tek 216-252-0488
Ohio Dayton, Ad-El-Tek 513-836-2741
Ohio Englewood, Ad-El-Tek, Inc. 513-836-8471
Pa King of Prussia, L.G.White-Keystone 215-265-1817
Tenn Memphis, S. Wallace 901-682-2281
For: Can., Malton, Ont., Deskin 416-677-5517
For: Can., Montreal, Que., Deskin 514-384-1420
For: Can., Vancouver, B.C., Deskin 610-922-5036

SCHWEITZER, PETER J. DIV., Kimberly Clark Corp., Lee, Mass., 01238, Tel: 413-243-1000, TWX: 413-243-2121; S.M. Paper: T. Steinert; S.M. Films: J. Tosch

SCIENTIFIC-ATLANTA, INC., Box 13654, Atlanta, Ga., 30324, Tel: 404-938-2930, TWX: 810-766-4912; Sls. Mgr: H. Klippel

Local Sales Offices & Reps. (Scien Atlanta Reps)
Cal Long Beach, Sciec-Atlanta 213-428-7515
Cal Los Altos, Scic-Atlanta 415-941-1616
Ill Belleville, Scic-Atlanta 618-397-9251
Md Bladensburg, Scicc-Atlanta 301-779-1515
Mass Burlington, Sci.-Atlanta 617-272-1256
NJ Leonia, Sci-Atlanta 201-461-5340
Tex Dallas, Sci.-Atlanta 214-357-1855
Wash Seattle, Showalter-Judd 206-762-2310
Wash Seattle, Showalter-Judd 206-324-7911
For: Can., Montreal, Que., Radionics 514-735-4565

(Optima-Enclosures Reps.)
Ala Huntsville, Gentry 205-536-5306
Ariz Phoenix, Hytronic Meas. 602-253-6104
Cal Long Beach, Sciec-Atlanta 213-428-7515
Cal Los Altos, Scientific-Atlanta 415-941-1616
Colo Denver, Hytronic Meas. 303-388-4081
Fla Orlando, Gentry Associates 305-894-4401

Ill	Rosemont, Cozzens & Cudahy	312-825-1144
Ind	Indpls., Cozzens & Cudahy	317-244-2456
Md	Bladensburg, Sciec-Atlanta	301-779-1515
Mass	Lexington, Zieco, Inc:	617-861-8300
Minn	Mpls., Cozzens & Cudahy	612-920-1022
Mo	Edmundson, Cozzens & Cudahy	314-423-1234
NJ	Edison, Scien-Atlanta	201-461-5340
NM	Albuquerque, Hytronic Meas.	505-268-3941
NC	Burlington, Gentry	919-227-2581
Ohio	Medina, Cozzens & Cudahy	216-725-5660
Okla	Tulsa, Carey-Wolf, Zerbe Co.	918-622-9233
Tex	Ft. Worth, Carey-Wolf, Co.	817-738-1996
Tex	Houston, Carey-Wolf, Zerbe	713-643-2114
Utah	Salt Lake City, Hytronic Meas.	801-466-4924
Wash	Seattle, Showalter-Judd	206-762-2310

SCIENTIFIC COLUMBUS, Div. Esterline Corp., 1035 W. 3rd Ave., Columbus, Ohio, 43212, Tel: 614-294-5671; Sls. Mgr: W. Traetow .....Vol 2•1180

Local Sales Offices & Reps.

Ala	Birmingham, J. Spader Co.	205-879-1366
Ariz	Phoenix, B.F.A., Inc.	602-946-4215
Ark	El Dorado, L. C. Byrne Co.	501-863-9435
Cal	City of Industry, Esterline Angus	213-330-1621
Cal	Hayward, Esterline Angus	415-785-8232
Colo	Denver, C. Beabout Co.	303-244-3151
DC	Washington, Hildenbrand Co.	703-280-2330
Fla	Orlando, R.G. Cheney	305-894-7371
Haw	Honolulu, Berkley Engrg. & Equip. Co.	808-538-1921
Ill	Elmhurst, Esterline Angus	312-833-4410
Ind	Indpls, C.D. Arnold Co.	317-546-4053
Iowa	Cedar Rapids, H. Ferris	319-363-9156
Iowa	Des Moines, H. Ferris	515-255-5008
La	New Orleans, Mid-South Sls.	504-822-3030
Mass	Holliston, Esterline Angus	617-235-5343
Mich	Detroit, G. R. Peters Assocs.	313-564-6325
Mich	Marquette, NWR Elctrns.	906-226-7578
Minn	Minneapolis, Scientific Columbus	
Minn	Virginia, NWR Elctrns.	218-741-5080
Mo	Crestwood, C. B. Fall Co.	314-968-3850
NM	Albuquerque, BFA Corp.	505-296-8303
NM	Las Cruces, B.F.A. Corp.	505-523-0601
NY	Buffalo, R. F. Lamb Co., Inc.	716-874-4900
NY	Kingston, R. F. Lamb Co., Inc.	914-338-8833
NY	New York, Esterline Angus	201-471-0084
NY	Rochester, R.F. Lamb Co., Inc.	716-544-5580
NY	Syracuse, R. F. Lamb Co., Inc.	315-454-2469
NC	Charlotte, R. Chapman	704-525-2421
NC	Raleigh, R. Chapman	919-782-2624
Ohio	Cincinnati, Beedle Equip. Co.	513-793-0140
Ohio	Cleveland, Waldrip Blankenburg & Co.	216-526-1100
Ore	Portland, McLaren Inc.	503-297-2248
Pa	Philadelphia, Esterline Angus	215-887-2268
Pa	Pittsburgh, Scientific Columbus	614-294-5671
SC	W. Columbia, R. Chapman	803-256-2984
Tenn	Knoxville, W. Massey Co.	615-577-9553
Tex	Dallas, McCoy Assocs.	214-350-9931
Tex	Houston, E. Smith Sls.	713-649-5756
Va	Fairfax, Hillenbrand Co.	703-280-2330
Wash	Bellevue, McLaren, Inc.	206-454-3400
Wisc	Milwaukee, T. R. Bicker	414-453-3772
For:	Can., Calgary, Alberta, Showalter Agencies, Ltd.	403-269-6411
For:	Can., Don Mill, Ont., R. G. Shelley, Ltd.	416-447-6471
For:	Can., New Westminster, Showalter Agencies, Ltd.	604-524-1434

SCIENTIFIC COMMUNICATIONS, 3425 Kingsley, Garland, Tex., 75041, Tel: 214-271-3685, TWX: 910-860-5172; Sls. Mgr: M.E. Wallace .....Vol 1•567

Local Sales Offices & Reps.

Cal	Anaheim, Blair Assocs.	714-635-1350
Cal	Los Altos, H. Stout Assoc.	415-948-3265
Fla	Ft. Lauderdale, Snow Co.	305-563-2448
Md	Rockville, SCI - Washington Off.	301-881-7387
Mass	Wellesley, Reptron	617-275-8585
NJ	Pennsauken, Megargel & Himmelstein Assoc.	609-662-3081
Tex	Dallas, Texas Microwave	214-358-1172
Tex	El Paso, Kelley Entprs.	915-751-3843

SCIENTIFIC EDUCATIONAL PRODS., SEP Instrs. Div., Box 1686, FDR Sta., N.Y., N.Y., 10022, Tel: 212-867-9480; Sls. Mgr: J. Asch

SCIENTIFIC MEASUREMENTS, 2945 Central, Wilmette, Ill., 60091, Tel: 312-256-0148; Sls. Mgr: R.A. Karlin

SCIENTIFIC TECHNOLOGY, 1157 San Antonio Rd., Mountain View, Cal., 94040, Tel: 415-965-0910; Pres: A.R. Lazzara; Ch. Engr: R.M. Brown; Sls. Mgr: David Persen

SCIENTRONICS, 25 Clark Dr., Barrington, N.J., 08007, Tel: 609-546-5792; Sls. Mgr: R. Patterson

SCS CORPORATION-MICROSYSTEMS, 1150 NW 70th St., Ft. Lauderdale, Fla., 33309, Tel: 305-974-5400, TWX: 510-956-9897; V.P. Mktg: J.E. Lane; Pres: T.A. Ivesdal Vol 2•605

Local Sales Offices & Reps.

Luminetics Comp., Sub SCS Corp.-Micro

Ala	Huntsville, INTEREP Assocs.	205-881-3677
Ariz	Phoenix, W. W. Posey Co.	602-934-1335
Cal	Los Altos, W. W. Posey Co.	415-948-7771
Cal	San Diego, Miracle & Assocs.	714-276-8619
Cal	Van Nuys, Penwarden Entprs.	213-785-0773
Conn	North Haven, Kitchen & Kutchin	203-239-0212
Fla	Melbourne, Tech-Rep Assocs.	305-723-9140
Ill	Des Plaines, Coombs Assocs.	312-298-4830
Ind	Fort Wayne, Coombs Assocs.	219-743-4611
Mass	Lexington, Kitchen & Kutchin	617-862-8230
Mich	Utica, Hufferd Co.	313-731-6003
Mo	St. Louis, Coombs Assocs.	314-567-3657
NJ	Hackensack, SJS Assocs.	201-488-2444
NJ	Springfield, Service & Tech. Unltd.	201-232-2666
NY	Commack, Service & Tech. Unltd.	516-543-1061
NY	Syracuse, Lenard Co.	315-479-9191
Ohio	Chagrin Falls, Midwest Mktg. Assoc.	216-247-6655
Ohio	Dayton, Midwest Mktg. Assoc.	513-433-2511
Pa	Narberth, S. A. Jeffries, Inc.	215-664-8500
Tex	Addison, Campion Sales Co.	214-239-9196

SCS Corp.-Microsystems

Ala	Huntsville, INTEREP Assocs.	205-881-3677
Ariz	Phoenix, W. W. Posey Co.	602-934-1335
Cal	Culver City, DeAngelo, Rothman & Co.	213-398-6239
Cal	Los Altos, W. W. Posey Co.	415-948-7771
Cal	San Diego, DeAngelo, Rothman & Co.	714-225-1800
Conn	North Haven, Kitchen & Kutchin	203-239-0212
Ill	Des Plaines, Coombs Assocs.	312-298-4830
Ind	Fort Wayne, Coombs Assocs.	219-743-4611
Mass	Lexington, Kitchen & Kutchin	617-862-8230
Mich	Utica, Hufferd Co.	313-731-6003
Mo	St. Louis, Coombs Assocs.	314-567-3657
NJ	Hackensack, SJS Assocs.	201-488-2444
NY	Syracuse, Lenard Co.	315-479-9191
Ohio	Chagrin Falls, Midwest Mktg. Assoc.	216-247-6655
Ohio	Dayton, Midwest Mktg. Assoc.	513-433-2511
Pa	Narberth, S. A. Jeffries, Inc.	215-664-8500
Tex	Addison, Campion Sales Co.	214-239-9196

SCS MICROSYSTEMS, See SCS Corp.-Microsystems

SEACOR, INC., 598 Broadway, Norwood, N.J., 07648, Tel: 201-768-6070; Sls. Mgr: M. Davis Vol 2•1132; Vol 3•499

Local Sales Offices & Reps.

Cal	Northridge, Orion Sls.	213-886-4761
Cal	Palo Alto, Abbott Engrg.	415-327-0830
Colo	Denver, Williams Assocs.	303-388-4391
Conn	Manchester, G-M Assocs.	203-646-4443
Fla	Jupiter, Cherry Assocs.	305-746-4591
Ill	Skokie, Mar-Con	312-675-6450
Kans	Shawnee Mission, TSA Tech. Sls.	913-831-2888
Md	Baltimore, J & B Sales	301-823-0071
Mass	Framingham, G-M Assocs.	617-872-0333
Mass	Waltham, Conti-Younger	617-890-4582
Mich	Grosse Pointe Park, Greiner Assocs.	313-499-0188
Minn	Mpls., Heimann Co.	612-861-6051
NY	East Rockaway, W. Bellenkes Assocs.	516-887-1443
NY	Great Neck, R.E. Breuer Co.	516-466-3030
NY	Ontario Center, Gehrs & Kehoe	315-524-2491
NY	Syracuse, W. A. Franklin Sls.	315-446-2246
NC	Burlington, P.J. Nahser Co.	919-226-8053
Ohio	Cincinnati, W. Geisting Assocs.	513-931-0812
Pa	Ardmore, R.D. Freedman Assocs.	215-649-3679
Tex	Dallas, Evans & McDowell Assocs.	214-238-7157

SEAL-PEEL, INC., Box 250, Troy, Mich., 48084, Tel: 313-588-1055; Sales Mgr: V. Sheets

SEALECTRO CORP., 225 Hoyt St., Mamaroneck, N.Y., 10543, Tel: 914-698-5600, TWX: 710-566-1110; V.P. Sls: S. Lescarboura Vol 1•372-374; Vol 2•1133; Vol 3•774-785

Local Sales Offices & Reps.

Ala	Huntsville, Young & Lawrence Assoc.	205-539-6575
Ariz	Scottsdale, Barnhill Five, Inc.	602-947-7841
Cal	Los Angeles, Sealectro West	213-666-4040
Cal	Mt. View, Sealectro West	415-965-1212
Colo	Denver, Barnhill Five	303-934-5505
Fla	Ft. Lauderdale, Young & Lawrence Assoc.	305-563-6717
Fla	Miami Bch., Geartner Assocs.	305-861-3661
Fla	Orlando, Geartner Assocs.	305-299-1000
Fla	St. Petersburg, Young & Lawrence Assoc.	813-894-0026
Fla	Winter Park, Young & Lawrence Assoc.	305-647-6929
Haw	Honolulu, Pegart International Hawaii	808-839-6574
Ill	Arlington Hghts., R. Diethert Co.	312-593-7600
Iowa	Des Moines, Beams	515-282-0292
Md	Rockville, Mechtronics Sls., Inc.	301-340-2130
Md	Silver Spring, J. J. Wild Co.	301-587-2523
Mass	Concord, Sls. Engrg. Co.	617-369-3943
Mass	Needham, J.J. Wild Co.	617-444-2366
Mich	Farmington, Carter, McCormic & Peirce	313-477-7700
Mich	Farmington, W. R. Hummon & Assocs.	313-474-0661
Minn	Mpls., ECR	612-927-4547
NJ	Mountainside, J.J. Wild Co.	201-654-3272
NJ	So. Hackensack, Engineered Prods., Inc.	201-488-4040
NM	Albuquerque, Barnhill Five, Inc.	505-299-7658
NY	Hastings-on-Hudson, J.J. Wild Co.	914-963-3803
NY	Jericho, J.J. Wild Co.	516-921-7100
NY	Liverpool, J. J. Wild Co.	315-612-5176
NY	Mt. Vernon, Friedman-Smith Sls.	914-664-4866
NY	Syracuse, I.A. Hotze	315-GR-9-6641
NC	Burlington, P. J. Nahser Company, Inc.	919-226-8053
NC	Charlotte, R. Diethert Co.	704-376-8341
Ohio	Cleveland, Carter, McCormic & Peirce	216-333-5650
Ohio	Columbus, McFadden Sls. Co.	614-CA-1-3363
Ohio	Dayton, Carter, McCormic & Peirce	513-278-5873
Okla	Tulsa, G.V. Peck	918-585-5853
Pa	Delmont, T. F. Laslo & Assocs.	412-468-5045
Pa	Narberth, S.A. Jeffries	215-664-8500
Pa	Philadelphia, C. H. Newson & Assocs.	215-248-3377
Pa	Pittsburgh, Carter, McCormic & Pierce	412-824-3769
Pa	Southampton, J.J. Wild Co.	215-357-6645
Tex	Houston, G.V. Peck	713-664-1435
Wash	Seattle, Blum & Assocs.	206-SU-2-1600
Wisc	Waukesha, R. Diethert Co.	414-547-6575
For:	Can., Dorval, 760, Que., Avotronics, Ltd.	514-631-9168
For:	Can., Willowdale, Ont., Avotronics, Ltd.	416-493-9711

SEALECTRO Local Distributors

Ala	Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr.	205-539-2731
Cal	Goleta, Radio Prods. Sls., 350 S. Kellogg Ave	805-964-6823
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	Mt. View, Powell Elctrns/California, Box 997, 411 Fairchild Dr.	415-964-0820
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Fla	Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave	305-885-8761
Fla	Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way	305-859-1450
Ill	Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.	
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Md	Beltsville, Powell Elctrns/Washington, 10728 Hanna St.	301-937-4030
Mass	Boston, De Mambro Elctrns, 1095 Commonwealth Ave.	617-787-1200
Minn	Minneapolis, ICI-Industrial Comps. Inc., 612-927-9991	991
NY	Freeport, Milgray Elctrns, 191 Hanse Ave	516-546-6000
Ore	Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd	503-292-3534
Pa	Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave	215-365-1900
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Local Sales Offices & Reps.

Ariz	Phoenix, Hytronics Measurements, Inc.	602-253-6104
Cal	Inglewood, J. Berman Co.	213-678-1281
Cal	Oakland, Moulthrop Sls. Inc.	415-261-7676
Colo	Denver, Hytronic Measurements, Inc.	303-388-4081
Fla	Orlando, Cartwright & Bean	305-896-2031
Fla	Plantation, Cartwright & Bean	305-791-3989
Ga	Atlanta, Cartwright & Bean	404-237-2273
Ill	Chicago, GNB Assocs., Inc.	312-673-4050
Ill	Chicago, Sola Electric	312-439-2800
Ind	Fort Wayne, Baehr, Greenleaf & Assoc. Inc.	219-483-6864
La	Chalmette, Cartwright & Bean	504-279-4598
Md	Silver Spring, NKA, Inc.	301-585-6141
Mass	Norwood, JMG, Inc.	617-762-5333
Mich	Detroit, R.C. Merchant & Co., Inc.	313-535-6000
Mich	St. Joseph, R. C. Merchant & Co.	616-983-7378
Minn	Minneapolis, Stack-Johnson	612-925-2111
Miss	Jackson, Cartwright & Bean, Inc.	601-354-1368
Mo	Kansas City, Forristal-Young Sls. Co.	816-358-6771
Mo	St. Louis, Forristal-Young Sls. Co.	314-645-2360
NJ	Cherry Hill, Trinkle Sls.	609-667-3500
NM	Albuquerque, Hytronic Measurements, Inc.	505-268-3941
NY	Mineola, Willco Sls.	516-294-9840
NY	Rochester, L-Mar Assocs.	716-328-5240
NY	Rochester, Sola Electric	716-288-2230
NC	Charlotte, Cartwright & Bean	704-333-6457
NC	Raleigh, Cartwright & Bean	919-832-7128
Ohio	Cincinnati, Baehr, Greenleaf & Assoc. Inc.	513-891-3826
Ohio	Cleveland, Sola Electric	216-521-8038
Ohio	Columbus, Baehr, Greenleaf & Assoc. Inc.	614-486-4046
Ohio	Lakewood, Baehr, Greenleaf & Assoc. Inc.	216-221-9030
Ore	Portland, Earl & Brown Co.	503-292-9145
Tenn	Memphis, Cartwright & Bean	901-276-4442
Tex	Dallas, R.E. Nesbitt Co.	214-357-4601
Tex	Houston, R. E. Nesbitt Co.	713-224-3633
Utah	Salt Lake City, Hytronics Measurements, Inc.	801-466-4924
Wash	Seattle, Earl & Brown Co.	206-284-1121

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Ala	Birmingham, J.W. Clary Co., 1713 Second Ave. S.	205-322-2488
Cal	Garden Grove, Allied Elctrns., 12311 Industry St.	213-598-6605
Cal	Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way	213-685-5511
Cal	Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave.	415-961-1500
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ill	Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.	
Ill	Palatine, Ohm/Elctrns, 645 Vermont Ave	312-359-5500
Ill	Schiller Park, Hamilton-Avnet Elctrs., 3900 N. 25th Ave.	
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Kans	Kansas City, Burstein-Applebee	816-561-5460
Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
La	Lafayette, Ralph's Inc., 3004 Cameron St.	318-234-4507
Md	Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd.	301-823-0070
Mass	Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy.	617-491-3300
Mich	Muskegon, Western Elctrn Supply, 1781 5th St	616-722-7628
Mich	Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza	313-729-8500
Mo	Kansas City, Burstein Applebee	816-561-5460
Neb	Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St.	402-341-7700
NJ	Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22	201-376-8900
NY	Lynbrook, Peerless Radio, 19 Wilbur St.	516-593-2121
NY	Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd.	716-328-3230
Ohio	Akron, Akron Elctrn. Supply, 107 S. Arlington St	216-762-8818
Ohio	Akron, Sun Radio Co., 110 E. Market St.	216-HE-4-2171
Ohio	Cincinnati, United Radio Co., Summit & Reinhold Dr.	800-582-7080
Ohio	Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St.	216587-3600
Ohio	Dayton, Pioneer/Dayton, 1900 Troy St.	513-236-9900
Ohio	Solon, REPCO, 6835 Cochran Rd.	216-248-8900
Ohio	Warren, REM Elctrns. Supply Co., 264 W. Market St.	216-399-2777
Pa	Pittsburgh, Cameradio Co., 2801 Liberty Ave.	412-391-7400
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	
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Tex	Houston, Harrison Equip. Co. Inc., 1616 McGowen St.	713-224-9131
Utah	Salt Lake City, Standard Supply Co., 225 E. 6th So.	801-355-2971
Va	Norfolk, Priest Elctrn., 6431 Tidewater Dr.	703-855-2021
Wash	Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S.	206-763-2300
Wisc	Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd.	414-545-6500

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Ariz	Phoenix, Maddox Sls. Co.	602-274-3807
Cal	Los Angeles, Maddox Sls. Co.	415-431-2953
Cal	San Francisco, Maddox Sls. Co.	213-269-7291
Ill	Chicago, Cumming & Foley Sls. Co.	312-725-8110
Kans	Shawnee Mission, M. E. Bettis Co.	913-362-0772
Md	Phoenix, REBCO Sls.	301-592-8907
Mass	Wayland, Ellingwood, Inc.	617-265-6400
NJ	River Edge, Meg Electronic Sls.	201-265-9887
NM	Albuquerque, Maddox Sls. Co.	505-298-2422
Ohio	Cleveland, J. O. Olsen Co.	216-752-5444
Tex	Dallas, G. Weinreich & Assoc.	214-321-2800
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Tex	Ft. Worth, Allied Elctrns., 401 E. 8th St.	817-336-5401

SOLID STATE DEVICES, INC., 14830 Valley View Ave., La Mirada, Cal., 90638, Tel: 213-921-9660, TWX: 910-586-1881; Sls. Mgr: M. Rican **Vol 1•597; Vol 2•941**

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Cal	Norwalk, Bertrand-Zoolalian	213-921-9791
Cal	Oakland, Moulthrop Sls., Inc.	415-261-7676
Colo	Boulder, H. Bass	303-449-7509
Fla	Maitland, Beacon	305-647-3498
Fla	Palm Beach Gardens, Beacon Elctrns.	305-622-2770
Ga	Atlanta, Beacon	404-351-3654
Ill	Chicago, TechRep	312-761-0548
Kans	Overland Park, Dy-Tronix	816-931-3030
Mass	Brookline, Tech. Prods.	617-731-0858
Mich	Warner, DEM Elctrn. Sls.	313-755-6660
Minn	Minneapolis, Citronics Sls. Co.	612-888-3065
Mo	Hazelwood, Dy-Tronix	314-731-5799
NJ	Wallington, Comp-Tech Sls.	201-935-5454
NM	Albuquerque, J. Smith	505-255-2111
NY	Liverpool, BCS Assocs.	315-458-4774
NY	New Hyde Park, Comp-Tech	516-593-2628
Pa	Phila., Schibley	215-676-9885
SC	Spartanburg, Beacon	803-576-7462
Tex	Addison, Campion Sls. Co.	214-239-9196
Va	Fairfax, Schibley	703-591-3008
Va	Falls Church, Beacon	703-534-1868
Wash	Seattle, Underwood & Underwood	206-243-2133

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Ariz	Phoenix, Moltronics, Inc., 2746 W. Palm LA.	602-272-7951
Cal	Chatsworth, Westates Elctrns. Corp., 20151 Bahama St.	213-341-4411
Cal	San Diego, Moltronics, Inc., 7969 Engineer Rd.	714-278-5020
Cal	Santa Clara, Moltronics, Inc., 337 Mathews St.	408-244-7600
Cal	South Gate, Moltronics, Inc., 5610 E. Imperial Hwy.	213-773-6521
Mich	Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza	313-729-8500
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Ohio	Dayton, Pioneer/Dayton, 1900 Troy St.	513-236-9900

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SOLITRON Local Distributors

Ala	Huntsville, Hall-Mark Elctrns., Box 1133	205-539-0691
Ariz	Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave.	602-269-1391
Ariz	Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd.	602-273-7331
Cal	Culver City, Avnet Electrns. Div., 10916 Washington Blvd.	213-836-7200
Cal	Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way	213-685-5511
Cal	Menlo Park, Bell Inds., Elctrn Distr. Div., 1070 Obrien Dr	415-323-9431
Cal	San Carlos, Intermark, 100 Industrial Way	415-592-1641
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Cal	San Diego, Kierulff-San Diego, 8797 Balboa Ave.	714-278-2112
Cal	Santa Ana, Intermark, 2920 W. Warner St.	714-540-1322
Colo	Denver, Intermark, 2600 W. Second St.	303-936-8284
Colo	Denver, Kierulff-Denver, 10890 E. 47th Ave.	303-343-7090
Fla	Clearwater, Southland Elctrncs., 1771 N. Hercules	813-443-4514
Fla	Orlando, Hall-Mark Elctrn., 7233 Lake Ellenor Dr.	305-855-4020
Ill	Elk Grove Vi, Hall-Mark Elctrns. Corp., 180 Crossen Ave	312-437-8800
Ill	Elk Grove Village, Lakeland Elctrns., 2451 Brickvale Dr.	312-595-1000
Md	Baltimore, RESCO, 1026 Cromwell Bridge Rd.	301-823-0070
Md	Hanover, Hamilton/Avnet Elctrns.	301-796-5000
Md	Savage, Pyttronic Ind., 8200 Wellmoor Ct.	
Mass	Boston, De Mambro Elctrns, 1095 Commonwealth Ave.	617-787-1200
Mass	Needham Hgts., Kierulff - Boston, 14 Charles St.	617-449-3600
Mich	Detroit, RS Elctrns., 12775 Lyndon St.	313-491-1000
Mich	Farmington, Northland Elctrns., Inc., 32708 W. Eight Mile Rd.	313-477-3200
Minn	Minneapolis, ICI-Industrial Comps. Inc., 612-927-9991	77-3200
Mo	No. Kansas City, LCOMP-Kan City, 1520 Taney St.	910-221-2400
Mo	St. Louis, LCOMP-St. Louis Inc., 2605 S. Hanley Rd.	314-647-5505
NJ	Haddenfield, M & S Assocs., 31 Tanner St.	609-429-7055
NM	Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E.	505-247-1055
NY	Buffalo, Summit Dist. Inc., 916 Main St.	716-884-3450
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NY	Hauppauge, Time Elctrncs., 70 Marcus Blvd.	516-273-0100
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Ohio	Dayton, Kierulff - Dayton, 2030 Drill Ave.	513-278-9411
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Ohio	Kettering, Arrow Elctrns., 3100 Plainfield Rd.	513-253-9176
Pa	Erie, Erie Corporate Contrs., 1938 Buffalo Rd.	814-455-8110
Pa	Trevose, Hall-Mark Elctrns., Box 125	215-355-7300
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Ala	Huntsville, W.A. Brown Comps.	205-539-4411
Ariz	Scottsdale, Piper Sls.	602-946-4437
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Fla	Orlando, W.A. Brown Comps.	305-425-5505
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Fla	Port Salerno, Solitron Microwave	305-746-8931
Ill	Chicago, D. Dolin Sls. Co.	312-286-6200
Ill	Des Plaines, Solitron Devices	312-824-8127
Ind	Indianapolis, Sukup & Cox Inc.	317-257-8436
Kans	Overland Park, Ensco-Rep.	913-381-7557
Md	Towson, Solitron Devices	301-821-1282
Mass	Lexington, Circuit Sls. Co.	617-861-0567
Mass	Needham, Solitron Devices, Inc.	617-444-1152
Mich	Dearborn, Pitcher-Poulin	313-582-5450
Minn	St. Paul, Wagner Consits.	612-698-0331
Mo	Saint Louis, Ensco-Rep	314-542-3935
NY	Jamaica, S & J Sls. Assocs.	212-291-3232
NY	Syracuse, Nycom, Inc.	315-437-8343
NY	Tappan, Solitron Devices, Inc.	914-359-5050
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Ohio	Dayton, Luebbe Sls.	513-294-0426
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Ohio Dayton, Kierulff - Dayton, 2030 Drill Ave. 513-278-9411
Ohio Kettering, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Pa Erie, Erie Corporate Contrs., 1938 Buffalo Rd. 814-455-8110
Pa Trevose, Hall-Mark Elctrns., Box 125 215-355-7300
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Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
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Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
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Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500
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Ariz Scottsdale, Barnhill Three 602-947-7841
Cal Glendale, Instrument Specialists, Inc. 213-245-9404
Cal San Diego, Instrument Specialists, Inc. 714-565-2555
Cal Santa Clara, Instrument Specialists, Inc. 408-244-1505
Colo Denver, Barnhill Three 303-934-5505
Conn Hamdon, Pat Jenks Assocs. 203-281-0810
Fla Orlando, BCS Assocs. 305-843-1510
Haw Honolulu, Earl & Blackwell Co. 808-847-3028
Ill Chicago, Pivan Engrg. Co. 312-539-4838
Ind Indianapolis, Pivan Engrg. Co. 317-253-1681
Kans Shawnee Mission, Pivan Engrg. Co. 913-722-1030
Md Baltimore, Dyna Rep. Co. 301-879-2586
Mass Wakefield, Pat Jenks Assocs. 617-246-1590
Mich Detroit, S. Sterling Co. 313-255-1970
Minn Minneapolis, Pivan Engrg. Co. 612-537-4501
Mo Manchester, Pivan Engrg. Co. 314-227-3501
NH Manchester, Sorensen Co. 603-668-4500
NJ Bordentown, Dyna Rep Co. 609-298-6700
NJ Union, SBM Assocs. 201-687-8737
NM Albuquerque, Barnhill Three 505-299-7658
NY Pleasantville, SBM Assocs. 914-769-1811
NY Rochester, SBM Assocs. 716-266-1400
NC Greensboro, BCS Assocs. 919-273-1918
Ohio Cleveland, S. Sterling Co. 216-442-8080
Ohio Dayton, S. Sterling Co. 513-298-7573
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Ala Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr. 205-539-2731
Ariz Phoenix, Liberty Electrns., 3612 N. 16th St. 602-264-4438
Cal El Segundo, Liberty Elctrns., 124 Maryland St. 213-322-8100
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Fla Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave 305-885-8761
Fla Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way 305-859-1450
Md Beltsville, Powell Elctrns/Washington, 10728 Hanna St. 301-937-4030
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
Minn Minneapolis, Hall-Mark Elctrns., 4555 W. 77th St. 612-925-2944
NJ Clifton, Eastern Radio, 312 Clifton Ave. 201-471-6600
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
Okla Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave. 918-835-8458
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave 215-365-1900
Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
Tex Houston, Hall-Mark Elctrn., Box 36739 713-781-6100
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

SPRAGUE ELEC. CO., 481 Marshall St., No. Adams, Mass., 01247, Tel: 413-664-4411, TWX: 710-369-1360; Dir. Adv. & Sls. Prom: S.L. Chertok

Local Sales Offices & Reps.
Ala Huntsville, Elctrn. Mktg. Assocs. 205-852-2660
Ala Huntsville, Sprague Elefc. Co. 205-883-0520
Ariz Tempe, Sprague Elec. Co. 602-279-5435
Cal Burlingame, W. J. Purdy Co. 414-347-7701
Cal Inglewood, Sprague Elec. Co. 213-649-2600
Cal Los Angeles, KCE Corp. 213-649-2622
Cal San Diego, KCE Corp. 714-278-7640
Colo Denver, K-C Marketers Inc. 303-733-5561
Colo Denver, Sprague Elec. Co. 303-756-3611
Conn Trumbull, Sprague Elec. Co. 203-261-2551
DC Washington, Sprague Elec. Co. 202-244-6026
Fla Longwood, Sprague Elec. Co. 305-831-3636
Ill Schiller Park, Sprague Elec. Co. 312-678-2262
Ill St. Ann, Sprague Elec. Co. 314-291-2500
Ind Indianapolis, Sprague Elec. Co. 317-253-4247
Mass North Adams, Sprague Elec. Co. 413-664-4411
Mass Waltham, Sprague Elec. Co. 617-899-9100
Mich Jackson, Sprague Elec. Co. 517-787-3934
Minn Minneapolis, HMR, Inc. 612-920-8200
Mo St. Ann, Sprague Elec. Co. 314-291-2500
NJ Cherry Hill, Sprague Elec. Co. 609-667-4444
NJ Cherry Hill, Trinkle Sls. Inc. 609-667-3500
NJ Wayne, Sprague Elec. Co. 201-696-8200
NM Albuquerque, W. J. Purdy Co. 505-266-7959
NY Mamaroneck, W. Rutt, Inc. 914-698-8600
NY Melville, Sprague Elec. Co. 516-549-4141
NY Syracuse, Mar-Com Assocs. 315-437-2843
NY Syracuse, Sprague Elec. Co. 315-437-7311
NC Winson-Salem, Electronic Mktg. Assocs. 919-722-5151
Ohio Chagrin Falls, Sprague Elec. Co. 216-247-6488
Ohio Dayton, Sprague Elec. Co. 513-278-0781
Tex Richardson, Sprague Elec. Co. 214-235-1256
Va Lexington, Sprague Elec. Co. 703-463-9161
Wash Seattle, Sprague Elec. Co. 206-632-7761
For: Can., Toronto 15, Ont., Sprague Elec. of Can., Ltd. 416-766-6123
For: Can., Ville St. Laurent 9, P.Q., Sprague Elec. of Can., Ltd. 514-747-7811

SPRAGUE Local Distributors
Ala Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr. 205-539-2731
Ariz Phoenix, Liberty Electrns., 3612 N. 16th St. 602-264-4438
Ariz Phoenix, Moltronics, Inc., 2746 W. Palm LA. 602-272-7951
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal El Segundo, Liberty Elctrns., 124 Maryland St. 213-322-8100
Cal Garden Grove, Allied Elctrns., 12311 Industry St. 213-598-6605
Cal Irvine, Cramer/L. A., 17201 Daimler St. 714-979-3000
Cal Los Angeles, WESCO Elctrns.-L.A., 5650 Jillson St. 213-685-9525
Cal Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave. 415-961-1500
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal Mt. View, Powell Elctrns/California, Box 997, 411 Fairchild Dr. 415-964-0820
Cal Palo Alto, WESCO Elctns.-Palo Alto, 3973 E. Bayshore Rd. 415-968-3475
Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Cal San Diego, Moltronics, Inc., 7969 Engineer Rd. 714-278-5020
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Cal Santa Clara, Moltronics, Inc., 337 Mathews St. 408-244-7600
Cal South Gate, Moltronics, Inc., 5610 E. Imperial Hwy. 213-773-6521
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Colo Denver, Kierulff-Denver, 10890 E. 47th Ave. 303-343-7090
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Conn North Haven, Cramer/Conn., 35 Dodge Ave. 203-239-5641
Fla Hollywood, Cramer/Ew Hollywood, 4035 North 29th Avenue 305-923-8181
Fla Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave 305-885-8761
Fla Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way 305-859-1450
Ga Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW 404-355-2223
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ill Skokie, Bell Inds. Elctrn. Distr. Div., 7701 N. Austin Ave. 312-282-5400
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Kans Kansas City, Burstein-Applebee 816-561-5460
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Md Beltsville, Powell Elctrns/Washington, 10728 Hanna St. 301-937-4030
Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Needham Hgts., Kierulff - Boston, 14 Charles St. 617-449-3600
Mass Newton, Cramer Elctrn. Inc., 85 Wells Avenue 617-969-7700
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Neb Lincoln, Scott Elctrn Supply Corp., 4040 Adams St 403-434-8308
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NM Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E. 505-247-1055
NY Binghamton, Wilshire Elctrns., 617 Main St., Westover Plaza 607-797-1236
NY Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave. 212-492-9590
NY Buffalo, Genesee Radio & Parts Co., 2550 Delaware Ave. 716-873-9661
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Elmsford, Melville Radio, 1 Nepperham Ave. 914-592-7100
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Hauppauge, L.I., Cramer/Long Island, 29 Oser Avenue 516-231-5682
NY Hicksville, Kierulff - Hicksville, 49 Bethpage Rd. 516-433-5530
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Woodbury, Harvey Radio, 60 Crossways Park W. 516-921-8700
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Cincinnati, Cramer/Tri-States, 666 Redna Terr. 513-771-6441
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Pattison Supply Co., 4550 Willow Pkwy. 216-441-3000
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Ohio Dayton, Kierulff - Dayton, 2030 Drill Ave. 513-278-9411
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave 215-365-1900
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Garland, Kierulff-Dallas, 2815 National Dr. 214-271-2472
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Wash Seattle, Kierulff - Seattle, 5940 6th Ave. S. 206-763-1550
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200

Wisc Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave. 414-228-8100
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

SPRAGUE-GOODMAN ELECTRONICS, INC., 371 Willis Ave., Mineola, N.Y., 11501, Tel: 516-746-1385; Pres: J. Goodman; V. Pres: H. Fried

SPRAYON PRODS., INC., Ind'l. Supply Div., 26300 Fargo Ave., Bedford Hgts., Ohio, 44146, Tel: 216-292-7400; V.P: D.B. Powers

SPRENGNETHER, W.F. INSTR. CO., INC., 4567 Swan St., St. Louis, Mo., 63110, Tel: 314-535-1682; Sls. Mgr: K.D. Scott

SQUARE D CO., Executive Plaza, Park Ridge, Ill., 60068, Tel: 312-774-9200; Comm. V.P. Sls: L.J. Murrans Vol 2•367,875

SRC DIV., Moxon, Inc., 2222 Michelson Dr., Newport Bch., Cal., 92664, Tel: 714-833-2000, TWX: 910-596-1362; Sls. Mgr: D.J. Romrell; Mktg. Mgr: J. Heyer; Mktg: J. Haas .....Vol 2•1178

Local Sales Offices & Reps.
Ala Huntsville, International Scientific Instrs. 205-837-1601
Ariz Phoenix, Moxon Elctrns. 602-273-7363
Cal Irvine, Moxon Elctrns. 714-833-2000
Cal San Diego, Moxon 714-292-4820
Cal Sunnyvale, Moxon 408-734-4352
Colo Denver, PLS Assoc. 303-771-0140
Fla Orlando, Truex Assocs. Inc. 305-859-2160
Ill Des Plaines, Cozzens & Cudahy 312-298-3600
Ind Indianapolis, Cozzens & Cudahy 317-244-2456
Md Rockville, Farrell 301-424-9460
Mass Cambridge, Ken Corp. 617-491-5700
Mich Farmington, Carter, McCormic & Pierce 313-477-7700
Minn Mpls., Cozzens & Cudahy 612-884-4336
Mo Edmundson, Cozzens & Cudahy 314-423-1234
NJ Union, SBM Reps. 201-687-8737
NM Albuquerque, PLS Assocs. 505-255-2330
NY Endicott, SBM Reps. 607-754-1334
NY Pleasant Ville, SBM Reps. 914-769-1811
NY Rochester, SBM Repres. 716-266-1400
NC Winston Salem, International Scientific Instrs. 919-722-1783
Ohio Dayton, Carter, McCormic & Peirce 513-278-5873
Pa Pittsburgh, Carter, McCormic & Peirce 412-824-3760
Tex Dallas, A. Barnes Co. 214-235-4541
Tex Houston, A. Barnes Co. 713-523-7333
Utah Salt Lake City, PLS Assoc. 801-272-3681
Wash Seattle, R. Drake 206-763-2755

SSR INSTRS. CO., 1001 Colorado Ave., Santa Monica, Cal., 90401, Tel: 213-451-8701; Product Line Mgr: J. Barrett

STA-WARM ELEC. CO., 116 N. Chestnut St., Ravenna, Ohio, 44266, Tel: 216-296-6461; Sls. Mgr: E. Littrell

STACKBIN CORP., Box 434, Pawtucket, R.I., 02862, Tel: 401-722-1600; Sls. Mgr: J.J. Patterson

STACKPOLE CARBON CO., CARBON DIV., Stackpole St., St. Marys, Pa., 15857, Tel: 814-781-1234, TWX: 510-693-4511; Sls. Mgr: G. Pauline

STACKPOLE CARBON CO., Elctrn. Comps. Div.-Fixed Comp. Resistors, Kane, Pa., 16735, Tel: 814-837-7000, TWX: 510-695-8404; Sls. Mgr: J.S. Sennett

STACKPOLE Local Distributors
Ariz Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd. 602-273-7331
Cal Los Angeles, WESCO Elctrns.-L.A., 5650 Jillson St. 213-685-9525
Cal Palo Alto, WESCO Elctns.-Palo Alto, 3973 E. Bayshore Rd. 415-968-3475
Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Mass Needham Hgts., Kierulff - Boston, 14 Charles St. 617-449-3600
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
NY Hicksville, Kierulff - Hicksville, 49 Bethpage Rd. 516-433-5530
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Wisc Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave. 414-228-8100

STACKPOLE CARBON CO., Elctrn. Comp. Div.-Soft Ferrites/Special Resistors, St. Marys, Pa., 15857, Tel: 814-781-1234, TWX: 510-693-4511; Sls. Mgr: D. Almquist

Refer to STACKPOLE CARBON CO. Elctrn. Comps. Div. Fixed Composition Resistors/Capacitors For Sales Office Information.

STACKPOLE Local Distributors
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121

STACKPOLE CARBON CO., Magnet Div., Kane, Pa., 16735, Tel: 814-837-7000, TWX: 510-695-8360; Sls Mgr: V.D. Benigni

STACKPOLE COMPS. CO., Box 14466, Raleigh, N.C., 27610, Tel: 919-828-6201, TWX: 510-928-0520; Sls. Mgr: C.F. Robison .....Vol 2•1136,1137

Local Sales Offices & Reps.
Ariz Phoenix, Dorton Enterprises 602-263-0414
Cal Los Angeles, Black, Ekizion & Strong Inc. 213-870-9191
Cal Mt. View, Melchior Assocs. 415-964-2321
Cal San Diego, Black, Ekizion & Strong Inc. S. 714-278-2150
Colo Denver, Parker Webster Co. 303-770-1972
Conn Plantsville, R. J. Pisaneschi 203-628-9505
Ga Peachtree City, J.A. Creighton 404-461-9836
Ill Chicago, A.A. Woods 312-283-7400
Ind Bloomington, R. E. Riggs 812-339-6166
La Baton Rouge, R.F. Gallagher 504-924-4995
Md Baltimore, Stemler Assoc., Inc. 301-944-8262
Mass Bedford, Deco Co. 617-275-1860
Mich Birmingham, J. E. Vollmer, Jr. 313-644-3571
Minn Minneapolis, HMR, Inc. 612-920-8200
Mo Kansas, Ensco-Rep. Inc. 913-381-7557
Mo St. Louis, Ensco-Rep. Inc. 314-456-3935
NJ Englewood Cliffs, Sprung/Nussbaum, Inc. 201-947-6767
NY Buffalo, R. W. Mitscher Co. 716-854-2517
NY Fayetteville, R.W. Mitscher 315-637-9575
NC Raleigh, R.W. Mitscher 919-828-0575
Ohio Hudson, D. J. Mohr 216-653-2255
Pa Oreland, Brown-Oberlies Inc. 215-887-1325
Pa Pittsburgh, H. S. Swoyer 412-256-2538
Tenn Shelbyville, R. W. Mitscher 615-684-4544
Tex Dallas, M. N. Herbst 214-239-2497
Va Virginia Beach, R.W. Mitscher 703-464-0500
Wash Bellevue, Vantage Corp. 206-455-3460
Exp: N.Y., N.Y., Ad Auriema 212-349-8220
For: Can., Toronto, Ont., Canadian Stackpole Ltd. 416-255-2373

STACO, INC., 2240 E. 3rd St., Dayton, Ohio, 45403, Tel: 513-253-1191, TWX: 810-459-1798; Sls. Mgr: D. James; V.P. Eng: H.G. Zambell .....Vol 3•1288,1289

Local Sales Offices & Reps.
Ark Little Rock, Electra-Tech Midsouth, Inc. 501-562-4090
Cal Los Angeles, E. Strassner 213-666-1511
Cal Santa Clara, Thomas-Hartman Assocs. 408-247-1252
Conn Hamden, Impact Sls. 203-248-9368
Fla North Miami, Winfield Elctrn. Sls. 305-945-6544
Ga Atlanta, Millar Elctrns. 404-261-6160
Ill Skokie, Saffro & Assocs. 312-JU-8-0905
Ind Indpls, Southern Sls. 317-253-3359
Kans Shawnee Mission, Kathrinus-Kelly Co. 913-722-0000
Ky Louisville, Southern 502-583-6902
Md Lanham, Eastern Comps., Inc. 301-794-8610
Mass Waltham, Impact Sls. 617-893-2850
Mich Ferndale, Shalco, Inc. 313-547-4771
Minn Mpls, C. Gibb Co. 612-FR-7-1200
Mo St. Louis, Kathrinus-Kelly Co. 314-968-3800
NY Buffalo, R.F. Lamb Co. 716-874-4900
NY Kingston, R.F. Lamb Co. 914-338-8833
NY Rochester, R.F. Lamb Co. 716-544-5580
NY Syracuse, R.F. Lamb Co. 315-454-2469
NY Valley Stream, Levison Sls. Co. 516-LO-1-9696
NC Raleigh, Millar Elctrns. 919-787-9564
Ohio Cleveland, Marlow 216-381-4500
Pa Phila, Eastern Comps. 215-WA-7-6362
Pa York, Eastern Comps. 717-764-3114
Tex Bellaire, Brice Co. 713-666-1788
Tex Richardson, Brice Co. 214-235-7281
Wash Seattle, R.K. Squibb, Inc. 206-632-2450

STACO, Local Distributors
Ala Birmingham, J.W. Clary Co., 1713 Second Ave. S. 205-322-2488
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Minn Minneapolis, Elctrn Center Inc., 127 3rd Ave. N. 612-338-5881
NY Binghamton, Wilshire Elctrns., 617 Main St., Westover Plaza 607-797-1236
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Pattison Supply Co., 4550 Willow Pkwy. 216-441-3000
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Pa Philadelphia, Arch Electronics, 1318 Arch St
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Tenn Chattanooga, Curle Elctrns., 1813-S. Market
Tex Houston, Geophysical Supply Co., Box 52230 713-224-0621

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

STACOSWITCH, INC., 1139 Baker St., Costa Mesa, Cal., 92626, Tel: 714-549-3041, TWX: 910-595-1507; Sls. Adm: K. Johnson; Sls. Admn: G. Slouka

STAINLESS, INC., 3rd St., N. Wales, Pa., 19454, Tel: 215-699-4871, TWX: 510-661-8097; Sls. Mgr: J.C. Rodriguez

STAKE FASTENER CO., 9835 Dupree St., S. El Monte, Calif., 91733, Tel: 213-442-4700; Sales: J.D. Pon

STANCOR, Essex Int'l., Inc., 3501 W. Addison St., Chicago, Ill., 60618, Tel: 312-463-7400, TWX: 910-221-5466; Sls. Eng: J. Ewing; Ch. Eng: E. Kelly; Sls: N. Eichenberger

STANCOR Local Distributors
Ala Birmingham, J.W. Clary Co., 1713 Second Ave. S. 205-322-2488
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Garden Grove, Allied Elctrns., 12311 Industry St. 213-598-6605
Cal Goleta, Radio Prods. Sls., 350 S. Kellogg Ave 805-964-6823
Cal Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way 213-685-5511
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave. 415-961-1500
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Conn Hamden, Connecticut Electro Sls., 1601 Dixwell Ave. 203-288-8266
Ga Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW 404-355-2223
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
La Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094 318-423-6131
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mich Muskegon, Western Elctrn Supply, 1781 5th St 616-722-7628
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Minn Minneapolis, Elctrn Center Inc., 127 3rd Ave. N. 612-338-5881
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
NY Buffalo, Genesee Radio & Parts Co., 2550 Delaware Ave. 716-873-9661
NY Elmsford, Melville Radio, 1 Nepperham Ave. 914-592-7100

NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY White Plains, Westchester Elctrns., 602 Mamaroneck Ave. 914-949-2400
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tenn Chattanooga, Curle Elctrns., 1813-S. Market
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Houston, Geophysical Supply Co., Box 52230 713-224-0621
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

STANDARD CONDENSER CORP., 1065 W. Addison St., Chicago, Ill., 60613, Tel: 312-327-5440; Sls. Mgr: R.T. McLean
Local Sales Offices & Reps.
Cal Westminster, A.A. Dowers 213-596-4485
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Ill Chicago, Rinaldi 312-763-4848
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Cal	Goleta, Radio Prods. Sls., 350 S. Kellogg Ave	805-964-6823
Cal	Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way	213-685-5511
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave.	415-961-1500
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Cal	San Diego, Shanks and Wright Inc., 2045 Kettner Blvd.	714-239-0176
Cal	San Diego, Western Radio, 1415 India St.	714-235-6571
Cal	San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.	
Colo	Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave.	303-287-9611
Colo	Denver, Burstein-Applebee	303-244-3336
Conn	Fairfield, Utronic Inc., 273 Linwood Ave.	203-255-4521
Conn	Hamden, Arrow Elctrncs., 295 Treadwell St.	203-248-3801
Ga	Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW	404-355-2223
Ill	Chicago, Burstein-Applebee	312-763-4848
Ill	Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.	
Ill	Palatine, Ohm/Elctrns, 645 Vermont Ave	312-359-5500
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Iowa	Cedar Rapids, Iowa Radio Supply Co. Inc., 719 Center Point Rd. NE	319-364-6154
Kans	Kansas City, Burstein-Applebee	816-561-5460

Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mich Muskegon, Western Elctrn Supply, 1781 5th St 616-722-7628
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Minn Minneapolis, Elctrn Center Inc., 127 3rd Ave. N. 612-338-5881
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
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NY Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave. 212-492-9590
NY Buffalo, Radio Equip. Corp., 196 Vulcan St 716-874-2690
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
NY Woodbury, Harvey Radio, 60 Crossways Park W. 516-921-8700
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Farr Elctrns, 5403 Prospect Ave. 216-881-7403
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
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Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tenn Chattanooga, Curle Elctrns., 1813-S. Market
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Va Roanoke, Peoples Radio & Tv Supply Co., 1015 Moorman Rd
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

SWS SILICONES DIV., Stauffer Chemical Co., Sutton Rd., Adrian, Mich., 49221, Tel: 313-263-5711, TWX: 510-450-2606; Natl. Sls. Mgr., Fluid Prods: R.C. Flewwelling; Natl. Sls. Mgr., RTV - Elastomers: J.D. Acker; Natl. Sls. Mgr., Heat Curable Rubber: R.L. Harden

SYNCHRO-START PRODS., 8151 N. Ridgeway, Skokie, Ill., 60076, Tel: 312-267-1730; Sls. Mgr: A.F. Barrett; Mktg. Mgr: G.A. Soule

SYNTHANE TAYLOR CORP., An Alco Standard Corporate Partner, Valley Forge, Pa., 19481, Tel: 215-666-0300; V.P. Mktg: R.L. Smith

SYNTRONIC INSTRS., INC., 100 Industrial Rd., Addison, Ill., 60101, Tel: 312-543-6444, TWX: 910-651-2191; Chf. Sls. Eng: P. Evans .....Vol 3•535

Local Sales Offices & Reps.
Cal Arcadia, Ash M. Wood Co. 213-447-3511
Cal Los Altos, Frauman Assocs. 415-941-0660
Colo Wheatridge, Waugaman Assocs., Inc. 303-423-1020
Conn New Canaan, W. Couch 203-966-4630
Ill Northfield, Torkelson 312-446-9085
Ind Indianapolis, Torkelson 317-244-7867
Md Reisterstown, Massey Assocs. 301-833-2039
Mass Norwood, S. Pierce, Inc. 617-762-3164
Minn Mpls., Torkelson 612-835-2414
NJ Fairlawn, G. D. Harris Assoc. 201-796-5200
Pa Havertown, Snyder & Massey 215-789-2320
Tex Irving, Space Elctrns. 214-251-2261
Exp: N.Y., N.Y., Sylvan Ginsbury 212-689-5212

SYRACUSE ELCTRNS. CORP., Box 566, Syracuse, N.Y., 13201, Tel: 315-488-4911; Sls. Mgr: C.N. Benoit

Local Sales Offices & Reps.
Cal San Rafael, Wells Assocs. 415-454-5730
Cal Sherman Oaks, Gee Assocs. 213-788-5961
Fla Seminole, G. W. Fenton 813-393-5803
Ill Chicago, Automation Equip. 312-631-9673
Ind Angola, Southern Sls. 219-665-3961
Ind Indianapolis, Southern Sls. 317-253-3359
Mass Waltham, Electro Prods. 617-899-1570
Mich Dearborn, Pitcher-Poulin 313-582-5450
Minn Minneapolis, K. C. Brooks 612-544-3179
Mo St. Louis, Elec. Controls 314-645-2400
NJ Ridgewood, Ballou 212-964-4640
NY Baldwinsville, Scibetta Reps. 315-622-3993
Ohio Cleveland, Marlow Assocs. 216-381-4500
Pa Ardmore, Rothenheber 215-642-6911
Pa Pittsburgh, Trymac Co. 412-823-8400
Tenn Memphis, R. Jordan Assocs. 901-452-7441
Wisc Cedarburg, Automation Equip. 414-242-1520

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Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400

SYSCON INT'L., INC., 205 Sycamore St., So. Bend, Ind., 46622, Tel: 219-287-5916; Sls. Mgr: R.E. Haggerson; Dir. of Engr: Dr. D.E. Brown

SYSTEMS INSTRS. RESCH., INC., 331 Luckie St., N.W., Atlanta, Ga., 30313, Tel: 404-525-2434; Mktg: J.M. Pensinger

SYSTONICS, INC., Box 121, Winchester, Mass., 01890, Tel: 617-729-4439; Pres: R.C. Thomas

SYSTRON-DONNER CORP., One Systron Dr., Concord, Cal., 94520, Tel: 415-682-6161, TWX: 910-481-9472; Mktg. Dir: J.E. Niebuhr .....Vol 1•508-511

Local Sales Offices & Reps.
Ala Huntsville, Sci. Devices-S.E. 205-536-1969
Ariz Mesa, Scl. Devices 602-834-1682
Cal Los Angeles, Sci. Devices-Cal. 213-641-4800
Cal Mountain View, Sci. Devices-Cal. 415-964-4230
Cal San Diego, Sci. Devices-Cal. 714-279-6642
Colo Denver, Sci. Devices-S.W. 303-573-9466
Conn Hamden, Sci. Devices-N.E. 203-248-9361
Fla Ft. Lauderdale, Sci. Devices-S.E. 305-721-4260
Fla Orlando, Sci. Devices-S.E. 305-424-7932
Haw Honolulu, Aloha Assoc. 808-941-1574
Ill Des Plaines, Sci. Devices-Midwest 312-297-5240
Kans Lenexa, Sci. Devices-S.W. 913-631-3818
Mass Waltham, Sci. Devices-N.E. 617-894-5637
Mich Franklin, Sci. Devices-Midwest 313-363-2282
Minn Minneapolis, Sci. Devices-Midwest 612-544-1616
NJ Palisades Pk., Sci. Devices-E. 201-871-3916
NM Albuquerque, Sci. Devices-S.W. 505-268-6729
NY Liverpool, Sci. Devices-N.Y. 315-457-7420
NY Rochester, Sci. Devices 716-334-2445
NC Burlington, Sci. Devices-S.E. 919-228-6279
Ohio Cleveland, Sci. Devices-Midwest 216-261-2000
Ohio Dayton, Sci. Devices-Midwest 513-298-9904
Pa Plymouth Meeting, Sci. Devices-Phil. 215-825-9515
Tex Houston, Sci. Devices-S.W. 713-623-4250
Tex Richardson, Sci. Devices-S.W. 214-231-8106
Tex San Antonio, Sci. Devices-S.W. 512-694-6251
Va Norfolk, Sci. Devices 703-499-8133
Va Springfield, Sci. Devices-Wash., D.C. 703-451-6500
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SYSTRON-DONNER CONCORD INSTR. DIV., 10 Systron Dr., Concord, Cal., 94518, Tel: 415-682-6161, TWX: 910-481-9479; Mktg. Mgr: N. Kelley .....Vol 1•508-511

Refer to Systron-Donner Corp. for sales office information.

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SYSTRON-DONNER INERTIAL DIVISION, 200 San Miguel Rd., Concord, Cal., 94518, Tel: 415-682-6161, TWX: 910-481-9478; Sls. Mgr: B. Sage

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SYSTRON-DONNER MICROWAVE DIV., 14844 Oxnard St., Van Nuys, Cal., 91409, Tel: 213-786-1760, TWX: 910-495-1786; Mktg. Mgr: T. Anderson .....Vol 1•510

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SYSTRON DONNER TRYGON ELCTRNS. SUB., 1200 Shames Dr., Westbury, N.Y., 11590, Tel: 516-997-6200, TWX: 510-222-0492 .....Vol 1•913-917

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T-BAR INC., 141 Danbury Rd., Wilton, Conn., 06897, Tel: 203-762-8351; Sls. Mgr: A.H. Morgan; Comp. Sls. Mgr: W.R. Jonsson; Data Sys. Sls. Mgr: J.E. Gaffney Vol 2•889,1139

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Cal Palo Alto, Engineering Assocs. 415-326-7842
Cal San Marino, Van Gott & Assocs. 213-282-1125
Colo Golden, J. F. Hurlbut Co. 303-279-7138
Conn Wilton, T-Bar Inc. 203-762-8351
Fla Orlando, Geartner Assocs. 305-299-1000
Ill Chicago, R. M. Weisz Assocs. 312-637-9117
Mass Needham, A & M Electronic Reps Inc. 617-444-8170
Mich Dearborn, Villani-Pitcher, Inc. 313-271-4600
Minn St. Paul, Northport Engrg. 612-698-3841
NJ Fort Lee, Tecnimat 201-461-8686
NY New Hartford, KLM Assocs. 315-735-8525
Ohio Centerville, EMA Inc. 513-433-2800
Pa Ambler, Wyncote Instrumentation 215-643-2440
Tex Dallas, R. R. Thomas Co. 214-363-8591
Tex Houston, Unidyne 713-782-0218
Va McLean, Carwithen Assocs. 703-821-3131
Wash Seattle, D. Smith Sls. Co. 206-633-3160
Exp: Wimborne, Dorset, FR Elex, Flight Refuelling Ltd. Wimborne 2121

T-BAR Local Distributors
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565

T-F ELECTRONICS, INC., 1701 Evergreen St., Austin, Tex., 78704, Tel: 512-444-9674; Sls. Mgr: G.L. Barr Vol 2•452

T-M VACUUM PRODS., Warrington & Rowland, Riverton, N.J., 08077, Tel: 609-829-2000; Sls. Mgr: H.O. Walp, Jr.

TA MFG. CORP., Viking Inds. Co., 4607 Alger St., Los Angeles, Cal., 90039, Tel: 213-240-4600, TWX: 910-497-2065; Dir. of Mktg: A. Siebrandt

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Cal Los Angeles, TA Mfg. Corp. 213-240-4600
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Conn Trumbull, Pfannkuch & Co. 203-268-4590

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Iowa Cedar Rapids, J-R Sls. Engr. 319-377-8211
Kans Wichita, D-O Engr. 316-264-7358
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Mass Southboro, Pfannkuch & Co. 617-481-1769
Mich Southfield, Representative Elect. Products 313-354-9066
Minn Minneapolis, Nortec Sales, Inc. 612-835-7414
Mo St. Louis, Industrial Metal Working 314-739-3947
NJ Belleville, Andrews & Andrews 201-569-8800
NM Albuquerque, Crown Engr. 505-265-2066
NY Huntington, Andrews & Andrews 516-692-8686
Ohio Cincinnati, F.D. Borchelt 513-851-7586
Tex Fort Worth, John H. Smith Co. 817-267-1202
Wisc Milwaukee, Cumming & Foley 414-228-8740
For: Can., Ontario, International Fasteners 416-749-0070

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Ind Indianapolis, R. Milsk Co. 317-546-5468
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Kans Overland Park, Kimiam Sls., Inc. 913-648-5191
Mass Needham, Coakley, Boyd & Abbett, Inc. 617-444-5470
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Minn Minneapolis, Northern States Sls. Co. 612-866-3468
NY Syracuse, W. Tauber Co. 315-446-7094
NY Tuckahoe, L-C-A Sls. Co. 914-961-4700
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Pa Pittsburgh, Tanner Co. 412-561-4687
Tex Houston, M. F. Klicpera Co. 713-747-3868
Exp: Chicago, Ill., Ortiz Bros. Int. 312-478-3685

TANSITOR ELCTRNS., Div. Aerotron, West Rd., Bennington, Vt., 05201, Tel: 802-442-5473, TWX: 710-360-1782; Sls. Mgr: F.H. O'Neil

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Cal Pico Rivera, Westrep 213-949-2551
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Colo Denver, Walker Assoc. 303-623-8713
Conn North Haven, J. E. Boeing Co. 203-488-8301
Fla Oviedo, Conley & Assoc. 305-365-3283
Ga Atlanta, Rep, Inc. 404-876-1591
Ill Chicago, L-Tec, Inc. 312-286-1500
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NJ Haddonfield, Sunday-O'Brien 609-429-4013
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NC Smithfield, Byrd & Barbour Sls. 919-934-8136
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Ohio Dayton, Augnat Assoc. 513-223-5002
Ore Portland, R. Legg Co. 503-292-8824
Tex Dallas, United Comps. 214-324-1448
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NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370

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TAURUS CORP., Academy Hill, Lambertville, N.J., 08530, Tel: 609-397-2390; Sls. Mgr: J.D. Kreuter Vol 1•375

Local Sales Offices & Reps.
Cal Los Angeles, R. Sweet 213-477-4517
Cal Pasadena, Sci. Sls. SY 1-3778
Conn New Haven, Forsberg Sls. 203-239-5111
Fla Clearwator, Brennan Assoc. 813-446-5006
Ind Ft. Wayne, Hoeming Sls. 219-483-6913
Mass Brockton, Forsberg Sls. 617-522-6300
NJ Cherry Hill, H.S. Bancroft 609-UL-4-8000
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NY New York, K. Huges 212-695-0082
Ohio Wickliffe, W.J. Brauer 216-943-0601
Pa Pittsburgh, W.J. Brauer 412-921-3213

TAYLOR INDUSTRIES INC., Fisher Rd., Howell, Mich., 48843, Tel: 517-546-0450; Sls. Mgr: C.B. Vaughn

TAYLOR INSTR. PROCESS CONTROL DIV., Sybron Corp., 95 Ames St., Rochester, N.Y., 14601, Tel: 716-235-5000, TWX: 716-235-4893; Sls. Mgr: R.S. Peterson

TAYLOR-WINFIELD CORP., 1052 Mahoning Ave., N.W., Warren, Ohio, 44482, Tel: 216-399-8861; Sls. Mgr: H.W. Horlacher

TDC, DIV. FREQ. TECHNOLOGY INC., Box 365, Littleton, Mass., 01460, Tel: 617-456-3374

TDK ELECTRONICS CO., LTD., 14-6 2-Chome, Uchikanda, Chiyoda-ku, Tokyo 101, Japan, Tel: (03) 256-6111; Dir: Y. Nakamura; Mgr: M. Kurihara Vol 3•536,537

Local Sales Offices & Reps.
Cal El Segundo, TDK Elctrns. Corp. 213-644-8625
Ill Chicago, TDK Elctrns. Corp. 312-973-1222

TDK ELCTRNS. CORP., 23-73 48th St., Long Island City, N.Y., 11103, Tel: 212-721-6881; Sls. Mgr: Mr. Matsugaya Vol 3•536,537

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Ohio Cleveland, Farr Elctrns, 5403 Prospect Ave. 216-881-7403

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Fla Casselberry, Dyne-A-Mark 305-831-5100
Fla Clearwater, Dyne-A-Mark 813-446-3229
Fla Pompano Bch., Dyne-A-Mark 305-942-4041
Ga Atlanta, Elmar Assocs. 404-261-4345
Ill Des Plaines, Lincoln, Hodges & Assoc. 312-297-3810
Kans Merriam, Tech. Reps. 913-432-4110
Md Baltimore, Burgin-Kreh Assoc., Inc. 301-788-5200
Mass Braintree, Bordewieck Engrg. Sls. 617-843-0845
Mich Southfield, Representatives Elctrn. Prods. 313-354-9066
Minn Hopkins, Grayden & Flemmer, Inc. 612-941-1120
Mo Hazelwood, Tech. Reps. 816-758-5491
NY Albany, Compar Albany, Inc. 518-489-7408
NY Endwell, Compar Albany, Inc. 607-723-8743
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NY Liverpool, Compar Albany, Inc. 315-471-3356
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Pa Ambler, W. M. Assocs. 215-643-4119
Pa Pittsburgh, A. Nace Co., Inc. 412-922-7225
Tex Dallas, Jacobson Co. 214-363-7584
Va Lynchburg, Burgin-Kreh Assoc., Inc. 703-845-5600
Wisc Waukesha, Lincoln, Hodges & Assoc. 414-542-3087

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TECH LABS., INC., Bergen & Edsall Blvds., Palisades Pk., N.J., 07650, Tel: 201-944-2221, TWX: 201-947-0825; Gen. Sls. Mgr: W. Longthorne; Pres: J. Spontak; Chief Engr: A. Konrad ..... Vol 2•1140

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Colo Denver, Cristee-Meade Co. 303-232-4900
Conn Cheshire, E. Lane 203-272-6081
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Ind Ft. Wayne, Hoemig Sls. 219-483-6913
Md Towson, Habco Elctns. 301-825-9637
Mass Millis, Selmark Assocs. 617-376-2914
Mich Jackson, N. Scroggs Co. 517-750-1170
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NJ Morris Plains, Ken Garrison Assocs. 201-539-3142
NY Forest Hills, Malin Assocs. 212-268-9122
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Pa Pittsburgh, Waggoner-VerHill Assoc. 412-241-5202
Wash Seattle, J. McClamrock 206-244-9391

TECH SERV., INC., Box 125, Fogelsville, Pa., 18051, Tel: 215-285-4211, TWX: 510 651 2802; Sls. Mgr: P.D. Donahue

TECH SPRAY, Box 949, Amarillo, Tex., 79105, Tel: 806-372-8523; Pres: D. Paveit; Sls. Mgr: P.E. Jones

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Kans Overland Park, T. L. Dowell Inc. 913-649-6069
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Minn Minneapolis, Dick Borrett Co. 612-929-0028
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Exp: N.Y., New York, Empire Exporters, Inc.

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TECHNI-RITE ELCTRNS., See Recorder Sys. Div.

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Minn St. Paul, Sales Service Machine Tool Co. 612-MI-6-8663
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Tex Dallas, R. E. Nesbitt Co. 214-FL-7-4601
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Wash Seattle, R. Johnston Co. 206-LA-4-5170

TECHNICAL MAT'L., 700 Fenimore Rd., Mamaroneck, N.Y., 10543, Tel: 914-698-4800, TWX: 710-566-1100; Sls. Mgr: N.H. DePasquale

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Fla Fort Walton Beach, W. A. Brown Instru. 904-243-6424
Fla Orlando, W. A. Brown Instrus. 305-425-5505
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Md Rockville, Farrell Assocs., Inc. 301-424-9460
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Mo St. Louis, Palatine Engrg. Sls. 314-426-7055
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For: Can., Winnipeg, Man., C. L. Thompson Ltd. 204-783-0848

TECHINQUES, INC., 235 Jackson St., Englewood, N.J., 07631, Tel: 201-569-5900; Sls. Mgr: L.O. Silvan

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Md Towson, Marktron, Inc. 301-825-8222
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NJ Haddonfield, T.M. Mills Co. 609-429-1005
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Ore Portland, Oak Industries 503-292-0878
Tex Ft. Worth, W. Fralia 817-738-2394

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TECNETICS, INC., Box 910, Boulder Ind'l. Pk., Boulder, Colo., 80302, Tel: 303-442-3837, TWX: 910-940-3246; Sls. Mgr: V. Brown; Applications Engr: V. Garrison; Sls. Adm: J. McDaniel ..... Vol 1•892-896

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Ind Indianapolis, Torkelson Assocs. 317-244-7867
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NM Albuquerque, C.T. Carlberg & Assocs. 505-265-1579
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NY Great Neck, Eastern Instru. 516-466-9505
NC Winston-Salem, W.A. Brown Comps. 919-725-5384
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Ohio Dayton, Satullo Co. 513-293-7061
Pa Philadelphia, Eastern Instr. 215-927-7777
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TEKFORM PRODS. CO., 2780 Coronado St., Anaheim, Cal., 92806, Tel: 714-630-2340; Sls. Mgr: M. Riel

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Fla Palm Beach Gardens, Beacon Elctrns. 305-622-2770
Ga Atlanta, Beacon Elctrns. 404-351-3654
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Wash Bellevue, F. Westhead & Assocs. 206-747-7233

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Mass Newton Highlands, Compar Inc. 617-969-7140
Mich Dearborn, Pitcher-Poulen, Inc. 313-582-5450
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NY Kingston, R.F. Lamb Co. 914-338-8833
NY Rochester, R.F. Lamb Co. 716-544-5626
NY Syracuse, R.F. Lamb 315-454-2469
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Ohio Dayton, Instr. Sys. 513-294-2838
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TELECTRO SYS. CORP., 96-18 43rd Ave., Corona, N.Y., 11368, Tel: 212-651-8900; Sls. Mgr: H. Sussman

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Mich Birmingham, J.C. Hofstetter Co. 313-643-7203
Minn Minneapolis, S. Clothier Co. 612-869-3231
NJ Eatontown, Teledyne Relays Eastern Regional Office 201-542-6884
NM Albuquerque, A. Q. Elctrns. 505-255-8701
NY Mount Vernon, Friedman-Smith Elctrns. 914-664-4866
NY Syracuse, I.A. Hotze Co. 315-479-6641
NC Raleigh, R.W. Mitscher Co. 919-828-0575
Ohio Dayton, J.C. Hofstetter Co. 513-298-0662
Ohio Medina, J.C. Hofstetter Co. 216-241-4880
Okla Tulsa, Vista Assocs. 918-627-7557
Pa Pittsburgh, J.C. Hofstetter Co. 412-561-5454
Tenn Shelbyville, R. W. Mitscher Co. 615-684-4544
Tex Richardson, Vista Engrg. 214-235-4547
Wash Bellevue, Western Tech. Sls. 206-454-3906

TELEDYNE RELAYS Local Distributors
Ariz Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd. 602-273-7331
Ariz Phoenix, Liberty Electrns., 3612 N. 16th St. 602-264-4438
Cal El Segundo, Liberty Elctrns., 124 Maryland St. 213-322-8100
Cal Los Angeles, WESCO Elctrns.-L.A., 5650 Jillson St. 213-685-9525
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal Palo Alto, Kierulff-Palo Alto, 3969 E. Bayshore Rd. 415-968-6292
Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Colo Denver, Kierulff-Denver, 10890 E. 47th Ave. 303-343-7090
Md Hyattsville, Milgray/Washington, 5405 Lafayette Pl. 301-864-1111
Mass Boston, De Mambro Elctrns, 1095 Commonwealth Ave. 617-787-1200
Mass Burlington, Milgray/New England, 79 Terrace Hall Ave 617-272-6800
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
NJ Cherry Hill, Milgray/Delaware Valley, 1165 Marlkress Rd. 609-424-1300
NM Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E. 505-247-1055
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Freeport, Milgray/New York, 191 Hanse Ave 516-546-6000
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Pa Philadelphia, Milgray/Delaware Valley 215-228-2000
Wash Seattle, Kierulff - Seattle, 5940 6th Ave. S. 206-763-1550
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

TELEDYNE ROTOLITE, Dept. EEM, 328 Essex St., Stirling, N.J., 07980, Tel: 201-647-1040; Sls. Mgr: L. Ariyan

TELEDYNE SEMICONDUCTOR, 1300 Terra Bella Ave., Mountain View, Cal., 94040; Dir. Mktg: R.F. Graham

TELEDYNE SEMICONDUCTOR Local Distributors
Ala Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr. 205-539-2731
Cal Chatsworth, Westates Elctrns. Corp., 20151 Bahama St. 213-341-4411
Cal Los Angeles, WESCO Elctrns.-L.A., 5650 Jillson St. 213-685-9525
Cal Menlo Park, Bell Inds., Elctrn Distr. Div., 1070 Obrien Dr 415-323-9431
Cal Palo Alto, WESCO Elctrns.-Palo Alto, 3973 E. Bayshore Rd. 415-968-3475
Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Cal Sepulveda, Milgray/California, 8718 Woodley Ave 213-894-4011
Colo Denver, Kierulff-Denver, 10890 E. 47th Ave. 303-343-7090
Fla Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave 305-885-8761
Fla Orlando, Milgray/Florida, 5400 Diplomat Circle 305-647-5747
Fla Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way 305-859-1450
Ill Rosemont, Kierulff - Chicago, 9340 William St. 312-678-8560
Md Beltsville, Powell Elctrns/Washington, 10728 Hanna St. 301-937-4030
Md Hyattsville, Milgray/Washington, 5405 Lafayette Pl. 301-864-1111
Mass Burlington, Milgray/New England, 79 Terrace Hall Ave 617-272-6800
Minn Minneapolis, ICI-Industrial Comps. Inc., 612-927-9991
NJ Cherry Hill, Milgray/Delaware Valley, 1165 Marlkress Rd. 609-424-1300
NM Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E. 505-247-1055
NY Binghamton, Wilshire Elctrns., 617 Main St., Westover Plaza 607-797-1236
NY Freeport, Milgray/Int'l, 191 Hanse Ave 516-546-6000
NY Freeport, Milgray/New York, 191 Hanse Ave 516-546-6000
NY New Hyde Park, Lafayette Ind'l. Elctrns., Inc., 1327 Second Ave. 516-488-6600
Ohio Cleveland, Milgray/Cleveland, 1821 E. 40th ST. 216-881-8800
Pa Philadelphia, Milgray/Delaware Valley 215-228-2000
Pa Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave 215-365-1900
Tex Houston, Lenert Co., Box 2184 713-225-1465
Wash Seattle, Kierulff - Seattle, 5940 6th Ave. S. 206-763-1550

TELEDYNE TABER, 455 Bryant St., No. Tonawanda, N.Y., 14120, Tel: 716-694-4000, TWX: 710-262-1264; Sls. Mgr: D. Flavin

TELEDYNE WESTERN WIRE & CABLE, 2425 E. 30th St., Los Angeles, Cal., 90051, Tel: 213-587-7103; V.P: S.M. Johns; Gen. Sls. Mgr: C. Hoyt

TELESCIENCES, See Automatic Production Systems Inc.

TELETYPE CORP., 5555 Touhy Ave., Skokie, Ill., 60076, Tel: 312-982-2000, TWX: 910-223-3611; Dir. Mktg: D.F. Corkle

TELEVISION MICROTIME, INC., 1280 Blue Hills Ave., Bloomfield, Conn., 06002, Tel: 203-242-0761, TWX: 710-425-2390; Sls. Mgr: R. Paulson; Mktg. Dir: R. McLean

Local Sales Offices & Reps.
Cal Los Angeles, Camera Sys. Intern'l., Inc. 213-748-8925
Cal San Diego, Recording Center, Inc. 714-295-3194
Cal Santa Clara, Tel Alpha - Audio/Video Sys. 408-247-0911
Fla Orlando, J.D. Ivey 305-423-8281
Ill Franklin Park, Rich Inc. 312-678-3100
Mass Newton, Lake Sys. Corp. 617-244-6881
Mich Ferndale, Gen. Television Network 313-548-2500
Minn Minneapolis, Intern'l. Communication Services 612-544-8931
NY New York City, The Harvey Group, Inc. 212-832-8675
NC Winston-Salem, Kirkman Elctrns. Inc. 919-724-0541
Ohio Cleveland, Elctrn. Prods. Corp. 216-692-3050
Ore Portland, Oregon Audio/Video Sys. Co. 503-224-4313
Pa Philadelphia, Marco Video Sys. Inc. 215-849-9501
Wash Seattle, Aero Marc, Inc. 206-725-1400
Exp: Can., Toronto 18, Ont., Applied Elctrns. Ltd. 416-252-3761

TELEX COMM. DIV., 9600 Aldrich Ave., S., Minneapolis, Minn., 55420, Tel: 612-884-4051, TWX: 29-7053; Nat'l. Sales Mgr: Heinz Lambrecht; Sales Administration: Art Bruns ..... Vol 1•376

Local Sales Offices & Reps.
Cal Burbank 213-849-5716
Cal Burlingame 415-697-6575
Cal Los Angeles
Colo Denver 303-756-1589
DC Washington 202-785-0885
Fla Miami 305-754-5475
Ill Chicago 312-286-6824
Md Baltimore 301-764-7189
Mass Framingham 617-875-5396
Mass Wellesley Hills 617-235-0102
Mich Detroit 313-838-9100
Minn Minneapolis 612-884-4051
NY Flushing 212-969-7600
NY Rochester 716-442-9700

Ohio Cleveland 216-382-9090
Pa Newton Square 215-353-2241
Tex Dallas 214-357-8481
For: Can., Scarborough 416-291-2501

TELEX Local Distributors
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700

TELMAR, INC., 1150 W. Third Ave., Columbus, Ohio, 43212, Tel: 614-299-2165; Dir. of Mktg: J.A. Mohrman

TELONIC INDS., INC., Box 277, Laguna Beach, Calif., 92652, Tel: 714-494-9401, TWX: 910-596-1320; Prod. Mgr: W. Anthony; Sls/Mktg. Mgr: J.R. Smith

Local Sales Offices & Reps.
Ala Huntsville, Gentry Assocs. 205-534-9771
Ariz Scottsdale, J. Smith Assocs. 602-943-4131
Cal Cupertino, T. L. Snitzer Co. 408-257-8333
Cal Del Mar, T. L. Snitzer Co. 714-454-2191
Cal Los Angeles, T. L. Snitzer Co. 213-836-6170
Fla Orlando, Gentry Assocs. 305-894-4401
Haw Honolulu, Harkon Hawaii 808-538-7178
Ill Northfield, Torkelson Assocs. 312-446-9085
Ind Indianapolis, Torkelson Assocs. 317-244-7867
Kans Lenexa, S. Sterling Co. 913-888-2995
Md Lanham, Brimberg Assocs. 301-552-2200
Mass Needham, Addelco Corp. 617-444-4754
Mich Detroit, S. Sterling Co. 313-255-1970
Minn Minneapolis, Torkelson Assocs. 612-835-2414
Mo St. Louis, S. Sterling Co. 314-542-3636
NM Albuquerque, J. Smith Assocs. 505-255-2111
NY Albany, J. A. Reagan Co. 518-489-4777
NY Flushing, F & F Associates 516-334-1160
NC Burlington, Gentry Assocs., Inc. 919-227-3639
Ohio Cleveland, S. Sterling Co. 215-442-8080
Pa Ambler, WM Assocs. 215-643-4119
Tex Dallas, Texas Avionics Co. 214-368-3566

TELREX LABS., Asbury Park, N.J., 07712, Tel: 201-775-7252; Sls. Mgr: C. Ercolino

TELVAC INSTR. CO., 14614 Raymer St., Van Nuys, Cal., 91405, Tel: 213-994-9471; Sls. Mgr: J. Gaumer

Local Sales Offices & Reps.
Md Baltimore, Milan Assoc., Inc.
Mass Babson Park, P.R. Sturgeon Co., Inc.
NY Syracuse, E. Dutcher

TELVAC Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565

TEMPIL DIV., Hamilton Blvd., So. Plainfield, N.J., 07080, Tel: 201-757-8300, TWX: 138662; Genl. Mgr: A.F. Fleury

TEMPLEMAN, D.R. CO., 8 Park St., Plainville, Conn., 06062, Tel: 203-747-2709; Sls. Mgr: O.W. Bray

TEMPO INSTRUMENT, INC., 51 E. Bethpage Rd., Plainview, N.Y., 11803, Tel: 516-694-4400, TWX: 510-224-6421; Reg. Sales: R. Reed; Reg. Sales: H. White; Liaison Mgr: R. Egyud

Local Sales Offices & Reps.
Industrial Prods. Group
Cal City of Commerce, Pacific Scientific Co. 213-927-5333
Cal San Carlos, Pacific Scientific Co. 415-592-6300
Md Baltimore, Stemler 301-944-8262
Mich Farmington, Electro-Matic Co. 313-477-7270
Minn Minnetonka, T.H. Ayres 612-935-2191
NJ Barrington, Stemler Assocs. 609-546-6238
NJ Hohokus, Alto 201-447-1770
NY Rochester, H.C. Johnson 716-482-3000
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Pa Paoli, Stemler Assocs. 215-644-3477
Va Alexandria, Stemler 301-255-7485
Military Prods. Group
Cal Chatsworth, Tempo 213-993-1311
Cal Mountain View, Western Sls. Assoc. 415-967-5913
Cal Van Nuys, Cardinal Assoc. 213-787-5511
Conn Essex, Lafage Assocs. 203-767-0465
Md Baltimore, Stemler 301-944-8262
Mass Waltham, Russell Assocs. 617-890-4570
Mich Southfield, Luebbe Sls. Co. 313-357-0355
Mo Kansas City, PEM Sls. Co. 816-333-6012
Mo St. Louis, PEM Sls. Co. 314-434-4425
NJ Cherry Hill, Stemler Assoc. 609-966-4070
NJ Clifton, Avionics Equip. Inc. 201-772-1956
NY Brightwaters, Russell Assocs. 516-666-6500
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Ohio Dayton, Luebbe Sls. Co. 513-294-0426
Tex Richardson, P.J. Scanlon Co. 214-231-4661
Va Alexandria, Stemler 703-548-7818
Exp: NYC, Aero-Spectrum Inc. 212-752-4770

TEMPTRONIX INC., 40 Glen Ave., Newton, Mass., 02159, Tel: 617-965-3420; Mgr. Mktg. & Appl: T.G. Gerendas; Appl. Eng: Dr. H. Lyden

Local Sales Offices & Reps.
Ariz Scottsdale, Allen Assocs. 602-946-4903
Cal Palo Alto, Coherent Mktg. Assocs. 415-327-2217
Fla Longwood, Lenz Engrg. Co. 305-831-9797
Ill Des Plaines (Chicago), Cozzens & Cudahy, Inc. 312-298-3600
Ind Indianapolis, Cozzens & Cudahy, Inc. 317-244-2456
Minn Minneapolis, Cozzens & Cudahy, Inc. 612-884-4336/7
Mo St. Louis, Cozzens & Cudahy, Inc. 314-423-1234
NY Elmont, Crane & Egert Corp. 516-488-2100

TENNEY ENGRG., INC., 11000 Springfield Rd., Union, N.J., 07083, Tel: 201-686-7870, TWX: 710-985-4725; Mktg. Mgr: R.S. Schiffman

Local Sales Offices & Reps.
Ala Huntsville, FM Assocs. 205-536-9990
Ariz Scottsdale, Allen Assocs. 602-946-4903
Cal Belmont, Fisher Assocs. 408-245-0986
Cal Paramount, Tenney Engrg. 213-634-8232
Colo Denver, Williams Assoc. 303-343-2911
Conn Hamden, Equipment Sls. Co. 203-248-5581
Fla Lake Worth, R.H. Brown 305-655-3392
Fla Orlando, FM Assocs. 305-851-5710
Ill Des Plaines, Marsland Assocs. 312-298-2620
Ind Indianapolis, Marsland Assocs. 317-924-3568
Md Lanham, Brimberg Assocs. 301-552-2200
Mass Chelmsford, Equip. Sls. 617-256-8547
Mich Farmington, Anderson Elctrns. 313-476-9161
Minn Minneapolis, Marsland Assocs. 612-545-4481
Mo St. Peters, Marsland Assocs. 314-278-6949
NJ Moorestown, Salem Scientific 609-235-4565
NM Albuquerque, Williams Assoc. 505-255-1638
NY Fayetteville, M.P. Andrews 315-637-3144
NC Greensboro, FM Assocs. 919-294-2754
Ohio Cleveland, Dietrich & Assocs. 216-781-1855
Ohio Dayton, Dietrich & Assocs. 513-223-2992
Okla Tulsa, Carey, Wolf & Assoc. 918-622-9233
Pa Pittsburgh, Dietrich & Assocs. 412-892-2992
Tex Austin, Carey, Wolf & Assoc. 512-345-0876
Tex Ft. Worth, Carey, Wolf & Assoc. 817-738-1996
Tex Houston, Carey, Wolf & Assoc. 713-643-2114
Utah Salt Lake City, Haskel Engrg. & Supply 801-487-2238
Wash Seattle, Showalter-Judd, Inc. 206-762-2310

TENOR CO., INC., 17020 W. Rogers Dr., New Berlin, Wisc., 53151, Tel: 414-782-3800; Sls. Mgr: R. Turnbull

TENSOLITE, Div. Carlisle Corp., W. Main St., Tarrytown, N.Y., 10591, Tel: 914-631-2300, TWX: 710-567-1202

Local Sales Offices & Reps.
Ariz Scottsdale, Piper Sls. Co. 602-946-4437
Cal Monterey Park, Aero-K.A.P. 213-573-5313
Colo Denver, Todd Assocs. 303-777-4381
Conn Canaan, Hathaway Elctrns. 617-646-1380
Fla W. Palm Beach, Kinnally 305-967-3541
Ill Chicago, J. Golten 312-725-7870
Ind Greenwood, V. Schillinger Co. 317-888-2260
Mass Arlington, Hathaway Elctrns. 617-646-1380
Minn St. Paul, Cahill Assocs. 612-739-8445
Mo St. Charles, Buse Sls. Co. 314-946-6430
NY Penfield, J. Lazor Assoc., Inc. 716-473-8337
NY Tarrytown, F. Wroblewski 914-631-2300
Pa Paoli, Stitzer Assocs. 215-644-5500
Tenn Oak Ridge, G. K. Bickford
Tex Dallas, Blackburn Assocs. 214-FL-1-9991
Va Fairfax, Snyder & Massey Assocs. 703-273-1413
Wash Seattle, Barrett Sls. Co. 206-885-6991

TERADO CORP., 1068 Raymond Ave., St. Paul, Minn., 55108, Tel: 612-646-2868; Sls. Engr: W.M. Sorenson Vol 1•906,907

Local Sales Offices & Reps.
Cal Redwood City, Sinai-Johnson, Inc. 415-363-6263
Cal Torrance, Barstow & Doran, Inc. 213-325-4140, 325-2240
Ga Atlanta, J.E. Joyner & Assocs. 404-758-7496
Ill Chicago, R. M. Weisz Assocs. 312-637-9117
Mass Northboro, W. B. Pray Sls., Inc. 617-393-3434
Minn St. Paul, W. Engelbretson 612-222-2338
NJ Caldwell, A. Cerf & Co. 201-226-2263
Tex Dallas, Maynard-Gunn Sls. Co. 214-742-2384

TERADO Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000

TERADYNE, INC., 183 Essex St., Boston, Mass., 02111, Tel: 617-482-2700, TWX: 710-321-1055; V.P. Sls: J. Prestridge

TERADYNE COMPONENTS, 900 Lawrence St., Lowell, Mass., 01852, Tel: 617-454-9195, TWX: 710-343-1758; V.P. Marketing: T. Neavitt

TEST & MEASURING INSTRS. INC., North American Philips Co., 224 Duffy Ave., Hicksville, N.Y., 11802, Tel: 516-433-8800, TWX: 510-221-1839; VP & GM: A. Katz; Prod. Mgr: A. Van Kranenburg ..... Vol 4•422-425*

Local Sales Offices & Reps.
Ala Huntsville, E.G. Holmes 205-837-6900
Ariz Phoenix, Cleveland Entprs. 602-938-4620
Cal Inglewood, L & M Engrg. 213-674-6850
Cal Santa Clara, L & M Engrg. 408-243-2891
Fla Orlando, E.G. Holmes 305-241-2128
Ga Chamblee, E.G. Holmes 404-451-6161
Ill Des Plaines, Marsland Assocs. 312-298-2620
Ind Indianapolis, Marsland Assocs. 317-924-3568
Kans Merriam, Tech. Rep. Inc. 913-432-4110
Md Baltimore, Dynarep Co. 301-539-5148
Mass Waltham, Test & Measuring Instr. 617-890-0588
Minn Minneapolis, Marsland Assocs. 612-545-4481
Mo Hazelwood, Tech. Rep. Inc. 314-524-6900
NJ Cherry Hill, Test & Measuring Instr. 609-667-7711
NM Albuquerque, Cleveland Entprs. 505-298-7671
NY Hicksville, Test & Measuring Instr. 516-433-8800
NY Syracuse, Tesco Assocs. 315-463-4566
Ohio Worthington, Ohio Instrs. 614-885-0743
Tex Austin, Crockett Engrg. 516-476-6801
Tex Dallas, Crockett Engrg. 214-637-6120
Va Springfield, Dyna Rep. Co. 703-321-8630
Va Virginia Beach, E.G. Holmes 703-340-6556
Wash Seattle, Comptronics 206-284-4842
Exp: Santurce, Puerto Rico, Philips Elctrns. Inc. 809-725-4645

TESTEX INC., See Automedia Inc.

TEXAS CAPACITOR CO., INC., 7830 Westglen Dr., Houston, Tex., 77042, Tel: 713-782-9232; Sls. Mgr: R. Redding

TEXAS Local Distributors
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Tex Houston, Hamilton/Avnet Elctrns., 1216 W. Clay
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131

TEXAS INSTRUMENTS, Components Grp., Box 5012, Dallas, Tex., 75222, Tel: 214-238-2011, TWX: 910-867-4702; Sls. Mgr: C.M. Clough

TEXAS Local Distributors
Ala Huntsville, Cramer/Ew Huntsville, 2310 Bob Wallace Ave.SW 205-539-5722
Ariz Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd. 602-273-7331
Cal Goleta, Radio Prods. Sls., 350 S. Kellogg Ave 805-964-6823
Cal Irvine, Cramer/L. A., 17201 Daimler St. 714-979-3000
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal Palo Alto, Kierulff-Palo Alto, 3969 E. Bayshore Rd. 415-968-6292
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Conn North Haven, Cramer/Conn., 35 Dodge Ave. 203-239-5641
Fla Hollywood, Cramer/Ew Hollywood, 4035 North 29th Avenue 305-923-8181
Fla Orlando, Cramer/Ew Orlando, 345 North Graham Avenue, Box 20214 305-894-1511
Ga Atlanta, Cramer/Atlanta, 3923 Oakcliff Industrial Court 404-448-9050
Ill Chicago, Semiconductor Specialists, Inc. 312-279-1000
Ill Mt Prospect, Cramer/Chicago, 1911 South Busse Road 312-593-8230
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Md Baltimore, Cramer/Baltimore, 922-24 Patapsco Avenue 301-354-0100
Md Gaithersburg, Cramer/Ew Washington, 16021 Industrial Drive 301-948-0110
Md Hyattsville, Milgray/Washington, 5405 Lafayette Pl. 301-864-1111
Mass Newton, Cramer Elctrn. Inc., 85 Wells Avenue 617-969-7700
Mass Newton, Cramer/International, 85 Wells Ave. 617-969-7700
Mich Livonia, Cramer/Detroit, 13193 Wayne Road 313-425-7000
Minn Edina, Cramer/Bonn, 7275 Bush Lake Road 612-835-7811
NJ Cherry Hill, Milgray/Delaware Valley, 1165 Marlkress Rd. 609-424-1300
NJ Moonachie, Cramer/N.J., 1 Barrett Ave. 201-935-5600

NJ Pennsauken, Cramer/Pa., 7300 Rte. 130 No. 215-923-5950
NM Albuquerque, Cramer/N.M., 137 Vermont N.E. 505-265-5767
NY East Syracuse, Cramer/Syracuse, 6716 Joy Road 315-437-6671
NY Endwell, Cramer/Binghamtom, 3220 Watson Blvd. 607-754-6661
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Freeport, Milgray/New York, 191 Hanse Ave 516-546-6000
NY Hauppauge, Cramer/Systems, 29 Oser Ave. 516-231-5682
NY Hauppauge, L.I., Cramer/Long Island, 29 Oser Avenue 516-231-5682
NY Rochester, Cramer/Rochester, 3259 Winton Road South 716-275-0300
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NC Winston-Salem, Cramer/EW, 938 Burke Street 919-725-8711
Ohio Cincinnati, Cramer/Tri-States, 666 Redna Terr. 513-771-6441
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Cramer/Cleveland, 5835 Harper Road 216-248-8400
Pa Philadelphia, Milgray/Delaware Valley 215-228-2000
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Utah Salt Lake City, Cramer/Utah, 391 West 2500 South 801-487-3681
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Wash Seattle, Kierulff - Seattle, 5940 6th Ave. S. 206-763-1550
Wisc Milwaukee, Cramer/Wisconsin, 5626 North 91st Street 414-462-8300

TEXAS INSTRUMENTS, 34 Forest St., Attleboro, Mass., 02703, Tel: 617-222-2800, TWX: 617-222-1259; Mktg. Staff: F.P. Stearns

TEXAS Local Distributors
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300

TEXAS INSTRUMENTS, Control Prods. Div., 35 Forrest St., Attleboro, Mass., 02703, Tel: 617-222-2800; Ad. Mgr: J. Fusek

TEXAS INSTRUMENTS, INC., Digital Sys. Div.-Houston, Box 1444, Houston, Tex., 77001, Tel: 713-494-5115; Sls. Mgr: J. McEwen

TEXAS INSTRUMENTS, Elctrn. Interconnection Prods., 35 Forrest St., Attleboro, Mass., 02703, Tel: 617-222-2800, TWX: 710-346-0566; Nat'l. Sls. Mgr: L. Smith ..... Vol 3•925-941

Local Sales Offices & Reps.
Ariz Phoenix, Shefler Kahn Co. 602-258-7893
Cal Los Angeles, M.A. Stolaroff Co. 213-295-7781
Cal Menlo Park, Long & Assoc., Inc. 415-327-1300
Colo Denver, Walker Assoc. 303-623-8713
Conn Hartford, Victor Assoc. 203-246-5643
Fla Orlando, Gra-Mar Inc. 305-894-3351
Ill Rolling Meadows, Sumer Inc. 312-394-4900
Ind South Bend, Valentine Schillinger & Assoc. 219-291-6258
Mass Framingham, Victor Assoc. 617-879-5710
Mich Dearborn, Pitcher Poulin 313-582-5450
NJ Haddonfield, Tai Corp. 609-854-3011
NY Garden City, Comtronic Assoc. 516-741-8966
NY Syracuse, Canavan-Scanlon Assoc. 315-463-9161
Ohio Cleveland, A. Baier Co. 216-461-6161
Va McLean, D. Carwithen Assoc. 703-821-3131
Wash Seattle, Blair Hirsh Co. 206-783-3423
For: Can., Montreal, Allied Elctrn. Sales 514-488-5547

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TODD PRODUCTS CORP., 123 Milbar Blvd., Farmingdale, N.Y., 11735, Tel: 516-293-3440, TWX: 510-224-6584; Sls. Mgr: P. Todd ..... Vol 1•897-899

Local Sales Offices & Reps.
Ariz Scottsdale, J. Smith Assocs. 602-943-4131
Cal Fullerton, Product Data Co. 714-870-9151
Cal Los Altos, Product Data Co. 415-941-4410
Colo Boulder, J. Smith Assocs. 303-449-7509
Ill Chicago, SEA Inc. 312-282-6804
Ind Carmel, SEA Inc. 317-846-2593
Mass Braintree, Bordewieck Engrg. 617-843-0845
Mich Southfield, DATA-TRON 313-354-6421
Minn Minneapolis, SEA Inc. 612-425-4455
Mo Kansas City, Harris-Hanson Co. 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NJ Cherry Hill, Williams Assocs. 609-424-4110
NJ Woodcliff Lake, F&F Assocs. 201-778-6767
NM Albuquerque, J. Smith Assocs. 505-255-2111
NY Flushing, F&F Assocs. 516-334-1160
NY Guilderland, Electro-Modular Sys. 518-456-2665
Ohio Dayton, DATA-TRON 513-223-8421
Ohio Wickliffe, DATA-TRON 216-585-8421
Tex Dallas, Dwayne Clement & Assoc. 214-239-6105
Wash Seattle, R. S. Drake Assocs. 206-763-2755
Wisc Milwaukee, Sea Inc. 414-547-6637

TODD SYSTEMS, 4 Radford Pl., Yonkers, N.Y., 10701, Tel: 914-963-3400; Sls. Mgr: S. Edwards

TOHOKU METAL INDS., LTD., No 13-10, 7 chome, Ginza, Chuo-ku, Tokyo, Japan, Tel: Tokyo 542-6171; Sls. Mgr: K. Suzuki

TOLEDO SCALE, Div. Reliance Elect. Co., 5225 Telegraph Rd., Toledo, Ohio, 43612, Tel: 419-478-5811

TOPAZ ELECTRONICS, 3855 Ruffin Rd., San Diego, Cal., 92123, Tel: 714-279-0111, TWX: 910-335-1526; Mktg. Mgr: L. Towle; Sls. Mgr: J. Reed Vol 1•909-911; Vol 2•582

Local Sales Offices & Reps.
Ala Huntsville, F-M Assocs. 205-536-9990
Ariz Scottsdale, J. Smith Assocs. 602-943-4131
Cal Anaheim, Topaz Elec. 714-279-0831
Cal Los Angeles, Topaz Elec. 714-279-0831
Cal Mountain View, Topaz Elctrns. 415-968-3773
Colo Boulder, J. Smith & Assocs. 303-499-7509
Conn W. Hartford, Instr. Assocs. 203-525-9367
Fla Orlando, F-M Assocs. 305-851-5710
Ill Chicago, Sumer Inc. 312-394-4900
Ind Indianapolis, Mktg. Engrs. 317-546-1524
Iowa Cedar Rapids, Palatine Engrg. Sls. 319-365-8071
Kans Andover, Palatine Engrg. Sls. 316-613-7512
Kans Overland Park, Palatine Engrg. Sls. 913-262-5643
Md Bethesda, Bartlett Assocs. 301-656-3061
Mass Bedford, Instr. Assocs. 617-275-0700
Mich Royal Oak, Satullo 313-549-3910
Minn Hopkins, Waytek Co. 612-935-5243
Mo St. Louis, Palatine Engrg. Sls. 314-426-7055
NM Albuquerque, J. Smith & Assocs. 505-255-2111
NY White Plains, Bartlett 914-949-6476
NC Greensboro, F-M Assocs. 919-294-2754
Ohio Cleveland, Satullo Co. 216-831-6904
Ohio Dayton, Satullo Co. 513-434-9541
Ore Portland, Arnett Sls. 503-292-9746
Pa Wayne, Bartlett 215-688-7325
Tex Houston, Palatine Engrg. Sls. 713-748-4076
Tex Richardson, Palatine Engr. Sls. 214-231-9489

TOPFLIGHT CORP., 160 East 9th Ave., York, Pa., 17404, Tel: 717-843-9901, TWX: 510-657-4849; Mktg. Dir: G.A. Conover; V.P. Gen. Mgr: P.F. Masterson

TORIN CORP., Kennedy Dr., Torrington, Conn., 06790, Tel: 203-482-4422, TWX: 710-439-2343; Mktg. Svcs. Adm: E. Myers ..... Vol 3•1052-1055

Local Sales Offices & Reps.
Cal Van Nuys, Torin Corp. 213-892-0741
Conn West Hartford, Torin Corp. 203-568-3790
Ill Arlington Heights, Torin Corp. 312-593-0660
Ill Elgin, Cole Dynamics 312-742-3000
Minn St. Paul, Hultgren & Strutzel Inc. 612-645-9121
NY Binghamton, Torin Corp. 607-797-7389
NY Rochester, Torin Corp. 716-586-8750
Tex Dallas, Torin Corp. 214-942-8822

TORIT CORP., 1133 Rankin St. (P.O. Box 3217), St. Paul, Minn., 55165, Tel: 612-698-0391; V.P. Sls./Mktg: T.G. Ranheim

TOROTEL, INC., 13402 S. 71 Hwy., Grandview, Mo., 64030, Tel: 816-761-6314, TWX: 910-777-7037; Sls. Mgr: H. Foland; Cust. Svc. Mgr: B. Bradshaw Vol 2•453; Vol 3•538-541,1304,1305

Local Sales Offices & Reps.
Ariz Scottsdale, Gassner & Clark 602-945-7979
Cal Los Altos, Parsons Co. 415-941-4745
Cal Los Angeles, El-Com Sls. 213-223-1351
Fla Pompano Beach, Varrelman-Gorman 305-941-5544
Fla Winter Park, Varrelman-Gorman 305-831-8688
Ill Chicago, Gassner & Clark 312-764-6121
Kans Shawnee Mission, Florence & Meyer 913-722-5210
Md Silver Sps., Mechtronics 301-622-2420
Mass Weston, J.J. Goode 617-235-3900
Minn St. Paul, H.A. Cullen 612-646-7371
NY Manhasset, Win-Cor Elctrn. 516-627-9474
NY Syracuse, T2 Elctrns. 315-463-8592
NC Charlotte, A.E. Over 704-366-8601
Ohio Cleveland, H. Teplitz 216-371-2044
Ohio Dayton, H. Teplitz 513-277-6531
Pa Birchrunville, Jadelectronics 215-647-5151
Tex Dallas, Norvell Assocs. 214-FL-7-6451
Tex Houston, Norvell 713-774-2568
Wash Bellevue, Western Tech. Sls. 206-454-3906
For: Can., Toronto, Ont., Wilson Entprs. 416-231-7536

TOROTRON, 255 Washington St., Mt. Vernon, N.Y., 10553, Tel: 914-664-2050; Ch. Eng: O. Zanger; Sls. Eng: M. Frank

Local Sales Offices & Reps.
NY Glen Cove, S. Glassman Assocs. 516-676-1039

TORQUE SYSTEMS, 225 Crescent St., Waltham, Mass., 02154, Tel: 617-891-0230; Mktg. Mgr: A.W. Siff Vol 2•322,668,991

TORR LABS., 2228 Cotner Ave., Los Angeles, Cal., 90064, Tel: 213-477-1224; Sls. Mgr: W. Shellhammer

Local Sales Offices & Reps.
Cal Palo Alto, Engrg. Assocs. 415-326-7842
Colo Greeley, G. Moss Elctrns. 303-353-1452
Ill Chicago, J. Popp Sls. Co. 312-626-3711
Iowa Cedar Rapids, J.R. Sales Engrg. 319-377-8211
NJ Haddonfield, M & S Assocs. 609-429-7055
Ohio Cincinnati, Giesting & Assocs. 513-931-0812
Tex Dallas, Evans-McDowell 214-238-7157
Wash Seattle, R.K. Squibb, Inc. 206-632-2450

TORWICO ELCTRNS., INC., Rte. 70, Lakewood, N.J., 08701, Tel: 201-364-1800, TWX: 201-363-1611; Sls. Mgr: S. Karr ..... Vol 3•1307

Local Sales Offices & Reps.
Cal Tarzana, R. Capell 213-987-2233
Conn Middletown, N.E. Reps., Inc. 203-344-3273
Fla Orlando, Gra-Mar, Inc. 305-894-3351
Ill Deerfield, W. Krueger 312-945-3720
Md Baltimore, W.S. Warrington & Assoc. 301-823-8759
Mass Needham Hgts., N.E. Reps., Inc. 617-449-3093
Mo St. Charles, Buse Sls. 314-946-6430
NJ Haddonfield, TAI Assocs. 609-854-3011
NY Fayetteville, H.C. Johnson 315-NE-7-9383
NY Great Neck, Trionic 516-466-2300
NY Guiderland, H.C. Johnson Agencies 518-456-9681
NY Rochester, H.C.Johnson 716-482-3000
NY Williamsville, H.C. Johnson 716-632-7880
Ohio Kent, Norco Ind'l 216-678-8462
Pa Glenshaw, H.C. Johnson Agencies 412-961-0414
Tex Fort Worth, W. Pat Fralia Co., Inc. 817-738-2394

TRA-CON, INC., 55 North St., Medford, Mass., 02155, Tel: 617-391-5550; Sls. Mgr: A. Swartz

Local Sales Offices & Reps.
Cal Mountain View, K. Anderson Co. 415-961-6007
NY Irvington, H. Shprentz Co. 914-591-7970

TRACOR, INC., 6500 Tracor La., Austin, Tex., 78721, Tel: 512-926-2800, TWX: 910-874-1372; Sls. Mgr: K.O. Mahler; Sls. Mgr: E.L. Friedrich; Sls. Mgr: H.L. Thomas

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Analytical Sales
Cal Danville, Western Scien. Assocs.
Ga Atlanta, Tracor, Inc.
Ga Chamblee, Southern Analytical Co.
Haw Kailua, W. L. Yauger
Ill Chicago, J & E Assocs.
Ind Indianapolis, Tech Sls. & Mktg.
La Baton Rouge, Tek Lab
Md Rockville, Analytical Assistance Dev.
NJ Union, Tracor Analytical Instrs.
Tex Austin, Targa Analytical Sys. Devices
Tex Austin, Tracor
Industrial Sales
Ala Huntsville, BCS Assocs.
Ariz Scottsdale, BFA Corp.
Cal N. Hollywood, M. Shovlowsky
Colo Denver, BFA Corp.
Colo Denver, Didier Denver
Fla Orlando, BCS Assocs.
Fla Plantation, BCS Assocs.
Ill Chicago, Midwest Microwave
Md Rockville, T. E. Corp.
Mass Waltham, Technical Entprs.
Mich Milford, H. M. Dyer Elctrns.
NM Albuquerque, BFA Corp.
NM Las Cruces, BFA Corp.
NY Garden City, PM Elctrns.
NC Greensboro, BCS Assocs.
Tex Euless, Data-Aids
Tex Houston, Data-Aids
Wash Seattle, Showalter-Judd
Medical Sales
Cal Oakland, J. Taylor & Assocs.
Cal Santa Fe Springs, AudioMed
Cal Whittier, Electro Medical Instrtn.
Colo Arvada, Tracoustics
Fla Orlando, Lee Assocs.
Ga Atlanta, Tracor, Inc.
Ill Chicago, Audiological Svc. & Supply
Md Frederick, D. B. Creighton Assocs.
Md Rockville, Tracor
Mass Lawrence, Medical Engrg. Assocs.
Minn New Brighton, Tracoustics
Miss Jackson, Sound & Communications
Mo St. Louis, EMI Labs.
NJ Cherry Hill, N. J. Auditory Test. & Equip.
NY New York, Madsen Electromedics
NY Staten Island, Medacoustics
Ohio Cleveland, Environmental Technology
Okla Oklahoma City, Oklahoma Audiometer Svc. Co.
Ore Portland, Sanderson Safety Supply
SC Greenville, Safeco Equip.
Tenn Chattanooga, Audio & Video Elctrn.
Tenn Kingsport, Safeco Equip.
Tex Austin, Audio-Medical Sys.
Tex Austin, Tracoustics
Tex Houston, Audio Elctrns.
Wash Seattle, Safety & Supply
For: Can., Oakville, Ont., Madsen Elctrns. Ltd.

TRAK MICROWAVE, 4726 Eisenhower Blvd., Tampa, Fla., 33614, Tel: 813-884-1411; Reg. Sls. Mgr. T.G. Toth

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Cal Los Angeles, RF Assocs. 213-478-1586
Cal Palo Alto, RF Assocs. 415-327-5531
Ill Highland Park, Feller Assocs. 312-433-3651
Ind Rochester, Feller Assocs. 219-223-2377
Mass Wayland, Wayland Engrg. Sls. 617-653-5256
NM Albuquerque, Premmco 505-265-9629
NY Hicksville, Salsbury Assocs. 516-938-1080
NY Skaneateles 513-252-9981
Pa Lafayette Hill, M. Lader 215-825-3177
Tex Dallas, Cain & Co. 214-369-2897
Va Woodbridge, M. Lader Co. 703-494-4731

TRANS-MET ENGRG., 601 S. Palm St., La Habra, Cal., 90631, Tel: 213-691-2266; V. P. Mktg: D.R. Hornbaker; Gen. Mgr: D. Rall

TRANS-SONICS, INC., P.O. Box 326, Lexington, Mass., 02173, Tel: 617-272-1000, TWX: 710-332-1635; Dir. of Mktg: J.P. Phillips

TRAN-TEC CORP., Box 1022, Columbus, Neb., 68601, Tel: 402-564-2748; V.P: S. Zwick

TRANS-TECH, 12 Meem Ave., Gaithersburg, Md., 20760, Tel: 301-948-3800, TWX: 710-828-0549; Sls. Mgr: E.T. Fleming

TRANSCO PRODS., INC., 4241 Glencoe Ave., Venice, Cal., 90291, Tel: 213-821-7911, TWX: 910-343-6469; Sls. Mgr: W. Schoenberger

Local Sales Offices & Reps.
Ariz Phoenix, PLS Assocs., Inc. 602-957-9110
Cal Los Altos, Jay Stone & Assocs. 415-948-4563
Colo Denver, PLS Assocs., Inc. 303-771-0140
Fla Clearwater, Southeastern Component Sls., Inc.
Ga Doraville, Transco Prods., Inc. 404-436-7544
Ill Park Ridge, RF Specialists 312-698-2044
Kans Wichita, Eugene Carbiener Assocs. 316-682-5782
Md Conowingo, Transco Prods., Inc. 301-378-3344
Md Ellicott City, VPI, Inc. 301-465-4060
Mass Brookline, L-K/Harman Assocs. 617-232-6687
Mass Easthampton, L-K/Harman Assocs. 413-527-4620
Mass Haverhill, L-K/Harman Assoc. 617-373-1313
NM Albuquerque, PLS Assocs., Inc. 505-255-2330
NY Great Neck, R.L. Diamond Inc. 516-482-8387
NY Utica, B. D. Hummel Co. 315-736-7821
NC Charlotte, Jake Rudisill Assocs. 704-377-6901
Ohio Middletown, Transco Prods., Inc. 513-423-0332
Pa Montgomeryville, VPI, Inc. 215-474-3200
Tex Ft. Worth, Carey, Wolf & Assocs. 817-738-1996
Tex Houston, Carey, Wolf & Assocs. 713-MI-3-2114
Utah Salt Lake City, PLS Assocs., Inc. 801-272-3681
Exp: Los Angeles, Tel Aviation Inc.

TRANSCON MFG. CO., 2655 Perth St. Box 20825, Dallas, Tex., 75220, Tel: 214-357-8301; Sls. Mgr: J. Clifford; Pres: D.C. Packard .....Vol 3•1412

Local Sales Offices & Reps.
Cal Inglewood, V & L 213-671-7688
Ill Chicago, Ropek-Cahill 312-287-7292
Md Phoenix, Cunningham & Assocs. 301-823-4220
Mass Lynn, Manford Sls. Co. 617-598-9119
NY Forest Hills, The Miller Co. 212-263-4446
Ohio Cleveland, Loesch Assocs. 216-241-4581
Ore Portland, J. BeLusko 503-222-4279

TRANSDUCER CONTROLS CORP., 737 N. Dodsworth, Covina, Calif., 91722, Tel: 213-331-0917; Mktg. Mgr: A.A. Isford

TRANSDUCERS, INC., 12140 E. Rivera Rd., Whittier, Ca., 90606, Tel: 213-693-2711, TWX: 910-586-1899; Vice Pres.-Mktg: H. Nielsen

Local Sales Offices & Reps.
Ariz Scottsdale, Inter-Mountain Engrg. Co. 602-947-7379
Cal San Diego, L.L. Stoakes, Inc. 714-274-6281
Cal Santa Clara, Richards Associates 408-246-5860
Cal Whittier, Transducers, Inc. 213-945-3741
Colo Littleton, Eissler Sls. & Service 303-794-1779
Ga Atlanta, Technical Prods., Inc. 404-252-6745
Ill Chicago, SEA, Inc. 312-282-6694
Ind Carmel, SEA, Inc. 317-846-2593
Kans Merriam, Tech Representatives, Inc. 913-432-4110
La Harvey, SECO 504-347-4646
Md Kensington, Kinney Techn. Prod., Inc. 301-942-2226
Mich Farmington, Carter McCormic & Peirce, Inc. 313-477-7700
Minn Minneapolis, SEA, Inc. 612-425-4455
Mo Hazelwood, Tech Representatives 314-524-6900
NM Albuquerque, Inter-Mountain Engrg. Co. 505-344-2212
NY Binghamton, Labtronics, Inc. 607-775-2875
NY Depew, Labtronics, Inc. 716-685-4111
NY Syracuse, Labtronics, Inc. 315-454-9314
NY Ulster Park, Labtronics, Inc. 518-372-6649
Ohio Chagrin Falls, Transducers, Inc. 216-247-5257
Ohio Cleveland, Carter, McCormic & Peirce, Inc. 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, Inc. 513-278-5873
Ohio Worthington, Carter, McCormic & Peirce, Inc. 614-888-4466
Ore Portland, Brett Associates, Inc. 503-232-4184
Pa Abington, Bach-Stewart Assocs. 215-885-1550
Pa Pittsburgh, Carter, McCormic & Peirce, Inc. 412-824-3760
RI Rumford, R. J. Hoder 401-438-2726
Tex Dallas, R. Martin Associates 214-358-3704
Tex Dallas, Techn. Prods., Inc. 214-357-9603
Tex Houston, R. Martin Assoc. 713-462-4077
Wash Seattle, Brett Associates, Inc. 206-935-8054
Wisc Waukesha, SEA, Inc. 414-547-6637
For: Can., Calgary, Alberta, Intertechnology, Ltd. 403-265-8552
For: Can., Don Mills, Ontario, Intertechnology, Ltd. 416-447-0738

TRANSICOIL, INC., Worcester, Pa., 19490, Tel: 215-277-1300, TWX: 510-660-0132; V.P. Mktg: E.F. Hall

TRANSITRON ELCTRN. CORP., 168 Albion St., Wakefield, Mass., 01880, Tel: 617-245-4500, TWX: 710-643-6718; Mktg. Mgr: A. Berry; Nat'l. Sls. Mgr: E. Youck; Mgr. Mktg. Svcs: A. DeMeo

Local Sales Offices & Reps.
Ariz Phoenix, Transitron Elctrn. Corp. 602-278-3596
Cal Long Beach, Transitron Elctrn. Corp. 213-595-5472
Cal Mountainview, Transitron Elctrn. Corp. 415-968-1710
Colo Denver, R. G. Entprs. 303-744-2464
Fla Orlando, Transitron Elctrn. Corp. 305-241-4526
Ill Chicago, Transitron Elctrn. Corp. 312-693-3360
Ill Oak Brook, Schuten Assocs. 312-654-8645
Kans Prairie Village, Engrg. Svcs. 913-649-4000
Md Baltimore, Callas Elctrns. 301-744-7711
Mich Novi, Miltimore Sls. 313-349-5820
Minn St. Louis Park, Transitron Elctrn. Corp. 612-546-4331
Mo St. Louis, Engrg. Svcs. 314-726-2233
NJ Nutley, Necco 201-661-5059
NJ South Orange, Transitron Elctrn. Corp. 201-763-4780
NY Rochester, Ontario Tech. Sls. 716-464-8636
NC Raleigh, A. B. Andrews 919-833-5567
Ohio Dayton, Transitron Elctrn. Corp. 513-276-4141
Pa Ambler, G.C.M. Inc. 215-646-7535
Tex Richardson, Transitron Elctrn. Corp. 214-234-2406
Wash Bellevue, ElecSel Corp. 503-649-6177

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Ala Huntsville, Hall-Mark Elctrns., Box 1133 205-539-0691
Ariz Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave. 602-269-1391
Cal Chatsworth, Westates Elctrns. Corp., 20151 Bahama St. 213-341-4411
Cal Culver City, Hamilton Electro Sales 213-870-7171
Cal Gardena, Bell Inds., 306 E. Aldndra Blvd 213-321-5802
Cal Goleta, Radio Prods. Sls., 350 S. Kellogg Ave 805-964-6823
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal Menlo Park, Bell Inds., Elctrn Distr. Div., 1070 Obrien Dr 415-323-9431
Cal San Carlos, Intermark, 100 Industrial Way 415-592-1641
Cal San Diego, Intermark, 7354 Convoy Ct. 714-279-5200
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal Santa Ana, Intermark, 2920 W. Warner St. 714-540-1322
Cal Sepulveda, Milgray/California, 8718 Woodley Ave 213-894-4011
Cal Van Nuys, Intermarket, 71110 Gerald Ave
Cal Woodland Hills, Semiconductor Concepts, 21201 Oxnard St. 213-884-4560
Colo Denver, Intermark, 2600 W. Second St. 303-936-8284
Fla Orlando, Milgray/Florida, 5400 Diplomat Circle 305-647-5747
Ill Elk Grove Vi, Hall-Mark Elctrns. Corp., 180 Crossen Ave 312-437-8800
Ill Rosemont, Advent Elctrns, 7110 N. Lyndon Ave. 312-298-4210
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Kans Wichita, Radio Supply Co., 115 Laura 316-267-5216
Md Hyattsville, Milgray/Washington, 5405 Lafayette Pl. 301-864-1111
Mass Burlington, Hamilton/Avnet Elctrns. 617-273-2120
Mass Burlington, Milgray/New England, 79 Terrace Hall Ave 617-272-6800
Mass Lexington, Harvey R & D Electrnc., 44 Hartwell Ave. 617-861-9200
Minn Minneapolis, Hall-Mark Elctrns., 4555 W. 77th St. 612-925-2944
Minn Minneapolis, Harry Stark Electrns. Supply, 112 3rd Ave., N. 612-332-1325
NJ Cherry Hill, Milgray/Delaware Valley, 1165 Marlkress Rd. 609-424-1300
NY Binghamton, Federal Elec., Inc., Box 1208 607-748-8211
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Freeport, Milgray/Int'l, 191 Hanse Ave 516-546-6000
NY Freeport, Milgray/New York, 191 Hanse Ave 516-546-6000
NY Hauppauge, Semiconductor Concepts Inc., Div JACO Elctrns., Engineers Rd. 516-273-1234
NY Hauppauge, Time Elctrncs., 70 Marcus Blvd. 516-273-0100
NY New Hyde Park, Lafayette Ind'l. Elctrns., Inc., 1327 Second Ave. 516-488-6600
NY Syracuse, Hamilton/Avnet Elctrns. 315-437-2642
NY Westbury, Hamilton-Avnet Electrns., 70 State St.
NC Winston-Salem, Kirkman Elctrns., Inc., 901 W. Second St. 919-724-0541
Ohio Cleveland, Milgray/Cleveland, 1821 E. 40th ST. 216-881-8800
Pa Philadelphia, Milgray/Delaware Valley 215-228-2000
Tex Dallas, Hamilton/Avnet Elctrns., 2403 Farrington
Tex Dallas, Solid State Elctrns. 214-352-2601
Wash Seattle, Hamilton/Avnet Elctrncs., 2320 6th Ave. 206-624-5930
Wash Seattle, Intermark, 621 S. Michigan Ave. 206-767-3160

TRANSMAGNETICS INC., 210 Adams Blvd., Farmingdale, N. Y., 11735, Tel: 516-293-3100, TWX: 510-224-6420; Pres: F. Haber; Chief Eng: A. Talbot; Prod. Mgr: I. Lawner .....Vol 1•379

Local Sales Offices & Reps.
Conn Bloomfield, Zaslow Sls. 203-242-7781
Minn Minneapolis, Thurston Assoc. 612-929-7801
Ohio Dayton, Berberich & Assoc. 513-252-9981

TRANSTECTOR SYSTEMS, 532 Monterey Pass Rd., Monterey Park, Cal., 91754, Tel: 213-283-9278; Sls. Mgr: R. Odenberg; Engr: B. Jameson .....Vol 2•1148

Local Sales Offices & Reps.
Ariz Scottsdale, J.A. Swanson Assocs. 602-947-4379
Cal Burlingame, Leddy Assocs. 415-347-5247
Cal Carmichael, Leddy Assocs. 916-944-1694
Cal Encino, Porter Co. 213-788-2350
Colo Littleton, Leddy Assocs. 303-795-1973
Ill Elk Grove Village, D. Eglof Elctrns. 312-439-8877
Md Lutherville-Timonium, Naudain Assocs. 301-252-5378
Mass Boston, Electrical Apparatus Co. 617-782-7440
NJ Mt. Laurel, Naudain Assocs. 609-235-1801
NJ Ridgewood, Ballou, Inc. 201-444-6990
NY Binghamton, Canavan Scanlon 607-724-7220
NY Buffalo, Canavan Scanlon 716-839-3373
NY Rochester, Canavan Scanlon 716-442-0720
NY Syracuse, Canavan Scanlon 315-463-9161
Ohio Fairborn, Technical Assocs. 513-878-2484
Ore Portland, Leddy Assocs. 503-643-3502
Tex Dallas, Glidden Electro Equip. 214-363-6539
Tex Houston, Glidden Electro Equip. 713-681-1415
Utah Keane, Leddy Assocs. 801-299-4382

TRANSYSTEMS ELCTRN. CO., 2200 Central Rd., Fort Lee, N.J., 07024, Tel: 201-WI-7-7648; Sls. Mgr: N. Fine

TRG PRODS., Control Data Corp. - Boston Microwave Prods. Div., 400 Border St., E. Boston, Mass., 02128, Tel: 617-569-2110, TWX: 710-329-6639; Prod. Mgr: T.B. Chudzik

TRI-EX TOWER CORP., 7182 Rasmussen Ave., Visalia, Calif., 93277, Tel: 209-732-8383; G/M: E. Borges; VP/Sls: C. Blyleven; VP/Dev: H. Holscher

TRI-TRONICS CO., 619 Enterprise Dr., Oak Brook, Ill., 60521, Tel: 312-654-3255; Engr: R. Anderson; Engr: D. Hacquebord

Local Sales Offices & Reps.
Colo Lakewood, Hess Elctrn. Control Co. 303-238-1850
Conn W. Hartford, A. Hatton Assocs. 203-233-3613
Ill Aurora, D. Smith & Assocs. 312-896-0828
Mo St. Louis, W. W. Munroe Equip. 314-968-2500
Ohio Dayton, Rockford Controls Ohio, Inc. 513-278-7362
Pa Chalfont, Mid-Lantic Assocs. (H. C. Buerger) 215-249-3301
SC Greenville, R. W. Bailey 803-233-5171

TRI-TRONICS LAB., Box 638, Euless, Tex., 76039, Tel: 817-267-1366; Pres: Al Wolfle; Sls. Mgr: J. Mattox; Sales: M. Tillman

Local Sales Offices & Reps.
Kans Kansas City, Thunderbird Sls. 913-642-7220
Kans Wichita, Thunderbird Sls. 316-684-3941
Mo St. Louis, Thunderbird Sls. 314-567-6488
Tex Austin, Corporation I 512-453-7244

TRIAC ELCTRN. SYS., Box 550, Forest Hills, N. Y., 11375, Tel: 212-687-0620; Pres: M. Walpow; Sls. Mgr: J. Rostow .....Vol 2•369-377

Local Sales Offices & Reps.
NJ Newark, Triac Elctrn. Sys.,Inc. 201-623-4258

TRIAD-UTRAD DIV., Litton Inds., Inc., 305 N. Briant St., Huntington, Ind., 46750, Tel: 219-356-6500, TWX: 810-333-1532; Sls. Mgr: P.N. Cook

TRIAD-UTRAD Local Distributors
Ala Birmingham, J.W. Clary Co., 1713 Second Ave. S. 205-322-2488
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Goleta, Radio Prods. Sls., 350 S. Kellogg Ave 805-964-6823
Cal Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way 213-685-5511
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave. 415-961-1500

Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Colo Denver, Burstein-Applebee 303-244-3336
Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
Conn Hamden, Arrow Elctrncs., 295 Treadwell St. 203-248-3801
Ill Chicago, Burstein-Applebee 312-763-4848
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Kans Kansas City, Burstein-Applebee 816-561-5460
Md Baltimore, Arrow Elctrns., 5207 E. Drive 301-247-5200
Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Mass Cambridge, Wilshire Elctrns./New England, 205 Alewife Brook Pkwy. 617-491-3300
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Clifton, Eastern Radio, 312 Clifton Ave. 201-471-6600
NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
NY Binghamton, Wilshire Elctrns., 617 Main St., Westover Plaza 607-797-1236
NY Elmsford, Melville Radio, 1 Nepperham Ave. 914-592-7100
NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY White Plains, Westchester Elctrns., 602 Mamaroneck Ave. 914-949-2400
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Arrow Elctrns., 23945 Merchantile Rd. 216-464-2000
Ohio Cleveland, Farr Elctrns, 5403 Prospect Ave. 216-881-7403
Ohio Dayton, Arrow Elctrns., 3100 Plainfield Rd. 513-253-9176
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801

TRIDAIR INDS., Fastener Div., 3000 W. Lomita Blvd., Torrance, Calif., 90505, Tel: 213-530-2200, TWX: 910-347-6239; Supv. Tech. Sales: J.H. Sherman

TRIMM, INC., 400 W. Lake, Box 489, Libertyville, Ill., 60048, Tel: 312-EM-2-3700; Sls. Mgr: P. Bottorff
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TRIO LABS, INC., 80 Dupont St., Plainview, N.Y., 11803, Tel: 516-681-0400, TWX: 510-221-1861; Sls. Mgr: J. Crawford

Local Sales Offices & Reps.
Ariz Scottsdale, Compar-Arizona 602-947-4336
Cal Palo Alto, B. Oppenheim, Inc. 415-321-7323
Fla Maitland, Greenstein Assocs. 305-831-5380
Md Upper Marlboro, RL Engrg. 301-760-5533
Mass Burlington, Research Instrs., Inc. 617-272-1800
Mich Southfield, Luebbe Sls. Co. 313-357-0335
Minn Saint Paul, Cahill Assocs. 612-739-8445
Mo Maryland Heights, Delltron, Inc. 313-434-3804
NJ Englewood Cliffs, Power Conversion & Control 201-569-0015
NY Albany, J.A. Reagan Co. 518-489-4777
NY Rochester, J.A. Reagan Co. 716-473-2115
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Ohio Cleveland, Luebbe Sls. Co. 216-333-0425
Ohio Dayton, Luebbe Sls. Co. 513-294-0426
Pa Delmont, Luebbe Sls. Co. 412-468-4019
Tex Dallas, Norvell Assocs., Inc. 214-350-6771
Tex Houston, Norvell Assocs. Inc. 713-774-2568

TRIO-TECH, INC. OF CALIF., 2435 N. Naomi St., Burbank, Calif., 91504, Tel: 213-846-9200, TWX: 910-498-2709; Sls. Mgr: J. Guy

Local Sales Offices & Reps.
Cal Mountain View, Tech-Ser, Inc. 415-969-9020
Cal San Diego, Tech-Ser, Inc. 714-222-1121
Fla Dunedin, W. J. Irvine Co. 813-733-5382
Ill Des Plaines, Maher Engrg. Co. 312-824-2124
Mass Wilmington, Technical Instr. 617-944-3930
NY Elmont, Crane & Egert Corp. 516-488-2100
NY Niagara Falls, Watmet, Inc. 716-285-3595
Tex Dallas, Stu Hamilton Assocs. 214-350-4344

TRIPLETT CORP., 280 Harmon Rd., Bluffton, Ohio, 45817, Tel: 419-358-5015, TWX: 810-490-2400; Sls. Mgr: J. Weldy
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Local Sales Offices & Reps.
Ariz Phoenix, Shefler-Kahn Co. 602-258-7893
Cal Inglewood, J. Berman Co., Inc. 213-678-1281
Cal Millbrae, Polach & Bensinger, Inc. 415-697-2525
Colo Denver, Shefler-Kahn 303-232-0873
Conn Wallingford, Adams-McGregor, Inc. 203-269-5816
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-2474
Fla Pompano Beach, Hutto-Hawkins-Peregoy, Inc. 305-943-9593
Ga Atlanta, Millar Elctrns. 404-261-6160
Haw Honolulu, Pegart Int'l Hawaii 808-538-7818
Ill Oak Pk., G. Petitt Co. 312-369-8940
Ind Ft. Wayne, W. Bieberich, Inc. 219-432-2537
Ind New Albany, W. W. Bieberich, Inc. 812-945-3187
Kans Overland Pk., T. Dowell, Inc. 913-649-6069
Md Reisterstown, Massey Assocs. 301-833-2039
Mich Grosse Pt., Woods Elko Sls. Corp. 313-884-1955
Minn Mpls., Heimann Co. 612-861-6051
Mo Shrewsbury, T. L. Dowell, Inc. 314-647-7067
NJ East Orange, Masin Esco, Inc. 201-647-6505
NM Albuquerque, Shefler-Kahn 505-265-7077
NY DeWitt, F. Taylor 315-446-0422
NY Syosset, Masin Esco, Inc. 516-364-0310
NC Raleigh, Millar Elctrns. 919-787-9564
Ohio Dayton, C. H. Dolfuss, Jr. & Co. 513-275-4831
Ohio Rocky River, C. Dolfuss, Jr. 216-333-7504
Ore Portland, J. J. Backer Co. 503-297-3776
Pa Havertown, Snyder & Massey Assocs. 215-789-2320
Pa Pittsburgh, G.S. Root 412-561-4125
RI Lincoln, Adams-McGregor 401-726-1300
Tex Dallas, Lund & Co. 214-358-4335
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For: Can., Downsview, Ont., L. Finkler, Ltd. 416-630-9103
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For: Can., Winnipeg, Manitoba, Smith-Patterson 204-774-1855

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Ala Birmingham, J.W. Clary Co., 1713 Second Ave. S. 205-322-2488
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Garden Grove, Allied Elctrns., 12311 Industry St. 213-598-6605
Cal Goleta, Radio Prods. Sls., 350 S. Kellogg Ave 805-964-6823
Cal Los Angeles, Metermaster-Main Off., 5646 Jillson St. 213-685-4340
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave. 415-961-1500
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Colo Denver, Burstein-Applebee 303-244-3336
Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Burstein-Applebee 312-763-4848
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Kans Kansas City, Burstein-Applebee 816-561-5460
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
La Baton Rouge, Ralph's, Inc., 1732 Plank Rd. 504-344-3761
La Lafayette, Ralph's Inc., 3004 Cameron St. 318-234-4507
La New Orleans, Ralph's, Inc., 4334 Stemway Dr. 504-242-2731
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
NY Brooklyn, LACO Ind'l. Elctrns. Corp., 4924 4th Ave. 212-492-9590
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
NY Rochester, Simcona Elctrncs. Corp., 275 Mt. Read Blvd. 716-328-3230
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ohio Cleveland, Farr Elctrns, 5403 Prospect Ave. 216-881-7403
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tex Beaumont, Ralph's, Inc., 1270 Broadway 713-833-9443
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

For Local Source Data Call Toll-Free 800-645-9200 (in N.Y. State Call 516-294-0990 Collect)

TRIRIDGE CORP., Elec. Comps. & Sys., Box 12420, Pittsburgh Airport, Pittsburgh, Pa., 15231, Tel: 412-899-2288, TWX: 710-789-3020

TROMPETER ELCTRNS., 8936 Comanche Ave., Chatsworth, Cal., 91311, Tel: 213-882-1020, TWX: 910-494-1210; Sls. Ad: W.J. Cushing Vol 2•1142-1147; Vol 3•946-951

Local Sales Offices & Reps.

Ala	Huntsville, Currie Aerospace	205-536-5650
Cal	Los Angeles, Trompeter Elctrns.	213-882-1020
Cal	Menlo Pk., Long & Assocs.	415-327-1300
Colo	Littleton, Aztec Entprs.	303-795-0250
Conn	Milford, Tesco	203-874-6643
Fla	Orlando, Currie Aerospace	305-855-0843
Ill	Elmhurst, Scott Assoc.	312-279-5681
Md	Silver Spring, Sel Tronics	301-589-3391
Mass	Needham Hgts., Tesco	617-444-7925
Mo	Kansas City, Harris-Hanson	816-444-9494
Mo	St. Louis, Harris-Hanson	314-962-0111
NJ	Saddlebrook, L & M Assoc.	201-843-8700
NM	Albuquerque, Aztec Entprs.	505-255-2440
NY	Brentwood, L & M Assocs.	516-231-8363
NY	New York, L & M Assocs.	212-675-7486
NC	Greensboro, Currie Aerospace	919-273-3040
Ohio	Berea, Geotronix Mktg. Assocs.	216-243-8520
Ohio	Columbus, Geotronix Mktg. Assocs.	614-457-8472
Pa	Andalusia, L & M	215-639-3100
Tex	Austin, A. Barnes Co.	512-454-4371
Tex	Dallas, A. Barnes	214-235-4541
Tex	Houston, A. Barnes Co.	713-523-7333
Tex	Richardson, A. Barnes	214-235-4541
Wash	Bellevue, Topp Engr. Sls. Co.	206-947-5410
For:	Can., Calgary, Alb., Westronic Engrg. Sls., Ltd.	403-259-2333
For:	Can., Ottawa 7, Ont., L. Albert Assocs.	613-746-0021
For:	Can., Vancouver 9, B.C., Westronic Engrg. Sls., Ltd.	604-732-5033

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Local Sales Offices & Reps.

Cal	Pasadena, Luscombe Engrg. Co.	213-684-2000
Cal	San Mateo, Luscombe Engrg. Co.	415-342-7057
Ill	Park Ridge, Electrical Materials & Equip.	312-696-1540
Mass	Waltham, J. W. Simpson Co.	617-891-9284
Mich	Clawson, George Instrument Co.	313-435-3400
NJ	South Orange, The Smith Co.	201-763-1770
NY	Rochester, KLM Assocs.	716-442-0820
NY	Syracuse, KLM Assocs.	315-458-6214
Ohio	Chagrin Falls, The J. Kilroy Corp.	216-247-8997
Pa	Jenkintown, Stein Instrumentation Corp.	215-885-2370

TRUTONE ELCTRNS., INC., 7315 Fulton Ave., No. Hollywood, Cal., 91605, Tel: 213-875-0423; Sls. Mgr: M.N. Leventhal

TRW CAPACITORS, 301 W. "O" St., Ogallala, Neb., 69153, Tel: 308-284-3611, TWX: 910-620-0321; Sls. Mgr: Al Tompkins ..... Vol 3•502-509

Local Sales Offices & Reps.

Ala	Huntsville, TRW Elctrns.	205-772-9656
Ariz	Scottsdale, Q.T. Wiles & Assocs.	602-947-5791
Cal	Del Mar, Q.T. Wiles & Assocs.	714-755-8668
Cal	Los Angeles, Q.T. Wiles & Assocs.	213-649-1232
Cal	Menlo Park, Straube Assocs.	415-323-2476
Cal	Woodland Hills, TRW Elctrns.	213-883-9033
Colo	Boulder, Straube Assocs.	303-443-8600
Conn	Rowayton, TRW Elctrns.	203-853-4466
Fla	Orlando, TRW Elctrns.	305-841-2982
Ill	Elk Grove, John G. Twist Co.	312-593-0200
Ind	Ft. Wayne, R. O. Whitesell & Assoc.	219-432-5591
Ind	Indianapolis, R. O. Whitesell & Assoc.	317-359-9283
Ind	Kokomo, R. O. Whitesell & Assoc.	317-453-6868
Iowa	Cedar Rapids, John G. Twist Co.	319-393-8703
Kans	Prairie Village, John G. Twist Co.	913-236-4646
Ky	Louisville, R. O. Whitesell & Assoc.	502-893-7303
Md	Ellicott City, TRW Elctrns.	301-465-1777
Mass	Waltham, TRW Elctrns.	617-899-6100
Mich	Grand Rapids, R. O. Whitesell & Assoc.	616-451-8901
Mich	Southfield, R. O. Whitesell & Assoc.	313-358-2020
Mich	St. Joseph, R. O. Whitesell & Assoc.	616-983-7337
Minn	Minneapolis, TRW Elctrns.	612-835-5454
Mo	St. Louis, John G. Twist Co.	314-432-2830
NM	Albuquerque, Straube Assocs.	505-294-1880
NY	Manlius, TRW Elctrns.	315-637-3255
NY	Rochester, TRW Elctrns.	716-461-3070
Ohio	Cincinnati, R. O. Whitesell & Assoc.	513-521-2290
Ohio	Dayton, R. O. Whitesell & Assoc.	513-298-9546
Ohio	Lakewood, R. O. Whitesell & Assoc.	216-228-7525
Okla	Oklahoma City, TRW Elctrns.	405-524-2040
Ore	Beaverton, N.R. Schultz Co.	503-646-1345
Pa	Narberth, TRW Elctrns.	215-667-3400
Pa	Pittsburgh, R. O. Whitesell & Assoc.	412-242-0100
Tenn	Bristol, R. O. Whitesell & Assoc.	615-968-4195
Tex	Dallas, TRW Elctrns.	214-637-6650
Tex	Houston, TRW Elctrns.	713-771-7812
Utah	Salt Lake City, Straube Assocs.	801-328-4513
Va	Roanoke, TRW Elctrns.	703-345-4965
Wash	Bellevue, N. R. Schultz Co.	206-454-0300
Wisc	Waukesha, John G. Twist Co.	414-786-6330
For:	Can., Dorval, Quebec, Lake Engrg. Co. Ltd.	514-631-8501
For:	Can., Scarborough, Ontario, Lake Engrg. Co. Ltd.	416-751-5980
For:	Richmond, B.C., Lake Engrg. Co. Ltd.	604-277-0414

TRW Local Distributors

Ala	Huntsville, Cramer/Ew Huntsville, 2310 Bob Wallace Ave.SW	205-539-5722
Ariz	Phoenix, Cramer/Ariz., 2816 N. 16th St.	602-263-1112
Ariz	Phoenix, Liberty Electrns., 3612 N. 16th St.	602-264-4438
Cal	Chatsworth, Westates Elctrns. Corp., 20151 Bahama St.	213-341-4411
Cal	Gardena, Bell Industries, 306 E. Alondra Blvd.	213-321-5802
Cal	Glendale, R. V. Weatherford, 6921 San Fernando Rd.	213-849-3451
Cal	Irvine, Cramer/L. A., 17201 Daimler St.	714-979-3000
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	San Diego, Cramer/San Diego, 8975 Complex Drive	714-565-1881
Cal	Sunnyvale, Cramer/San Fran., 720 Palomar Ave.	408-739-3011
Colo	Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave.	303-287-9611
Colo	Denver, Cramer/Denver, 5465 E. Evans Place at Hudson	303-758-2100
Conn	North Haven, Cramer/Conn., 35 Dodge Ave.	203-239-5641
Fla	Hollywood, Cramer/Ew Hollywood, 4035 North 29th Avenue	305-923-8181
Fla	Orlando, Cramer/Ew Orlando, 345 North Graham Avenue, Box 20214	305-894-1511
Ga	Atlanta, Cramer/Atlanta, 3923 Oakcliff Industrial Court	404-448-9050
Ill	Elk Grove Vi, Hall-Mark Elctrns. Corp., 180 Crossen Ave	312-437-8800
Kans	Lenexa, Hall-Mark Elctrn., 9006 Rosehill Rd.	913-888-4747
Md	Baltimore, Cramer/Baltimore, 922-24 Patapsco Avenue	301-354-0100
Md	Gaithersburg, Cramer/Ew Washington, 16021 Industrial Drive	301-948-0110
Mass	Boston, De Mambro Elctrns, 1095 Commonwealth Ave.	617-787-1200
Mass	Newton, Cramer Elctrn. Inc., 85 Wells Avenue	617-969-7700
Minn	Minneapolis, Hall-Mark Elctrns., 4555 W. 77th St.	612-925-2944
Mo	St. Louis, Hall-Mark Elctrn. Corp., 6100 Madison Ave.	314-521-3800
NJ	Clifton, Eastern Radio, 312 Clifton Ave.	201-471-6600
NJ	Moonachie, Cramer/N.J., 1 Barrett Ave.	201-935-5600
NJ	Pennsauken, Cramer/Pa., 7300 Rte. 130 No.	215-923-5950
NM	Albuquerque, Cramer/N.M., 137 Vermont N.E.	505-265-5767
NY	East Syracuse, Cramer/Syracuse, 6716 Joy Road	315-437-6671
NY	Hauppauge, L.I., Cramer/Long Island, 29 Oser Avenue	516-231-5682
NY	Lynbrook, Peerless Radio, 19 Wilbur St.	516-593-2121
NY	Rochester, Cramer/Rochester, 3259 Winton Road South	716-275-0300
NY	Rome, Rome Elctrncs., 108-110 Spring St.	315-337-5400
NY	Vestal, Federal Elctrn., Vestal Pkwy.	
NC	Raleigh, Cramer/EW, 3901 Winton Road	919-876-2371
NC	Winston-Salem, Cramer/EW, 938 Burke Street	919-725-8711
Ohio	Columbus, Electronics Mktg Corp., 1150 W. Third Ave.	614-299-4161
Okla	Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave.	918-835-8458
Pa	Trevose, Hall-Mark Elctrns., Box 125	215-355-7300
Tex	Dallas, Hall-Mark Elctrns, 9100 Markville Dr.	214-AD-1-6111
Tex	Houston, Hall-Mark Elctrn., Box 36739	713-781-6100
Utah	Salt Lake City, Cramer/Utah, 391 West 2500 South	801-487-3681
Va	Charlottesville, Virginia Radio Supply Co., Box 1189	703-296-4184
Wash	Seattle, Liberty Elctrns., 5303 2nd Ave. S.	206-763-8200
Wisc	Milwaukee, Hall-Mark Elctrns., 11925 Ripley Ave.	414-476-1270
For:	Can., Ont., Scarborough, Lake Engrg. Co. Ltd., 123 Manville Rd.	416-751-5980

TRW ELCTRNC. FUNCTIONS, Davis & Copewood Sts., Candem, N.J., 08103, Tel: 609-365-5500, TWX: 710-891-7087; Sls. Mgr: J. Lundon

TRW/GLOBE MOTORS, 2275 Stanley Ave., Dayton, Ohio, 45404, Tel: 513-228-3171, TWX: 810-459-1642; Sls. Mgr: J.D. Bourque ..... Vol 2•664-667

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Ala	Huntsville, TRW Elctrns.	205-772-9656
Ariz	Scottsdale, TRW Electronics	602-947-5791
Cal	Danville, Straube Assoc.	415-837-8151
Cal	Del Mar, TRW Electronics	714-755-8668
Cal	Los Angeles, TRW Elctrns.	213-649-1232
Cal	Menlo Park, Straube Assoc.	415-323-2476
Colo	Boulder, Straube Assocs.	303-443-8600
Conn	Rowayton, TRW Elctrns.	203-853-4466
Fla	Orlando, TRW Elctrns.	305-894-6881
Ill	Elk Grove Village, J. G. Twist Co.	312-593-0200
Ind	Fort Wayne, R. O. Whitesell & Assoc.	219-432-5591
Ind	Indianapolis, R. O. Whitesell & Assoc.	317-359-9283
Ind	Kokomo, R. O. Whitesell & Assoc.	317-453-6868
Iowa	Cedar Rapids, J. G. Twist Co.	319-365-1401
Kans	Prairie Village, J. G. Twist Co.	913-236-4646
Ky	Louisville, R. O. Whitesell & Assoc.	502-893-7303
Md	Silver Spring, NKA, Inc.	
Mass	Waltham, TRW Elctrns.	617-899-6100
Mich	Grand Rapids, R. O. Whitesell & Assoc.	616-451-8901
Mich	Southfield, R. O. Whitesell & Assoc.	313-358-2020
Mich	St. Joseph, R. O. Whitesell & Assoc.	616-983-7337
Minn	St. Paul, Northport Engrg.	612-698-3841
Mo	St. Louis, John G. Twist Co.	314-432-2830
NJ	Cherry Hills, NKA, Inc.	
NY	Garden City, Comtronic Assocs.	516-741-8966
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Ohio	Cleveland, R. O. Whitesell & Assoc.	216-333-2585
Ohio	Dayton, R. O. Whitesell & Assoc.	513-298-9546
Ore	Beaverton, N. R. Schultz Co.	503-646-1345
Pa	Narberth, TRW Elctrns.	215-667-3400
Pa	Pittsburgh, R. O. Whitesell & Assoc.	412-242-0100
Tenn	Bristol, R. O. Whitesell & Assoc.	615-968-4195
Tex	Houston, Vista Engrg. Assoc.	713-869-0109
Tex	Richardson, Vista Engrg. Assoc.	214-235-4547
Utah	Morgan, Straube Assocs.	801-829-6448
Va	Roanoke, TRW Elctrns.	703-774-5411
Wash	Bellevue, N. R. Schultz Co.	206-454-5224
Wisc	Waukesha, J. G. Twist Co.	414-786-6330
For:	Can., Port Credit, Ont., Leonard Elec. Ltd.	416-274-3454

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Ariz	Phoenix, Liberty Electrns., 3612 N. 16th St.	602-264-4438
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Cal Woodland Hill, Rampart Components, 21201 Oxnard St. 213-887-7260
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Fla Orlando, Hall-Mark Elctrn., 7233 Lake Ellenor Dr. 305-855-4020
Ill Elk Grove Vi, Hall-Mark Elctrns. Corp., 180 Crossen Ave 312-437-8800
Kans Lenexa, Hall-Mark Elctrn., 9006 Rosehill Rd. 913-888-4747
Md Baltimore, Hall-Mark Elctrns., 6660 Security Blvd. 301-265-8500
Minn Minneapolis, Hall-Mark Elctrns., 4555 W. 77th St. 612-925-2944
Mo St. Louis, Hall-Mark Elctrn. Corp., 6100 Madison Ave. 314-521-3800
NY Farmingdale, Hall-Mark Elctrns., 167 Marine St. 516-293-7500
NY Hauppauge, Rampart Components, Engineers Rd. 516-273-1111
NC Raleigh, Hall-Mark Elctrns., 3000 Indust. Dr. 919-832-4465
Okla Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave. 918-835-8458
Pa Trevose, Hall-Mark Elctrns., Box 125 215-355-7300
Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
Tex Houston, Hall-Mark Elctrn., Box 36739 713-781-6100
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200
Wisc Milwaukee, Hall-Mark Elctrns., 11925 Ripley Ave. 414-476-1270

TRW/HOLYOKE WIRE & CABLE, 720 Main St., Holyoke, Mass., 01040, Tel: 413-533-3961, TWX: 710-351-1337; Sls. Mgr: E.L. Bryon .....Vol 3•1414

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Colo Boulder 303-443-8600
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Mass Reading 617-944-3020
Mich Detroit 313-873-1150
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Mo St. Louis 314-727-7370
NJ Clifton 201-545-0990
NY Melville L.I. 516-293-9000
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Ohio Dayton 513-298-9862
Pa Glenside 215-887-7520
Tex Dallas 214-637-6650
Wash Seattle 206-633-3160

TRW INSTRS., 139 Illinois St., El Segundo, Cal., 90245, Tel: 213-535-0854, TWX: 910-348-6676; Sls. Mgr: R.L. Wallstrom

TRW/IRC FIXED RESISTORS, Box 393, Boone, N.C., 28607, Tel: 704-264-8861, TWX: 510-936-3241; Sls. Mgr: J. Mac Williams .....Vol 3•1180,1182-1185

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Ky Louisville, R.O. Whitesell Assoc. 502-893-7303
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Cal Glendale, R. V. Weatherford, 6921 San Fernando Rd. 213-849-3451
Cal Irvine, Cramer/L. A., 17201 Daimler St. 714-979-3000
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TRW/IRC FIXED RESISTORS, 401 N. Broad St., Philadelphia, Pa., 19108, Tel: 215-922-8900, TWX: 710-670-2286; Sls. Mgr: R.A. Glover
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Dayton, TRW Elctrn. Comps. 214-637-6650
Okla Oklahoma City, TRW Elctr. Comps. 405-524-2040
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Pa Pittsburg, R.O. Whitesell Assoc. 412-242-0100
Tex Dallas, TRW Elctr. Comps. 214-637-6650
Tex Houston, 713-771-7812
Utah Morgan, Straube Assocs. 801-829-6448
Va Roanoke, TRW 703-345-4965
Wisc Waukesha, J. G. Twist Co. 414-786-6330

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Ala Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr. 205-539-2731
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Cal Palo Alto, R. V. Weatherford, 3240 Hillview Ave. 415-493-5373
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Fla Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave 305-885-8761
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Md Savage, Pyttronic Ind., 8200 Wellmoor Ct.
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Mo St. Louis, Hall-Mark Elctrn. Corp., 6100 Madison Ave. 314-521-3800
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NY Hauppauge, Rampart Components, Engineers Rd. 516-273-1111

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Cal Los Angeles, Q. T. Wiles & Assocs. 213-649-1232
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Colo Boulder, Straube Assocs., Inc. 303-443-8600
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Okla Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave. 918-835-8458
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Mich St. Joseph, R. O. Whitesell & Assoc. 616-983-7337
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Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
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Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
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Fla Orlando, Hall-Mark Elctrn., 7233 Lake Ellenor Dr. 305-855-4020
Ill Elk Grove Vi, Hall-Mark Elctrns. Corp., 180 Crossen Ave 312-437-8800
Kans Lenexa, Hall-Mark Elctrn., 9006 Rosehill Rd. 913-888-4747
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
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Md Baltimore, Hall-Mark Elctrns., 6660 Security Blvd. 301-265-8500
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Mass Burlington, Arrow Elctrns., 15 A Street 617-273-0100
Minn Minneapolis, Hall-Mark Elctrns., 4555 W. 77th St. 612-925-2944
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Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
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NJ Moorestown, Arrow Elctrns., Pleasant Valley Rd. 609-235-1900
NJ Saddlebrook, Arrow Elctrns. Inc., 285 Midland Ave. 201-797-5800
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NY Farmingdale, Arrow Elctrns., Inc., 900 Broad Hollow Rd., Rte. 110 516-694-6800
NY Farmingdale, Hall-Mark Elctrns., 167 Marine St. 516-293-7500
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NY Rochester, Rochester Radio, 140 Main St. 716-454-6300
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Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Okla Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave. 918-835-8458
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400
Pa Trevose, Hall-Mark Elctrns., Box 125 215-355-7300
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Ill Elk Grove Village, Tucker Elctrns. Co. 312-437-8190
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Kans Andover, Palatine Sls., Inc. 316-683-7512
Kans Overland Park, Palatine Sls., Inc. 913-262-5643
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Mass Andover, Tucker Elctrn. Co. 617-475-7358
Mich Detroit, WKM Assocs., Inc. 313-892-2500
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Tex Addison, Parvin Sls. Co. OEM only 214-239-9148
Tex Dallas, E. L. Wilks Co. Distr. only 214-242-5321
Tex Houston, Parvin Sls. Co. OEM only 713-721-1054
Wash Seattle, M. K. Widdekind Co. Distr. & OEM 206-284-8020
Wisc Brookfield, Steffen Sls. Distr. only 414-781-7596

TURNER Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021

TYCO FILTERS DIV. INC., 3940 W. Montecito St., Phoenix, Ariz., 85019, Tel: 602-272-7945; Sls. Mgr: H. Schinaman .....Vol 2•454

Local Sales Offices & Reps.
Ariz Phoenix, Lange Assocs. 602-942-0724
Cal Mt. View, Nor-Cal Assocs. 415-961-8121
Cal Placentia, K'SON Corp. 714-524-1700
Colo Denver, Omega Ltd. 303-758-1508
Fla Orlando, G.F. Bohman Assocs. 305-855-0274
Ill Franklin Park, Dekotech, Inc. 312-455-5100
Ind Fort Wayne, TYCO 219-432-5591
Ind Indianapolis, R.O. Whitesell & Assocs.
Ind Kokomo, TYCO 317-453-6868
Ky Louisville, TYCO 502-893-7303
Md Millerville, Tomco Sls. Co. 301-987-1650
Mass Needham, A & M Elctrn. Reps. 617-444-8172
Mich Southfield, TYCO 313-358-2020
Mich St. Joseph, TYCO 616-983-7337
Minn Minneapolis, Stan Clothier Co. 612-869-3231
Mo Kansas City, Admack Sls. Co.
NJ Cherry Hill, J. N. Barrett Assocs. 609-429-1551
NY Dewitt, Tri-Tech Elctrns. 315-446-2881
Ohio Cincinnati, TYCO 513-521-2290
Ohio Cleveland, TYCO 216-333-2585
Ohio Columbus, TYCO
Ohio Dayton, TYCO 513-298-9546
Pa Pittsburgh, TYCO 412-242-0100
Tenn Bristol, TYCO 615-968-4195
Tex Richardson, Air Quip Sls. Company 214-239-8991
For: Can., Ste. Dorothee - Laval, Que., Harnett Entprs.

TYLAN CORP., 4203 Spencer St., Torrance, Calif., 90503, Tel: 213-370-3521, TWX: 910-344-6420; Sls. Mgr: D.B. LeMay; Sls: S.F. Ely; Sls: R. Howe

Local Sales Offices & Reps.
Cal Santa Clara, Tylan Corp. 408-248-8718
NJ Morris Plains, Tylan Corp. 201-540-8333

UBER GRAFIC INSTRS., Box 4, Palo Alto, Calif., 94302, Tel: 415-327-4732; Pres: D. Kroener

UID ELCTRNS. CORP., 4105 Pembroke Rd., Hollywood, Fla., 33021, Tel: 305-981-1211, TWX: 510-954-9810; V.P. Mktg: R.J. Stanish .....Vol 2•1149

Local Sales Offices & Reps.
Ala Huntsville, Powertronics 205-852-6347
Ariz Scottsdale, Barnhill Five 602-947-7841
Ark El Dorado, D. Bellew Sls., Inc. 501-863-8325
Cal Garden Grove, Impact Elctrns. 213-431-3581
Cal Menlo Park, G.R. McKnight Co. 415-325-2844
Colo Denver, Barnhill Five 303-934-5505
Conn Manchester, G-M Assoc. 203-646-4443
Fla Altamonte Spg., W.M.M. Assocs. 305-831-4645
Fla Clearwater, W.M.M. Assocs. 813-726-8871
Fla Miami Lakes, Man Rep. Corp. 305-822-7630
Fla Pompano Beach, W.M.M. Assocs. 305-943-3091
Ill Elk Grove Village, J. G. Twist 312-593-0200
Ind Ft. Wayne, R. O. Whitesell 219-432-5591
Ind Indpls., R. O. Whitesell 317-359-9283
Ind Kokomo, R. O. Whitesell 317-453-6868
Iowa Cedar Rapids, J. G. Twist Co. 319-365-1401
Kans Prairie Village, J. G. Twist Co. 913-236-4646
Ky Louisville, R. O. Whitesell 502-893-7303
Md Baltimore, J.R. Daniel & Co. 301-825-3330
Mass Framingham, G-M Assocs. 617-872-0333
Mich Grand Rapids, R.O. Whitesell & Assoc. 616-451-8901
Mich Southfield, R.O. Whitesell & Assoc. 313-358-2020
Mich St. Joseph, R. O. Whitesell & Assoc. 616-983-7337
Minn Mpls., R. J., Inc. 612-922-1425
Mo St. Louis, J. G. Twist Co. 314-432-2830
NM Albuquerque, Barnhill Five 505-299-7658
NY Jamaica, S. J. Sls. 212-291-3232
NY New York, Multiparts Corp. 212-944-4370
NY Rochester, L. Hart 716-244-3253
NC Greensboro, J.R. Daniel & Co. 919-294-1067
NC Thomasville, Powertronics 919-476-6727
Ohio Dayton, J. C. Hofstetter 513-298-0662

Ohio Medina, J. C. Hofstetter 216-241-4880
Pa Pittsburgh, J.C. Hoffstetter Co. 412-561-5454
Pa Willow Grove, J.R. Daniel & Co. 215-674-3850
SC Greenville, Powertronics, Inc. 803-244-1336
Tenn Bristol, R. O. Whitesell 615-968-4195
Tex Dallas, E. B. Robertson 214-942-2711
Tex Houston, E. B. Robertson 713-785-6800
Wash Seattle, R. Johnston 206-524-5170
Wisc Waukesha, J. G. Twist 414-786-6330
For: Montreal 261, Que., Can., Atlas Elctrns. 514-489-8495
For: Toronto 19, Ontario, Can., Atlas Elctrns. 416-781-6174

ULTRA-VIOLET PRODS., INC., 5100 Walnut Grove Ave., San Gabriel, Cal., 91778, Tel: 213-285-3123; Dir. Mktg: R.F. Vogelsang; Sls. Mgr. Sci. Div: J.R. Norton

ULTRASONIC CORP., Box 672, Pipestone, Minn., 56164, Tel: 507-825-5441; Sls. Mgr: S. Lodahl; Pres: B. Brual

ULTRASONIC INSTRS. INT'L., INC., 165 EM Marine St., Farmingdale, N.Y., 11735, Tel: 516-293-5577; Sls. Mgr: P. Platzman ..... Vol 1•938

ULTRONIX, INC., 461 N. 22nd St., Grand Junction, Colo., 81501, Tel: 303-242-0810, TWX: 910-929-6965; Sls. Mgr: B. Moore; Mktg. Mngr: J. Stinson

UNDERWRITERS SAFETY DEVICE CO., 4332 N. Kedzie Ave., Chicago, Ill., 60618, Tel: 312-583-4080; Sls. Mgr: H.R. Ege

UNGAR, Div. Eldon Inds., Inc., 233 E. Manville St, Compton, Calif., 90220, Tel: 213-774-5950; Pres: W.L. Nehrenz

Local Sales Offices & Reps.
Cal Burlingame, Elvey-Proctor 415-347-2994
Cal Inglewood, Ungar Sls. 213-678-5371
Colo Denver, K-C Marketers, Inc. 303-733-5561
Ill Chicago, G. McL. Cole 312-774-3535
Ind Indianapolis, F.J. McSweeney 317-255-3777
Iowa Des Moines, K.S.W. Assocs.
Md Silver Spring, M.F. Taylor 301-589-4002
Mass Needham, Mullin Tech. Sls. 617-444-4780
Mich Detroit, R. Milsk 313-342-6660
Minn Minneapolis, Heimann 612-861-6051
Mo Kansas City, K.S.W. Assocs. 816-363-5651
NY Buffalo, R.W. Mitscher 716-854-2517
NY Oceanside, Bittan Assocs. 516-593-3833
Ohio Cleveland, Baehr-Greenleaf 216-221-9030
Pa Pittsburgh, Covert & Newman Co. 412-563-0303
Tex Dallas, Texport 214-358-3435
Wash Seattle, J.J. Backer 206-285-1300

UNGAR Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Garden Grove, Allied Elctrns., 12311 Industry St. 213-598-6605
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.
Colo Denver, Burstein-Applebee 303-244-3336
Conn Fairfield, Utronic Inc., 273 Linwood Ave. 203-255-4521
Ga Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW 404-355-2223
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Burstein-Applebee 312-763-4848
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Iowa Cedar Rapids, Iowa Radio Supply Co. Inc., 719 Center Point Rd. NE 319-364-6154
Kans Kansas City, Burstein-Applebee 816-561-5460
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Mich Muskegon, Western Elctrn Supply, 1781 5th St 616-722-7628
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NJ Springfield, Federated Elctrns. Div. Federated Purchaser, Inc., 155 Rte. 22 201-376-8900
NY Binghamton, Wilshire Elctrns., 617 Main St., Westover Plaza 607-797-1236
NY Buffalo, Radio Equip. Corp., 196 Vulcan St 716-874-2690
NY Farmingdale, Harrison Elctnc., 20 Smith St. 516-293-7990
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Cleveland, Pattison Supply Co., 4550 Willow Pkwy. 216-441-3000
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Ohio Warren, REM Elctrns. Supply Co., 264 W. Market St. 216-399-2777
Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Erie, Mace Elctrn., 2631 W. 8th St. 814-838-3544
Pa Philadelphia, Simco Inc., 3907-11 N. Broad St. 215-BA-9-1880
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Geophysical Supply Co., Box 52230 713-224-0621
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Tex Houston, Lenert Co., Box 2184 713-225-1465
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Va Roanoke, Peoples Radio & Tv Supply Co., 1015 Moorman Rd
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801

UNHOLTZ-DICKIE CORP., 3000 Whitney Ave., Hamden, Conn., 06518, Tel: 203-288-3358; Pres: J.A. Dickie; V. Pres: K. Unholtz L. Shaw ..... Vol 1•530

Local Sales Offices & Reps.
Ala Huntsville, W. Brown 205-539-6884
Cal Redondo Beach, Unholtz-Dickie Corp. 213-378-9418
Conn Hamden, W.W. Jarowey Co. 203-288-3010
Fla Ft. Lauderdale, W. Brown 305-564-8000
Fla Orlando, W. Brown 305-425-5505
Ill Northfield, Torkelson Assocs. 312-446-9085
Ind Indianapolis, Torkelson Assocs. 317-244-7867
Kans Wichita, Aero-Hill Sls. 316-943-6371
Mich Farmington, Anderson Elctrns. 313-476-9161
Minn Minneapolis, Torkelson Assocs. 612-920-1046
NM Albuquerque, Elctrn. Entprs. 505-256-3561
NM Las Cruces, Elctrn. Enterprises 505-524-0126
NY No. Merrick, Space-Tronics 516-TN-8-1800
NC Winston-Salem, W. Brown 919-725-5384
Ohio Cleveland, Dietrich & Assocs. 216-781-1855
Ohio Dayton, Dietrich & Assocs. 513-223-6042
Pa Pittsburgh, Dietrich & Assocs. 412-892-2992
Tex Dallas, Merit Co. 214-352-8040
Va Alexandria, W. Brown 703-836-1800

UNIFORM TUBES, MicroDelay Division, Collegeville, Pa., 19426, Tel: 215-539-0700, TWX: 510-660-6107; Div. Mgr: A.W. McCrea ..... Vol 3•1415

Local Sales Offices & Reps.
Ariz Scottsdale, Gleason Sls. 602-946-3992
Cal Los Altos, Marketek, Inc. 415-941-0882
Cal Newport Bch., Uniform Tubes 714-833-1470
Cal Van Nuys, C.W. Swift & Assoc. 213-989-1133
Colo Denver, Crump Co. 303-534-5183
Conn Meriden, J. Anderson 203-269-1812
Fla Winter Park, Floritronics Inc. 305-886-4818
Ga Atlanta, Knapp-Richardson 204-233-3204
Ill Des Plaines, Coombs Assocs. 312-298-4830
Ill Schiller Pk., Uniform Tubes 312-671-2717
Ind Fort Wayne, Coombs Assocs. 219-747-0402
Mass Newburyport, J. Murphy 617-465-0304
Mass Seekonk, J. Murphy 617-SO-1-7153
Mo St. Louis, Coombs Assocs. 314-567-3399
Mo St. Louis, C.S. Ryan Co. 314-993-0350
NY Fairport, L. Bagley 716-377-2059
NY Mt. Vernon, Friedman-Smith Elctrn. Sls. 914-664-4866
NC Charlotte, J. H. Smith 704-394-4210
Ohio Cleveland, R. Reich 216-331-0541
Okla Tulsa, G.V. Peck Co. 918-585-5853
Pa Bala Cynwyd, Vantage Sls. 215-667-0990
Tex Dallas, G.V. Peck Co. 214-328-3511
Tex Houston, G.V. Peck Co. 713-664-1435
Wash Bellevue, Barrett Sls. 206-885-6991
Exp: Can., Nobleton, Ont., Braydon Electro 416-859-0712
Exp: Can., Toronto, Ont., Braydon Electro 416-787-1941
Exp: N.Y., New York, Ad. Auriema, Inc.

UNIMAX SWITCH CORP., Riker-Maxson Sub., Ives Rd., Wallingford, Conn., 06492, Tel: 203-269-8701, TWX: 710-476-1397; V.P. Mktg: A.J. Schweitzer Vol 2•1150

Local Sales Offices & Reps.
Ala Huntsville, Rep., Inc. 205-881-9270
Ariz Scottsdale, DeAngelo, Rothman & Cheever, Inc. 602-947-8626
Cal LA, M.A. Stolaroff 213-295-7781
Cal Los Altos, Ewing-Foley 415-941-4525
Colo Boulder, Straube Assocs. 303-443-8600
Conn Bloomfield, Zaslow Sls. 203-242-7781
Fla Oviedo, Conley & Assoc. 305-365-3283
Ga Atlanta, Rep., Inc. 404-876-1592
Ill Chicago, Wasson-Gallagher 312-261-7517
Ill Oak Pk., Wasson-Gallagher 312-383-6572
Ind Marion, O.H. Bromberg 317-664-5384
Ky Louisville, O. H. Bromberg 502-245-8916
Md Silver Spring, L.G. White 301-585-3141
Mass Lowell, Zaslow Sls. 617-458-8452
Mass Northboro, Zaslow Sls. 617-393-8150
Mich Grosse Pointe Park, Skip Greiner 313-499-0188
Minn Mpls., Jos-Co. Sls. Engrg. 612-835-5858
Mo St. Louis, Hill & Co. 314-621-1818
NJ Clifton, Grimm, Siegel Assoc. 201-546-5010
NM Albuquerque, Straube Assoc. 505-294-1880
NY Binghamton, Canavan-Scanlon Assoc. 607-724-7220
NY Buffalo, Canavan-Scanlon Assoc. 716-839-3373
NY Rochester, Canavan-Scanlon Assoc. 716-442-0720
NY Syracuse, Canavan-Scanlon Assoc. 315-488-0181
NC Winston-Salem, L.G. White 919-725-3612
Ohio Cincinnati, O.H. Bromberg 513-381-5728
Ohio Medina, J. Hofstetter 216-241-4880
Pa King of Prussia, White-Keystone 215-265-1817
Tenn Little Rock, Electra-Tech 501-562-4090
Tex Dallas, Glidden Electro & Equip. 214-363-6539
Tex Houston, Glidden Electro & Equip. 713-681-1415
Utah Salt Lake City, Straube Assoc. 801-272-2197
Wash Mercer Island, J. H. Andersen 206-232-0484
For: Can., Burlington, Ont., Motion Control Dev. 416-637-9369

UNIMAX Local Distributors
Ariz Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave. 602-269-1391
Cal Mt. View, Hamilton/Avnet Corp., 340 Middlefield Rd. 415-961-7000
Colo Denver, Hamilton/Avnet Electronics 303-534-1212
Ga Atlanta, Hamilton/Avnet Elctrncs., 6700 1-85 Access Rd. 404-448-0800
Mich Livonia, Hamilton/Avnet Elctrns. 313-522-4700
Minn Minneapolis, Hamilton/Avnet Elctrns. 612-854-8400
Mo Hazelwood, Hamilton/Avnet Electronics 314-731-1144
Tex Dallas, Hamilton/Avnet Elctrns., 2403 Farrington
Tex Houston, Hamilton/Avnet Elctrns., 1216 W. Clay
Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-262-8451
For: Can., Montreal, Hamilton/Avnet Elctrns. 514-735-6393
For: Can., Ottawa, Ont., Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl.
For: Can., Toronto, Ont., Hamilton/Avnet Elctrns. 416-789-1838

UNION CARBIDE, Carbon Prods. Div., 270 Park Ave., New York, N.Y., 10017

UNION CARBIDE, CHEMICALS & PLASTICS, 270 Park Ave., New York, N.Y., 10017, Tel: 212-551-4641

UNION CARBIDE, Consumer Prods., 270 Park Ave., New York, N.Y., 10017, Tel: 212-551-2345; Mgr: R.J. Price ..... Vol 1•919

Local Sales Offices & Reps.
Cal El Monte 213-579-0401
Cal San Francisco 415-765-1400
Ga Atlanta 404-633-6161
Ill Chicago, East Central Div. 312-822-7000
Ill Chicago, West Central Div. 312-822-7445

Kans Shawnee Mission 913-362-2203
Mass Needham Hts 617-444-5400
Minn Mpls 612-333-0415
NJ Cherry Hill 609-235-6200
NJ Westwood 201-664-7400
Ohio Cleveland 216-621-4207
Ore Portland 503-223-7175
Tenn Memphis 901-526-7421
Tex Dallas 214-631-0012

UNION CARBIDE, Films Packaging Div., 6733 W. 65th St., Chicago, Ill., 60638, Tel: 312-735-1234

UNION CARBIDE, Linde Div., 270 Park Ave., New York, N. Y., 10017, Tel: 212-551-2345

UNION CARBIDE, Mat'ls. Sys. Div. Comps. Dept., Box 5928, S.E. Greenville, S.C., 29606, Tel: 803-963-7421, TWX: 810-287-2536; Mgr. Mktg. Svcs: R.J. Irion Vol 3•511

Local Sales Offices & Reps.
Ariz Phoenix, Union Carbide 602-264-7332
Cal Marina Del Rey, Union Carbide 213-821-8824
Cal Mt. View, Union Carbide 415-969-9390
Cal San Diego, Celtec Co. 714-279-7961
Colo Denver, Parker-Webster Co. 910-935-0881
Fla Orlando, G. F. Bohman Assocs. 305-855-0274
Ill Chicago, Union Carbide 312-298-8340
Ind Indianapolis, L. M. DeVoe Co. 317-257-1227
Iowa Cedar Rapids, Seltec Sls. 319-362-8155
Kans Andover, Palatine Engrg. Sls. 316-683-7512
Kans Overland Park, Palatine Engrg. Sls. 913-262-5643
Mass Needham Heights, Union Carbide 617-444-5400
Mich Detroit, R. C. Merchant Co. 313-535-6000
Mich St. Joseph, R. C. Merchant Co. 616-983-7378
Minn Minneapolis, S Clothier Co. 612-869-3231
Mo St. Louis, Palatine Engrg. Sls. 314-426-7055
NY Liverpool, Union Carbide 315-451-0720
NY Tarrytown, Union Carbide 914-345-2047
Ohio Cincinnati, Baehr, Greenleaf & Assocs. 513-891-3826
Ohio Columbus, Baehr, Greenleaf & Assocs. 614-486-4046
Ohio Lakewood, Baehr, Greenleaf & Assocs. 216-221-9030
Ore Beaverton, Arneson Assocs. 503-646-3416
Pa King of Prussia, Union Carbide 215-265-0525
SC Greenville, Union Carbide 803-963-7421
Tex Addison, Parvin Sls. Co. 214-239-9148
Tex Houston, Parvin Sls. Co. 713-721-1054
Wash Seattle, Arneson Assocs. 206-762-7664
For: Can., Malton, Ont., Deskin Sls. Corp. 416-677-5517
For: Can., Montreal, Que., Deskin Sls. Corp. 514-384-1420

UNION Local Distributors
Ariz Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave. 602-269-1391
Cal Culver City, Hamilton Electro Sales 213-870-7171
Cal Gardena, Bell Industries, 306 E. Alondra Blvd. 213-321-5802
Cal Hollywood, Hamilton/Avnet Elctrncs. 305-925-5401
Cal Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way 213-685-5511
Cal Menlo Park, Bell Inds., Elctrn Distr. Div., 1070 Obrien Dr 415-323-9431
Cal Mt. View, Hamilton/Avnet Corp., 340 Middlefield Rd. 415-961-7000
Cal San Diego, Hamilton/Avnet Corp., 5569 Kearny Villa Rd. 714-279-1550, 279-2421
Cal Woodland Hills, JACO Elctrncs. 213-887-6400
Colo Denver, Hamilton/Avnet Electronics 303-534-1212
Fla Hollywood, Schweber Elctrns. 305-927-0511
Ga Atlanta, Hamilton/Avnet Elctrncs., 6700 1-85 Access Rd. 404-448-0800
Ga Atlanta, Schweber Elctrns. 404-449-9170
Ill Chicago, Schweber Elctrns. 312-593-2740
Ill Chicago, Semiconductor Specialists, Inc. 312-279-1000
Ill Rosemont, Kierulff - Chicago, 9340 William St. 312-678-8560
Ill Schiller Park, Hamilton-Avnet Elctrs., 3900 N. 25th Ave.
Ind Indianapolis, Graham Elctrncs., 133 S. Penn. St. 317-634-8480
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Iowa Cedar Rapids, Schweber Elctrns. 319-366-0774
Kans Prairie Village, Hamilton/Avnet Elctrncs., 3500 W. 75th St. 913-362-3250
Md Baltimore, Technico Inc., 1404 Bare Hills Ave. 301-828-6416
Md Hanover, Hamilton/Avnet Elctrns. 301-796-5000
Md Rockville, Schweber Elctrns. 301-881-2970
Mass Burlington, Hamilton/Avnet Elctrns. 617-273-2120
Mass Lexington, Harvey R & D Electrnc., 44 Hartwell Ave. 617-861-9200
Mass Waltham, Schweber Elctrns. 617-890-8484
Mich Detroit, Schweber Elctrns. 313-583-9242
Mich Livonia, Hamilton/Avnet Elctrns. 313-522-4700
Mich Romulus, Pioneer/Michigan, 6337 N. Beverly Plaza 313-729-8500
Minn Minneapolis, Hamilton/Avnet Elctrns. 612-854-8400
Minn Minneapolis, Semiconductor Specialists, 8030 Cedar Ave. S. 612-854-8841
Miss St. Paul, Gopher Elctrn. Co., 2520 W. Larpenteur Ave. 612-645-0889
Mo Hazelwood, Hamilton/Avnet Electronics 314-731-1144
Mo Kansas City, Hamilton/Avnet Elctrncs. 913-362-3250
Mo No. Kansas City, LCOMP-Kan City, 1520 Taney St. 910-221-2400
Mo St. Louis, Hall-Mark Elctrn. Corp., 6100 Madison Ave. 314-521-3800
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-239-0800
NJ Cherry Hill, Hamilton/Avnet Elctrns. 609-662-9337
NJ Clifton, Eastern Radio, 312 Clifton Ave. 201-471-6600
NJ Somerset, Schweber Elctrns. 201-469-6008
NM Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E. 505-247-1055
NY Buffalo, Summit Dist. Inc., 916 Main St. 716-884-3450
NY Hauppauge, Semiconductor Concepts Inc., Div JACO Elctrns., Engineers Rd. 516-273-1234
NY Rochester, Schweber Elctrns. 716-328-4180
NY Syracuse, Hamilton/Avnet Elctrns. 315-437-2642
NY Westbury, Hamilton-Avnet Electrns., 70 State St.
NY Westbury, Schweber Elctrns., Jericho Tpke 516-334-7474
NC Raleigh, Schweber Elctrns. 919-832-8881
NC Winston-Salem, Kirkman Elctrns., Inc., 901 W. Second St. 919-724-0541
Ohio Beachwood, Schweber Elctrns. 216-464-2970
Ohio Cleveland, Pioneer Standard Elctrns., Inc., 4800 E. 131st St. 216587-3600
Ohio Dayton, Pioneer/Dayton, 1900 Troy St. 513-236-9900
Okla Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave. 918-835-8458
Pa Trevose, Hall-Mark Elctrns., Box 125 215-355-7300
Tex Dallas, Hall-Mark Elcton Corp., 9333 Forest La. 214-231-5101
Tex Dallas, Hamilton/Avnet Elctrns., 2403 Farrington
Tex Dallas, Solid State Elctrns. 214-352-2601
Tex Houston, Hall-Mark Elctrn., Box 36739 713-781-6100
Tex Houston, Hamilton/Avnet Elctrns., 1216 W. Clay
Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-262-8451
Wash Seattle, Hamilton/Avnet Elctrncs., 2320 6th Ave. 206-624-5930
For: Can., Montreal, Hamilton/Avnet Elctrns. 514-735-6393
For: Can., Ont., Toronto, Schweber Elctrns., 60 Pleasant Blvd. 416-925-2471
For: Can., Ottawa, Ont., Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl.
For: Can., Toronto, Ont., Hamilton/Avnet Elctrns. 416-789-1838
For: Can., Vancouver, Cam Card Supply 604-291-1441
For: Can., Winnipeg, Cam Card Supply 204-942-0900

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

UNION CARBIDE, Mat'ls. Sys. Div., Crystal Prods., 8888 Balboa Ave., San Diego, Cal., 92123, Tel: 714-279-4500

UNION CARBIDE, Mat's. Sys. Div., Coatings Serv., 1500 Polco St., Indpls., Ind., 46224, Tel: 317-241-2311; Sls. Mgr: R. E. Barnhart

UNIROYAL, INC., 1230 Ave. of Americas, New York, N.Y., 10020, Tel: 212-489-4000, TWX: 212-640-4171; Prod. Specialist: T. Jens

Local Sales Offices & Reps.
Alas Anchorage 907-277-1469
Cal Santa Ana 714-545-5551
Cal South San Francisco 415-873-5880
Cal Vernon 213-583-2331
Colo Denver 303-388-2481
Fla Miami 305-635-5622
Ga Atlanta 404-366-4650
Haw Honolulu 808-847-4444
Ill Chicago 312-254-5700
Md Baltimore 301-485-8904
Mass Dedham 617-329-2060
Mass Springfield 413-781-8620
Minn St. Louis Park 612-546-2528
Mo Lenexa 913-888-1207
Mo St. Louis 314-429-6908
NJ Jersey City 201-432-4222
NY Buffalo 716-674-7700
NC Charlotte 704-334-0893
Ohio Cincinnati 513-242-5807
Ohio Port Clinton 419-732-2151
Ore Milwaukie 503-659-3870
Pa McKees Rocks 412-771-3500
Pa Philadelphia 215-742-7010
Tenn Memphis 901-527-2413
Tex Dallas 214-631-2310
Tex Houston 713-644-9161
Utah South Salt Lake City 801-484-8841
Va Richmond 703-271-6091
Wash Seattle 206-767-7066

UNITED DETECTOR TECHNOLOGY INC., 1732 21st St., Santa Monica, Cal., 90404, Tel: 213-829-3357; Mktg. V.P: P. Davis; Mgr. App. Eng: C. Hageman; Appl. Eng: J. Misch

Local Sales Offices & Reps.
Mich Detroit, Dietrich & Assocs., Inc. 313-961-4540
NJ Englewood, Scien. Devices-E. 201-871-3916
Ohio Cleveland, Dietrich & Assocs. 216-781-1855
Ohio Dayton, Dietrich & Assocs. 513-223-6042
Pa Pittsburgh, Dietrich & Assocs. 412-892-2992
Va Falls Church, Beacon North 703-534-1673

UNITED ELEC. CONTROLS CO., 85A School St., Watertown, Mass., 02172, Tel: 617-WA-6-1000, TWX: 617-092-2445; Sls. Mgr: A.W. Reis, Jr.

Local Sales Offices & Reps.
Cal Anaheim, United Electric Controls Co. 714-635-3730
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NJ Edison, United Electric Controls Co. 201-738-1900
Ohio Cleveland, United Electric Controls Co. 216-261-8141

UNITED MINERAL & CHEM. CORP., 129 Hudson St., New York, N.Y., 10013, Tel: 212-966-4330, TWX: 710-581-5799; Sls. Mgr. Metals: I. Stelzer; Sls. Mgr. Comps: M. Meeker

UNITED PRODS. CO., Div. Designatronics, 55 S. Denton Ave., New Hyde Pk., N.Y., 11040, Tel: 516-328-3300; Sls. Mgr: J. Keith

Local Sales Offices & Reps.
Cal Milbrae, Melvin Sls. 415-697-6922
Cal Tarzana, R. Capell 213-987-2233
Fla No. Miami, Barrett Assocs. 305-681-4957
Fla Orlando, Barrett Assocs. 305-277-2859
Ill Chicago, Croyden Elctrns. 312-237-4343
Kans Mission, Midland Engrg. 913-CO-2-6565
NH No. Conway, D & P Engrg. 603-356-5908
NY Great Neck, ERA 516-HU-2-9320
NY Rochester, L. G. Marchese 716-342-7664
Tex Dallas, Evans & McDowell 214-351-1839
Wash Seattle, R. Johnston 206-524-5170

UNITED SENSOR & CONTROL CO., 85 School St., Watertown, Mass., 02172, Tel: 617-296-1000, TWX: 617-092-2445; Sls. Mgr: A.W. Reis, Jr.

Local Sales Offices & Reps.
Cal Anaheim, United Electric Controls Co. 714-635-3730
Ill Elk Grove Village (Chicago), United Electric Controls Co. 312-437-3133
NJ Edison, United Electric Controls Co. 201-738-1900
Ohio Cleveland, United Electric Controls Co. 216-8141

UNITED SYS. CORP., 918 Woodley Rd., Dayton, Ohio, 45403

UNITRODE CORP., 580 Pleasant St., Watertown, Mass., 02172, Tel: 617-926-0404, TWX: 710-327-1296; Sls. Mgr: W. Schomm ..... Vol 2•621,957-966

Local Sales Offices & Reps.
Ala Huntsville, 20th Century Mktg. Hertz Skycenter 205-772-9237
Ariz Scottsdale, Compar of Arizona 602-947-4336
Cal Burlingame, Compar San Fran. 415-347-5411
Cal Escondito, Andrew Elctrn. Sls.
Cal Sherman Oaks, Unitrode Corp. 213-783-1301
Colo Littleton, Simpson Assocs. 303-798-8439
Conn Hamden, Compar New Eng. 203-288-9276
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Boca Raton, Conley Assocs. 305-395-6108
Fla Oviedo, Conley & Assocs. 305-365-3283
Fla Tampa, Conley & Assocs. 813-933-3183
Ill Chicago, Carlson Elctrn. Sls. 312-774-0277
Md Baltimore, Daniel & Co. 301-825-3330
Mass Lexington, Kitchen & Kutchin 617-862-8230
Mass Newton Highlands, Compar New Eng. 617-969-7140
Mich Grand Rapids, Rep. Elec. Products 616-245-0511
Mich Southfield, Rep. Elec. Products 313-354-9066
Minn Minneapolis, Compar Twin Cities 612-922-7011
Mo St. Louis, Carlson Elctrn. Sls. 314-991-0262

NM Albuquerque, Compar New Mexico 505-265-1020
NY Albany, Compar Albany 518-489-7408
NY Clifton, Compar N.Y. 201-546-3660
NY Endwell, Compar Albany 607-723-8743
NY Fairport, Compar Albany 716-271-2230
NY Liverpool, Compar Albany 315-471-3356
NC Burlington, P.J. Nahser, Inc. 919-226-8053
Ohio Cleveland, Gibson Elec. Mktg. 216-731-8330
Ohio Dayton, Gibson Elec. Mktg. 513-433-4055
Pa Willow Grove, Daniel & Co. 215-674-3850
Tex Houston, Semiconductor Sls. Assoc. 713-461-4197
Tex Richardson, Semiconductor Sls. Assoc. 214-231-6181
Wash Bellevue, Compar Northwest 206-747-6863
For: Can., Downsview, Ont., Kaytronics Limited 416-638-5511
For: Can., Montreal 267, Que., Kaytronics Limited 514-487-3434

UNITRODE Local Distributors
Ariz Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd. 602-273-7331
Cal Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way 213-685-5511
Cal Palo Alto, Kierulff-Palo Alto, 3969 E. Bayshore Rd. 415-968-6292
Cal San Diego, Kierulff-San Diego, 8797 Balboa Ave. 714-278-2112
Colo Denver, Kierulff-Denver, 10890 E. 47th Ave. 303-343-7090
Fla Hollywood, Schweber Elctrns. 305-927-0511
Ga Atlanta, Schweber Elctrns. 404-449-9170
Ill Chicago, Schweber Elctrns. 312-593-2740
Md Rockville, Schweber Elctrns. 301-881-2970
Mass Waltham, Schweber Elctrns. 617-890-8484
Mich Detroit, Schweber Elctrns. 313-583-9242
NJ Somerset, Schweber Elctrns. 201-469-6008
NM Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E. 505-247-1055
NY Rochester, Schweber Elctrns. 716-328-4180
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NY Westbury, Schweber Elctrns., Jericho Tpke 516-334-7474
NC Raleigh, Schweber Elctrns. 919-832-8881
Ohio Beachwood, Schweber Elctrns. 216-464-2970
Tex Dallas, Hamilton/Avnet Elctrns., 2403 Farrington
Tex Garland, Kierulff-Dallas, 2815 National Dr. 214-271-2472
Tex Houston, Hamilton/Avnet Elctrns., 1216 W. Clay
Tex Houston, Lenert Co., Box 2184 713-225-1465
Utah Salt Lake City, Alta-Land Elctrns., Inc., 2280 S. Main St. 801-486-7227
Wash Seattle, Kierulff - Seattle, 5940 6th Ave. S. 206-763-1550
For: Can., Ont., Toronto, Schweber Elctrns., 60 Pleasant Blvd. 416-925-2471

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

UNITRON INC., 1624 N. First St., Box 1331, Garland, Tex., 75040, Tel: 214-276-8591; Fact. Mktg. Mgr: R.L. Beutel ..... Vol 1•920,921

UNITRON INDS. CORP., 61-1 NanKing West Rd., Taipei, Taiwan, Republic of China; V.P: A. Chew

UNITRON INSTR. CO., 66 Needham St., Newton Highlands, Mass., 02161, Tel: 617-969-8600, TWX: 710-335-1684; Sls: J. Coyle; Sls: J. Dill; Sls: A. Hogle

UNIVERSAL AD-YU ELCTRNS., INC., 3125 E. Allerton Ave., Milwaukee, Wi., 53207, Tel: 414-482-4100; Dir. Sls: R.J. Fehrenbach

Local Sales Offices & Reps.
Cal Burbank, R. Olander 213-843-5200
Conn Southport, E.E. Specialists 203-327-3275
Ill Northfield, Laub Engrg. 312-446-4166
Kans Leawood, G. Vasen 913-649-0679
Mass Acton, E. E. Specialists, Inc. 617-259-9200
Mo St. Louis, G. Fixman 314-725-5219
Mo St. Louis, G. Fixman Engrg. 314-725-5219
NM Albuquerque, Elctrn. Entprs. 505-256-3561
NM Las Cruces, Elctrn. Enterprises 505-524-0126
Ohio Dayton, Micro Sls. 513-298-3033
Pa Philadelphia, E C I 215-927-6262
Wash Seattle, Dewar & Assocs. 206-763-2233

UNIVERSAL DRAFTING MACH., 5200 Richmond Rd., Bedford Hgts., Ohio, 44146, Tel: 216-292-7550

UNIVERSAL ELCTRNS. CO., 17811 Sky Park Cir., Unit "A", Irvine, Cal., 92664, Tel: 714-540-5249; Ch. Engr: E. Lacey

Local Sales Offices & Reps.
Ala Huntsville, S. Eastern Assocs. 205-539-9816
Ariz Scottsdale, Elctrn. Entprs. 602-946-9860
Cal Irvine, Universal Elctrns. 714-540-5249
Cal No. Hollywood, Crown Assocs. 213-877-3550
Colo Wheat Ridge, Marketing West 303-421-8226
Fla Orlando, Duay Entprs. 305-277-3296
Minn Anoka, K. Haugen Assoc. 621-421-3395
NH Salem, Bilowich Entprs. 603-898-5408
NJ Warren, Allied Sls. 201-755-7125
NM Albuquerque, Elctrn. Entprs. 505-524-0126
NY Buffalo, J.M. Glass Assocs. 716-856-9272
Pa Phila., W.F. Assocs. 215-224-4120
Tex Dallas, Herschel McCoy Assoc. 214-352-9517
Tex Houston, E.V. Smith Sls. 713-649-5756
For: Can., Montreal, Que., Solid State Engrg.

UNIVERSAL INSTRS., 139 E. Frederick St., Binghamton, N.Y., 13902, Tel: 607-772-1710, TWX: 510-252-1990; Sls. Mgr: G.C. Mayo

Local Sales Offices & Reps.
Cal Santa Ana, Universal Instr. 714-547-0886
Cal Scotts Valley, Universal Instrs. 408-438-2134
Colo Broomfield, Universal Instrs. 303-469-2076
Fla St. Petersburg, Universal Instrs. 813-392-5265
Ill Chicago, Solid State Elctrns., Inc. 312-889-8033
Ill Palantine, Universal Instrs. Corp. 312-358-4831
NH Manchester, Universal Instrs. Corp. 603-669-6500
NY Binghamton, Universal Instrs. Corp. 607-772-1710
NC Raleigh, Universal Instrs. Corp. 919-782-1436
Ohio Granville, Universal Instrs. 614-582-9107
Tex Dallas, Universal Instrs. 214-942-8747
Exp: N.Y., New York, B. Freudenberg, Inc. 212-PL-7-9130
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For: Can., Toronto, Ont., Willer Engrg. & Sls. 416-783-3373

UNIVERSAL MFG. CO., INC., 1168 Grove St., Irvington, N.J., 07111, Tel: 201-374-9800, TWX: 710-995-4647; Sls. Mgr: U. Rachner

UNIVERSAL RELAY CORP., 42 White St., New York, N.Y., 10013, Tel: 212-925-6900, TWX: 710-581-4461; Sls. Mgr: S. Soloway

UNIVERSAL VOLTRONICS CORP., 27 Radio Clr. Dr., Mt. Kisco, N.Y., 10549, Tel: 914-241-1300; Sls. Mgr: B. Ressler ..... Vol 1•922,923

Local Sales Offices & Reps.
Ala Huntsville, Ridge Instr. 205-837-3211
Cal Huntington Beach, H K Eng Co. 213-322-8684
Cal Redwood City, Pruitt-Parks 415-364-1640
Colo Denver, F.Y. Gates Co. 303-722-4674
Fla Orlando, Ridge Instr. 305-293-4711
Ga Atlanta, Ridge Instr. 404-939-1554
Ill N. Chicago, Torkelson Assoc. 312-446-9085
Ind Indpls., Torkelson 317-244-7867
Mass Waltham, Waitt Tech. Sls. 617-891-8195
Minn Mpls., R.J. Sls. 612-922-1425
NM Albuquerque, F.Y. Gates Co. 505-298-1875
NY Roslyn Heights, HDE Assoc. 516-484-4010
Pa King of Prussia, Letronix 215-265-1020
Tenn Oak Ridge, Ridge Instr. 615-483-1311
Tex Houston, L P Spencer Assoc. 713-488-5435
Va Elkridge 301-465-7923
Wash Bellevue, C. Fowler 206-454-8600

UNIVERSITY SOUND, Altec Corp., 1515 S. Manchester, Anaheim, Cal., 92803, Tel: 714-774-2900, TWX: 714-774-0251; Mktg. Dir: B. Rofkarh

UNIVERSITY Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave. 415-961-1500
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Ill Chicago, Burstein-Applebee 312-763-4848
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Kans Kansas City, Burstein-Applebee 816-561-5460
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
La Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094 318-423-6131
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Mo Kansas City, Burstein Applebee 816-561-5460
Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Lincoln, Burstein Applebee 402-434-0678
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
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NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
Ohio Akron, Sun Radio Co., 110 E. Market St. 216-HE-4-2171
Ohio Cleveland, Farr Elctrns, 5403 Prospect Ave. 216-881-7403
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Tex Houston, Lenert Co., Box 2184 713-225-1465
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021

UP-RIGHT SCAFFOLDS, Div. Up-Right, Inc., 1013 Pardee St., Berkeley, Calif., 94710, Tel: 415-843-0770, TWX: 415-891-9272; Sls. Mgr: R.L. Esken

USCC/CENTRALAB, ELCTRNS. DIV., Globe-Union, Inc., 2151 N. Lincoln St., Burbank, Cal., 91504, Tel: 213-843-4222, TWX: 910-498-2222; Sls. Mgr: F. Fry; Sls. Mgr: D. Hosmer; Appli. Engr: J. Bright Vol 2•583; Vol 3•510

Local Sales Offices & Reps.
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Ariz Tempe, Jarko 602-966-3020
Cal Burbank, USCC/Centralab 213-843-4222
Cal Santa Clara, Cal-Tronix 408-296-1366
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Fla Pompano Bch., Dyne-A-Mark 305-942-4041
Ga Atlanta, Rep., Inc. 404-876-1591
Ill Des Plains, Centralab 312-827-4487
Kans Shawnee Mission, Thomas-Modrcin 913-432-2131
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Mass Needham, Hatch 617-444-3310
Mich Southfield, Rep Assocs. 313-354-9066
Minn Mpls., Technical Assocs. 612-929-6721
Mo Hazelwood, Thomas-Modrcin Assoc. 314-838-6446
NJ Irvington, E. R. Alber 201-375-7458
NM Albuquerque, Electro-Rep 505-256-1749
NY Albany, Compar, Inc. 518-489-7408
NY Great Neck, E.R.A. 516-482-9320
Ohio Columbus, McFadden Sls. 614-221-3363
Pa Narberth, J. Bresson Assoc. 215-839-6770
Tex Irving, Aid Elctrns. 214-638-8015
Va Lynchburg, J. Bresson, Assoc. 703-237-0829
Wash Bellevue, H.S. Thorpe Co. 206-454-0667

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Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Colo Commerce City, Elmar Electronics Inc., 6777 E. 50th Ave. 303-287-9611
Wash Seattle, Liberty Elctrns., 5303 2nd Ave. S. 206-763-8200

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USECO DIV., Litton Inds, 13536 Saticoy St, Van Nuys, Cal., 91409, Tel: 213-786-9388, TWX: 910-495-1700; Sls. Mgr: P. Craig

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Ariz Tempe, Litton Precision Prods., Inc. 602-968-2455
Cal N. Hollywood, Los Angeles District Off. 213-985-8985
Cal Palo Alto, Quad-Rep 415-964-3532
Colo Littleton, Simpson Assocs. 303-794-8381
Fla Pompano Beach, Technology Mktg. Assocs. 305-942-0774
Ill Chicago, L-Tec, Inc. 312-286-1500
Mass Waltham, Boston District Off. 617-890-2207
Minn Minneapolis, Litton Precision Prods., Inc. 612-789-8951
Mo Raytown, CenTech, Inc. 816-358-8100
NJ Cherry Hill, Trinkle Sales, Inc. 215-925-7950
NJ Wayne, G. T. Assocs. 201-694-6040
NY E. Syracuse, Fountain, Young & Co.
NC Charlotte, Anthom, Inc. 704-527-1515
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Tex Dallas, BESCO 214-376-1929
Utah Salt Lake City, Simpson Assocs. 801-521-3622
Wash Seattle, Almac Stroum Elctrns. 206-763-2300

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Cal Los Angeles, Kierulff-Los Angeles, 2585 Commerce Way 213-685-5511
Cal Los Angeles, Radio Prods. Sls., 1501 S. Hill St. 213-748-1271
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Cal Mt. View, Powell Elctrns/California, Box 997, 411 Fairchild Dr. 415-964-0820
Cal San Diego, Moltronics, Inc., 7969 Engineer Rd. 714-278-5020

Cal San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd. 714-292-5611
Cal San Diego, Western Radio, 1415 India St. 714-235-6571
Cal Santa Clara, Moltronics, Inc., 337 Mathews St. 408-244-7600
Cal South Gate, Moltronics, Inc., 5610 E. Imperial Hwy. 213-773-6521
Fla Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave 305-885-8761
Fla Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way 305-859-1450
Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
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Okla Tulsa, Oil Capitol Elec., 708 S. Sheridan 918-836-2541
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave 215-365-1900
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Utah Salt Lake City, Standard Supply Co., 225 E. 6th So. 801-355-2971
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Milwaukee, Electronic Expeditors, Inc., 6045 N. Green Bay Ave. 414-228-8100

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Kans Leawood, Vasen Sales 913-649-0679
Md Randallstown, J. M. Chavis Assoc. 301-484-6349
Mass No. Andover, R.C. Ashworth & Assoc. 617-688-4333
Minn St. Paul, Knox Assocs. 612-488-5412
NJ Plainfield, Allied Sls. Corp.
Ohio Cincinnati, Val-Skol Sales
Pa Newtown Square, Hagy Assocs.
Tex Dallas, Stasco
Wash Seattle, F. Haight Co.

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Ill Northfield, Laub Engrg. 312-446-4166
Md Silver Spring, Spectroscopy Sys. 301-949-8261
Mich Detroit, Harvey Tpelitz & Co. 313-537-9058
NJ Leonia, B. Kohl 201-944-6488
NY N. Syracuse, NACO Elctrns. 315-699-2651
Ohio Cleveland, H. Teplitz & Co. 216-371-2044

USM CORP., Fastener Group, 510 River Rd., Shelton, Conn., 06484, Tel: 203-735-9341, TWX: 710-451-3734; Prod. Mgr. Eyelet Div: C.P. Losh; Prod. Mgr. "Pop" Rivet Div: E. Dalterio

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Ill Chicago, Allied Elctrns., 2400 W. Washington Blvd. 312-421-2400
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ky Louisville, Burks, P.I., 842 S. 7th 502-589-3960
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021

UTE MICROWAVE, 3500 Sunset Ave., Asbury Park, N.J., 07712, Tel: 201-922-1009; G.M: L. Nilson

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UTICA Local Distributors
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700

UTHE TECHNOLOGY INT'L., 320 Soquel Way, Sunnyvale, Cal., 94086, Tel: 408-738-3301; Sls. Mgr: S.R. Goldfarb; Sls. Mgr: V.D. Quandt

VACO PRODS. CO., 510 N. Dearborn St., Chicago, Ill., 60610, Tel: 312-467-0123, TWX: 910 221 2231; Sls. Mgr: B. Broude ..... Vol 3•952,953,1242

VACO Local Distributors
Ariz Tucson, Inland Elctrn Supply Co., Inc, Box 4010, 715 E. Broadway
Cal San Diego, Shanks and Wright Inc., 2045 Kettner Blvd. 714-239-0176
Ga Atlanta, Jackson Elctrncs., 1135 Chattahoochee Ave. NW 404-355-2223
Ill Chicago, Elctrn. Distr. Co., Inc., 4900 N. Elston Ave.
Ill Palatine, Ohm/Elctrns, 645 Vermont Ave 312-359-5500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Ind South Bend, Radio Distr Co Inc, 1212 High St 219-287-2911
Mass Woburn, Abbott Elctrn., 902 Main St. 617-935-2040
Minn Duluth, Northwest Radio, 123 E. First St. 218-727-1565
Neb Omaha, J-B Distributing Co., 1616 Cass St 402-341-5525
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
Ohio Solon, REPCO, 6835 Cochran Rd. 216-248-8900
Pa Altoona, Allegheny Elctrns, Inc, 800 Chestnut Ave
Pa Reading, Barbey Elctrn., 333 N. 4th St.
Tex Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St 817-335-6521
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801
Wisc Milwaukee, Marsh Elctrns., 6047 W. Beloit Rd. 414-545-6500

VACTEC, 2423 Northline Ind'l. Blvd., Maryland Hgts., Mo., 63043, Tel: 314-872-8300; Sls. Mgr: M.D. Levy Vol 2•679

Local Sales Offices & Reps.
Cal Encino, King-Way Assocs. 213-788-4124
Cal Santa Barbara, E.B. Schwerin 805-967-7317
Colo Arvada 303-423-5556
Conn Madison, A & M Elctrn. Reps. 203-245-1031
Fla Orlando, Buchanan & Abrams 305-423-8995
Ill Chicago, T.B. Hunter 312-777-2500
Ind Fort Wayne, Scott Elctrns. 219-743-1586
Ind Indianapolis, Scott Elctrns. 317-635-8951
Kans Prairie Village, Engrg. Svcs. Co. 913-649-4000
Md Baltimore, R. L. Wilkinson 301-377-7800
Mass Needham, A & M Elctrn. Reps. 617-444-8170
Mich Detroit, H. Mysing 313-537-5460
Minn Mpls., M. Foster 612-835-2252
Mo St. Louis, Engrg. Svcs. 314-726-2233
NY Syracuse, C.W. Beach 315-446-9587
Ohio Cincinnati, Scott Elctrns. 513-791-2513
Ohio Cleveland, Scott Elctrns. 216-291-2600
Ohio Columbus, Scott Elctrns. 614-236-8619
Ohio Dayton, Scott Elctrns. 513-223-2652
Pa Pittsburgh, Scott Elctrns. 412-781-3112
Pa Willow Grove, Tech. Parts 215-659-6900
Tex Dallas, Allied Comps. 214-348-6660
Tex Houston, Allied Comps. 713-782-5406
Utah Salt Lake City, Arrowhead Sls. Corp. 801-487-3444
Va Lynchburg, Royelec Elctrns. 703-846-7717
Wash Seattle, Blair Hirsh 206-783-3423
Exp: Mass., Plainville, Teknis 617-695-3591
For: Can., Montreal, Que., Ben-Manis Assoc. 514-336-4500

VACTRONIC LAB. EQUIP., INC., 65 Brightside Ave., E. Northport, N.Y., 11731, Tel: 516-AN-1-2660; Sls. Mgr: R. Morris

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VACUUM RESCH. MFG., 3100 Crow Canyon Rd., San Ramon, Cal., 94583, Tel: 415-837-7241; Sls. Mgr: N.A. Carter

VALIDYNE ENGRG. CORP., 19414 Londelius St., Northridge, Cal., 91324, Tel: 213-886-8488; Sls. Mgr: M.J. Kopp

VALPEY CORP., A Valtec Co., 1400 Highland St., Holliston, Mass., 01746, Tel: 617-429-4322; Sls. Mgr: N.E. Benoit

VANGUARD RELAY CORP., 225 Cortland St., Lindenhurst, N.Y., 11757, Tel: 516-884-5000; Sls. Mgr: B.S. Gilman

VARADYNE CAPACITORS, 2110 Broadway, Santa Monica, Cal., 90404, Tel: 213-829-2984, TWX: 910-343-6856; Mktg, Mgr: K. Miller; Sls. Mgr: P. Bowling Vol 3•512-514

Local Sales Offices & Reps.
Ala Huntsville, Tech Rep. Associates 205-881-2786
Ariz Phoenix, Hecht, Henschen & Assoc. Inc. 602-275-4411
Cal Menlo Park, Straube Assoc. 415-323-2476
Cal Northridge, Orion Sls. 213-240-3151
Cal Tustin, Orion Sls. 714-832-9687
Colo Boulder, Straube Rocky Mountain 303-443-8600
Conn North Haven, Kitchen & Kutchen 203-239-0212
Fla Indian Rocks Beach, Tech Rep Assocs. 813-595-2834
Fla Melbourne, Tech Rep Assocs. 305-723-9140
Ill Skokie, Mar-Con 312-675-6450
Ind Fort Wayne, TX Sales 219-485-0805
Md Baltimore, Callas Elctrns. 301-744-7711
Mass Lexington, Kitchen & Kutchen 617-862-8230
NJ Teaneck, R. T. Reid Assocs. 201-692-0200
NM Albuquerque, Straube Assoc. 505-294-1880
NY Buffalo, Bowser & Sapecky 716-839-4170
NY DeWitt, Bowser & Sapecky 315-446-5920
Pa Ambler, G.C.M. Assocs. 215-646-7535
Tex Dallas, Evans & McDowell Assoc. 214-238-7157
Tex Houston, Evans & McDowell Assoc. 713-777-1282
Utah Salt Lake City, Straube Rocky Mountain 801-328-4513
Wash Bellevue, Vantage Corp. 206-455-3460

VARFLEX CORP., 514 W. Court St., Rome, N.Y., 13440, Tel: 315-336-4400; Sls. Mgr: J.H. Finnegan Vol 3•1088

Local Sales Offices & Reps.
Ariz Phoenix, Elec. Specialty 602-275-5736
Cal Los Angeles, Electrical Spec. Co. 213-724-9600
Cal San Diego, Elec. Specialty Co. 714-239-1345
Cal So. San Francisco, Electrical Spec. Co. 415-589-9611
Colo Denver, Elec. Specialty 303-321-0226
Ga Chamblee, Prehler Elec. Insulation 404-451-4266
Ill Chicago, Prehler Elec. Insulation 312-384-6100
Ky Louisville, E & H Elec. Supply 502-587-0991
Mass Nahant, F.H. Hart 617-581-0381
Minn St. Paul, Prehler Elec. Insulation 612-776-1541
Mo University City, E.P. Gund 314-862-1650
NM Albuquerque, Elec. Specialty 505-842-5555
NY Carle Pl., W. R. Murphy 516-333-6122
NY Liverpool, W.T. Elliott 315-652-3690
Ohio Cleveland, Prehler Elec. Insulation 216-267-2650
Ore Portland, Elec. Specialty 503-227-3601
Pa Ardmore, Martin Elec. Co. 215-649-6332
Pa Phila., Prehler Elec. Insulation 215-725-5913
Pa Pittsburgh, E.B. Beach Co. 412-242-0400
Tex Houston, Hisco Elec. Insulation 713-228-6662
Utah Salt Lake City, Elec. Specialty 801-487-9805
Wash Seattle, Elec. Specialty 206-682-3434
For: Can., Toronto, Ont., Elec. Insulation & Fibre Co., Ltd. 416-251-1174

VARI-L CO., INC., 3883 Monaco Pkwy., Denver, Colo., 80207, Tel: 303-321-1511, TWX: 910-931-0590; V.P. Mktg: J. Kiser Vol 2•584,585,622-628; Vol 3•1308-1310

Local Sales Offices & Reps.

Cal	San Jose, All-Good North	408-288-6731
Cal	Santa Ana, Calif. Elctrn. Mktg.	714-835-2702
Cal	Woodland Hills, Calif. Elctrn. Mktg.	213-884-7867
Colo	Denver, Thorson Co.	303-355-3521
Fla	Longwood, Saber Assocs.	305-241-0742
Kans	Leawood, H.C. Heyde	913-649-8628
Md	Ellicott City, Applied Eng.	301-465-1272
Mass	Burlington, Tritek	617-272-4550
Mich	Southfield, T. Luebbe	313-357-0355
NM	Albuquerque, Cleveland Entprs.	505-298-7671
NY	Fayetteville, Graydon-Sherman	315-637-9861
NY	Hicksville, Salsbury	516-938-1080
Ohio	Cincinnati, Luebbe Sls.	513-871-4211
Pa	Cornwall, Applied Engrg.	202-783-7319
Tex	Dallas, Texas Avionics	214-368-3566
Wash	Seattle, D. Smith	206-633-3160
Exp:	N.Y., NY, S. Ginsbury	212-689-5212
For:	Can., Toronto, Ont., Wilson Entprs.	416-231-7536

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VARI-LIGHT CORP., Sub. Polacoat Inc., 9770 Conklin Rd., Cincinnati, Ohio, 45242, Tel: 513-791-6330

VARIAN ASSOCS., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-493-4000, TWX: 910-373-1731

VARIAN ASSOCS., Eastern Tube Div., 8 Salem Rd., Beverly, Mass., 01915, Tel: 617-922-6000, TWX: 710-347-1394; Mkt. Mgr: G.W. Karlsruher

Local Sales Offices & Reps.

Ariz	Scottsdale, Varian Assocs.	602-947-5461
Cal	Los Altos, Varian Assocs.	415-968-7630
Cal	Santa Monica, Varian Assocs.	213-828-5588
Fla	Clearwater, Varian Assocs.	813-446-8513
Fla	Lighthouse Point, Varian Assocs.	305-943-9495
Ga	Atlanta, Varian Assocs.	404-252-0045
Ill	Park Ridge, Varian Assocs.	312-825-6686
Md	Cheverly, Varian Assocs.	301-773-7010
Mass	Waltham, Varian Assocs.	617-890-4560
NJ	Cherry Hill, Varian Assocs.	609-428-6800
NJ	Springfield, Varian Assocs.	201-376-6600
NM	Albuquerque, Varian Assocs.	505-345-3827
NY	Syracuse, Varian Assocs.	315-437-2568
Ohio	Dayton, Varian Assocs.	513-298-7318
Tex	Richardson, Varian Assocs.	214-235-2385

VARIAN ASSOC., Solid State East Div., Micro-Link Prods., 8 Salem Rd., Beverly, Mass, 01915, Tel: 617-922-6000, TWX: 710-347-1394; Sls. Mgr: D.D. Milne

Local Sales Offices & Reps.

Ariz	Scottsdale, Varian Assocs.	602-947-5461
Cal	Los Altos, Varian Assocs.	415-968-7630
Cal	Santa Monica, Varian Assocs.	213-828-5588
Fla	Clearwater, Varian Assocs.	813-446-8513
Fla	Lighthouse Point, Varian Assocs.	305-943-9495
Ga	Atlanta, Varian Assocs.	404-252-0045
Ill	Park Ridge, Varian Assocs.	312-825-6686
Md	Cheverly, Varian Assocs.	301-773-7010
Mass	Waltham, Varian Assocs.	617-890-4560
NJ	Cherry Hill, Varian Assocs.	609-428-6800
NJ	Springfield, Varian Assocs.	201-376-6600
NM	Albuquerque, Varian Assocs.	505-345-3827
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Ohio	Dayton, Varian Assocs.	513-298-7318
Tex	Richardson, Varian Assocs.	214-235-2385

VARIAN ASSOCS., Travel Wave Tube Div., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-493-4000, TWX: 910-373-1731; Mktg. Mgr: J. Middaugh

VARIAN ASSOCS., Vacuum Div., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-493-4000, TWX: 910-373-1731; Ad. Mgr: N.F. Gross

Local Sales Offices & Reps.

Cal	Downey, Varian Vacuum Div.	213-927-2601
Cal	Los Altos, Varian Vacuum Div.	415-968-4936
Fla	Clearwater, Varian Vacuum Div.	813-446-8513
Ill	Park Ridge, Varian Vacuum Div.	312-825-3103
Md	Cheverly, Varian Vacuum Div.	301-772-7433
Mass	Waltham, Varian Vacuum Div.	617-890-5750
NJ	Springfield, Varian Vacuum Div.	201-376-6610
NY	Syracuse, Varian Vacuum Div.	315-437-3307
Ohio	Euclid, Varian Vacuum Div.	216-261-2115
Tex	Richardson, Varian Vacuum Div.	214-235-4586

VARIAN DATA MACHINES, 2722 Michelson Dr., Irvine, Cal., 92664, Tel: 714-833-2400, TWX: 910-596-1358; V.P. Mktg: H. Stover

Local Sales Offices & Reps.

Ala	Huntsville, BCS Assocs.	205-881-6220
Ariz	Scottsdale, Williams Assocs.	602-947-4297
Cal	Garden Grove	213-598-4438
Cal	San Diego	714-298-9292
Cal	Sunnyvale	408-736-5630
Colo	Denver, Williams Assocs.	303-388-4391
Conn	Hartford, Instr. Assocs.	203-525-9367
Fla	Orlando, Varian Data Mach.	305-645-2577
Ga	Atlanta, Varian Mach.	404-252-0047
Ill	Park Ridge	312-692-7184
Ind	Indianapolis, Carter Elctrns.	317-293-0696
Md	Cheverly	301-773-6770
Mass	Waltham	617-890-6072
Mich	Southfield	313-645-9950
Minn	Minneapolis, Carter Elctrns.	612-544-9393
Mo	St. Louis, Varian Data Mach.	314-524-0880
NJ	Union, SBM Assocs.	201-687-8737
NM	Albuquerque	505-298-5570
NY	Englewood Cliffs	212-325-5248
NY	Rochester, Varian Data Mach.	716-586-3273
NC	Greensboro, BCS Assocs.	919-273-1918
Ohio	Euclid, Varian Data Mach.	216-261-2115
Pa	Ft. Washington	215-643-2355
Tex	Houston	713-781-0105
Tex	Richardson	214-231-5145
Tex	San Antonio, Data Mktg. Assoc.	512-828-0937
Wisc	Milwaukee, Carter Elctrns.	414-464-5555

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VARIAN PALO ALTO TUBE DIV., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-493-4000, TWX: 910-373-1731; Mktg. Mgr: L.L. Moore

VARIAN Local Distributors

Cal	Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave.	415-961-1500
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La	Lafayette, Ralph's Inc., 3004 Cameron St.	318-234-4507
La	New Orleans, Ralph's, Inc., 4334 Stemway Dr.	504-242-2731
Mb	St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave	314-MA-1-5000
NY	New York, Midway Ind'l. Elec., 38 E. 29th St.	212-889-0370
Tex	Beaumont, Ralph's, Inc., 1270 Broadway	713-833-9443

VARIAN, Solid State East Div., Salem Rd., Beverly, Mass., 01915, Tel: 617-922-6000, TWX: 710-347-1394; Mktg. Mgr: T. Soldano

VARIAN, SOLID STATE WEST DIVISION, 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-493-4000, TWX: 910-373-1731; Mktg. Mgr: S. Porter ..... Vol 4•440,441*

Local Sales Offices & Reps.

Ariz	Scottsdale	602-947-5461
Cal	Los Altos	415-968-7630
Cal	Santa Monica	213-828-5588
Fla	Clearwater	813-446-8513
Fla	Lighthouse Point (Ft. Lauderdale), Varian Assocs.	305-943-9495
Ga	Atlanta	404-252-0045
Ill	Park Ridge	312-825-6686
Md	Cheverly	301-773-7010
Mass	Waltham	617-890-4560
NJ	Cherry Hill	609-428-6800
NJ	Springfield	201-376-6600
NM	Albuquerque	505-345-3827
NY	Syracuse	315-437-2568
Ohio	Dayton	513-298-7318
Tex	Richardson	214-235-2385
For:	Can., Georgetown, Ont., Varian Assocs. of Can. Ltd.	416-877-6901

VARO, INC., Electrokinetics Div., 402 E. Gutierrez St., Santa Barbara, Cal., 93102, Tel: 805-963-2055, TWX: 910-334-1177; Mktg. Mgr: N.G. Otis

VARO, Electron Devices Inc., Box 1437, 2203 Walnut St., Garland, Tex., 75040, Tel: 214-272-3561, TWX: 910-860-5194; Sls. Mgr: R. Sherrod

VARO SEMICONDUCTOR, INC., Box 676, Garland, Tex., 75040, Tel: 214-272-4551, TWX: 910-860-5178; V.P: H. Hess; Prod. Sls. Mgr: C. Merz; Prod. Sls. Mgr: J. Garvin Vol 2•968-974

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Ariz	Phoenix, W.W. Posey Co.	602-934-1335
Cal	Los Altos, W. W. Posey Co.	415-948-7771
Cal	Los Angeles, Corcoran Assoc.	213-823-2425
Colo	Golden, J.F. Hurlbut Co.	303-279-7138
Conn	No. Haven, Comp. Rep. Assoc., Inc.	203-239-9762
Del	Wilmington, T Davis Marketers	302-998-0123
Fla	Orlando, Buchanan & Abrams Assoc.	305-423-8995
Ill	Lombard, Olson Sls., Co.	312-627-3802
Ind	Indpls., Tech. Reps., Inc.	317-546-4967
Mass	Needham, Comp. Rep. Assoc., Inc.	617-444-2484
Mich	Farmington, Davis-Martensen Co.	313-474-8300
Minn	Mipls., L.F. Green Assoc.	612-781-1611
Mo	St. Louis, Coombs Assoc.	314-567-3657
NY	Great Neck, Cooper-Simon & Co.	516-487-1142
NY	Ithaca, Bob Dean, Inc.	607-272-2187
Ohio	Dayton, J.C. Hofstetter Co.	513-298-0662
Ohio	Medina, J. Hofstetter Co.	216-241-4880, 725-4477
Ohio	Twinsburg, J.C. Hofstetter Co.	216-425-4133
Ore	Portland, C.K. Shanks Assoc.	503-292-5656
Pa	Pittsburgh, J.C. Hofstetter Co.	412-561-5454
Tex	Garland, Whiteside Sls. Co.	214-231-9771
Tex	Houston, Whiteside Sls. Co.	713-498-2551
Va	Fairfax, T. Davis Mktrs.	703-591-7390
Wisc	Brookfield, Olson Sls. Co.	414-782-7590
For:	Can., Ontario, Downsview, Cantronics, Inc.	514-733-0749
For:	Can., Quebec, Montreal, Cantronics, Inc.	514-733-0749

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Cal	Chatsworth, Westates Elctrns. Corp., 20151 Bahama St.	213-341-4411
Cal	Garden Grove, Allied Elctrns., 12311 Industry St.	213-598-6605
Cal	Menlo Park, Bell Inds., Elctrn Distr. Div., 1070 Obrien Dr	415-323-9431
Cal	Sepulveda, Milgray/California, 8718 Woodley Ave	213-894-4011
Colo	Denver, Electronic Parts	303-266-3755
Fla	Orlando, Milgray/Florida, 5400 Diplomat Circle	305-647-5747
Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ill	Skokie, Bell Inds. Elctrn. Distr. Div., 7701 N. Austin Ave.	312-282-5400
Md	Hyattsville, Milgray/Washington, 5405 Lafayette Pl.	301-864-1111
Mass	Burlington, Milgray/New England, 79 Terrace Hall Ave	617-272-6800
Mich	Livonia, Cramer/Detroit, 13193 Wayne Road	313-425-7000
NJ	Cherry Hill, Milgray/Delaware Valley, 1165 Marlkress Rd.	609-424-1300
NY	Freeport, Milgray/Int'l, 191 Hanse Ave	516-546-6000
NY	Freeport, Milgray/New York, 191 Hanse Ave	516-546-6000
Ohio	Chesterland, Bridgefield Supply	216-729-9451
Ohio	Cleveland, Milgray/Cleveland, 1821 E. 40th ST.	216-881-8800
Pa	Philadelphia, Milgray/Delaware Valley	215-228-2000
Tenn	Memphis, Bluff City Distr. Co., Box 418, 234 East St.	901-725-9500
Tex	Ft. Worth, Allied Elctrns., 401 E. 8th St.	817-336-5401
Tex	Richardson, Altair Co., 405 N. Plano Rd.	214-231-5166
Wash	Bellevue, Bell Industries	206-747-1515
For:	Can., Hamilton, Ont., Western Radio Supply	416-528-0151
For:	Can., Montreal, Prelco Elctrns., 480 Port Royal St. W.	514-389-8051
For:	Can., Ont., Toronto, Electro Sonic, 543 Yonge St.	416-924-9301
For:	Can., Vancouver, B.C., R.A.E. Ind. Elctrns.	604-687-2621

VECTOR ELCTRN. CO., INC., 12460 Gladstone Ave., Sylmar, Cal., 91342, Tel: 213-365-9661, TWX: 910-496-1539; Sls. Mgr: F.L. Hill ..... Vol 3•954-958

Local Sales Offices & Reps.

Exp: Cal., Santa Monica, Trans-World Trade

VECTOR Local Distributors

Ala	Huntsville, Powell Elctrns/Huntsville, Box 1095, 803 Oster Dr.	205-539-2731
Cal	Garden Grove, Allied Elctrns., 12311 Industry St.	213-598-6605
Cal	Goleta, Radio Prods. Sls., 350 S. Kellogg Ave	805-964-6823
Cal	Los Angeles, Radio Prods. Sls., 1501 S. Hill St.	213-748-1271
Cal	Mt. View, Abacus Elctrns. Co., Inc., 1065 Terra Bella Ave.	415-961-1500
Cal	Mt. View, Elmar Elctrn., 2288 Charleston Rd.	415-961-3611
Cal	Mt. View, Powell Elctrns/California, Box 997, 411 Fairchild Dr.	415-964-0820
Cal	San Diego, Radio Prods. Sls., 7889 Clairemont Mesa Blvd.	714-292-5611
Cal	San Jose, Quement Ind'l. Elctrns., 1000 S. Bascom Ave.	
Fla	Miami Springs, Powell Elctrns/Florida, Box 514, 1740 NW 69th Ave	305-885-8761
Fla	Orlando, Powell Elctrns/Florida, Box 5604, 2032 Palmridge Way	305-859-1450
Ill	Chicago, Allied Elctrns., 2400 W. Washington Blvd.	312-421-2400
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ky	Louisville, Burks, P.I., 842 S. 7th	502-589-3960
La	Shreveport, Interstate Elec. Co., 1419 Culpepper, Box 1094	318-423-6131
Md	Beltsville, Powell Elctrns/Washington, 10728 Hanna St.	301-937-4030
Minn	Duluth, Northwest Radio, 123 E. First St.	218-727-1565

Mo St. Louis, Van Sickle Radio Elctrns, Inc, 1915 Washington Ave 314-MA-1-5000
Neb Omaha, Radio Equipment Co., Box 3843, 625 N. 18th St. 402-341-7700
NJ Pennsauken, Recso Eltrns.-Div. of Astex, Airport & Central Hwys. 609-662-4000
NY Lynbrook, Peerless Radio, 19 Wilbur St. 516-593-2121
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
Ohio Akron, Akron Elctrn. Supply, 107 S. Arlington St 216-762-8818
Ohio Cincinnati, United Radio Co., Summit & Reinhold Dr. 800-582-7080
Ore Portland, Almac/Stroum Elctrns, 8888 SW Canyon Rd 503-292-3534
Pa Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave 215-365-1900
Tex Ft. Worth, Allied Elctrns., 401 E. 8th St. 817-336-5401
Tex Houston, Harrison Equip. Co. Inc., 1616 McGowen St. 713-224-9131
Va Norfolk, Priest Elctrn., 6431 Tidewater Dr. 703-855-2021
Wash Seattle, Almac/Stroum Elctrns, 5811 Sixth Ave S. 206-763-2300
Wisc Madison, Satterfield Elctrn., 1900 S.Park St. 608-257-4801

VECTOR ENGRG., See American Vector Inc.

VECTOR INDUSTRIES, A Teledyne Co., 821 San Antonio Rd.,,Palo Alto, Cal., 94303, Tel: 415-327-2955, TWX: 910-373-1770; Sls. Mgr: J.L. Mongillo

VECTROL, INC., 1010 Westmore Ave., Rockville, Md., 20850, Tel: 301-424-6900, TWX: 89-8354; VP - Sls: R. Mitchell; VP-Engrg: N. Muskovac; Sls. Mgr: B. Strayton

Local Sales Offices & Reps.
Cal Little Rock, Electra Tech Midsouth 501-562-4090
Cal Redondo Beach, Control Switches Inc. 213-372-2181
Cal San Francisco, Artwell Elec. Co. 415-467-1880
Fla Tequesta, Dell-Tech Control Co. 305-746-7483
Ga Roswell, Cascade Control Co. 404-993-1667
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Ore Portland, Dyna Tech. 503-265-1455
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Wisc Milwaukee, E.A. Dickinson & Assocs. 414-264-1080

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Va Alexandria, Vanguard Engrg. 703-768-1660
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Pa	Philadelphia, Powell Elctrns, Inc., Box 8765, S. Island Rd & Enterprise Ave	215-365-1900
Pa	Reading, Barbey Elctrn., 333 N. 4th St.	
Tex	Ft. Worth, Swieco, Inc., Box 670, 1518 E. Lancaster St	817-335-6521
Utah	Salt Lake City, Standard Supply Co., 225 E. 6th So.	801-355-2971
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NJ Madison, Livera-Polk Assocs., Inc. 201-377-3220
NY Roslyn Heights, Livera-Polk Assocs., Inc. 516-484-1276
NC Raleigh, Leigh Sls., Inc. 919-787-9090
Pa Philadelphia, Eastern Components, Inc. 215-927-6262
Tex Dallas, Blackburn Assocs., Inc. 214-351-9991

WEST COAST RESCH. CORP., Box 25061, Los Angeles, Calif., 90025, Tel: 213-GR-8-8833; Gen'l. Mgr: H.M. Spivack

WESTAMP, INC., 1542 15th St., Santa Monica, Cal., 90404, Tel: 213-393-0401; Sls. Mgr: J. Manda

WESTERN COATING CO., Box 598, Royal Oak, Mich., 48073, Tel: 313-JU-8-3311; Pres: F.B. Evans

Local Sales Offices & Reps.
Cal Alhambra, Western Coating Co. 213-283-9331
Conn Farmington, R.M. Jones & Co. 203-677-2654
Fla Miami, Palmer Supplies Co. of Florida 305-633-8007
NY Garden City, Hogan Solvents & Chemicals 516-747-8460
Ohio Rocky River, G. Otte, Jr. 216-331-4139
Tex Dallas, Ahart Tool & Engrg. Co. 214-747-6004
Wisc Milwaukee, A.B. Plating Supply Co. Div. 414-383-1010

WESTERN COIL & ELEC. CO., 215 State St., Racine, Wisc., 53403, Tel: 414-632-4741; Sls. Mgr: W.T. Lewis

WESTERN ELCTRN. PRODS. CO., 107 Los Molinos, San Clemente, Cal., 92672, Tel: 714-492-4677; A/M: A. Schreiber

Local Sales Offices & Reps.
Ariz Phoenix, B. Kinkner Assocs. 602-944-4691
Cal Palo Alto, Engrg. Assocs. 415-326-7842
Cal Pasadena, P. Nurches Co. 213-681-8957
Conn Sherman, R. P. Mahan Co. Inc. 203-355-0231
Fla Delray Beach, Dearie & Farrell Co. 305-276-7462
Ill Glenview, F. William Castle Co. 312-724-3075
Mass Wellesley, R. P. Mahan Co., Inc. 617-237-1040
Minn St. Louis Park, Xylem Co. 612-920-9626
Mo Joplin, RM Engrg. & Sls. 417-781-4591
NJ Mountain Lakes, Dearie & Farrell Co. 201-334-4848
NY Syracuse, Dearie & Farrell Co. 315-463-4507
Ohio Cincinnati, Schlemmer Assocs. 513-522-8340
Pa Philadelphia, Dearie & Farrell Co. 215-563-1818
Tex Stafford, Jordan Equip. Co., Inc. 713-498-6212
Wash Seattle, F. H. Haight Co. 206-322-1818

WESTERN GEAR CORP., Electro Prods. Oper., Dept. E, 75 W. Green St., Pasadena, Cal., 91105, Tel: 213-796-4395, TWX: 213-639-6541; Sls. Mgr: J.A. Noumayer

WESTERN INDICATOR CO., 9835 Dupree St., So. El Monte, Cal., 91733, Tel: 213-442-4700; Sales: J.D. Pon

Local Sales Offices & Reps.
Cal San Diego, QualTronics 714-224-6555
Fla Merritt Island, L. Meldeau 305-452-5975
Ind Fort Wayne, McDonald Sls. Co. 219-745-9214
Kans Mulvane, R. Elston 316-267-2572
Mass Cambridge, Gilway Sls. Co. 617-465-7568
NY Lynbrook, H.B. Heft Co. 516-599-3351
NY Rochester, Gislason Sls. Co. 716-454-4741
Pa Wayne, Emlen-Peterson Co. 215-687-3535
Tex Irving, Lee Sls. Co. 214-255-5043
Wash Seattle, Norwest Co. 206-282-3707

WESTERN MAGNETICS, INC., 1733 Flower St., Glendale, Cal., 91201, Tel: 213-245-7311; Dir. of Mktg: Richard R. Fried

WESTERN RESERVE ELCTRNS., 2150 Highland Rd., Twinsburg, Ohio, 44087, Tel: 216-425-4951; Pres: D.S. Wise

WESTERN TELEMATIC, INC., 3001 Red Hill Ave., Costa Mesa, Cal., 92626, Tel: 714-979-0363; Sls. Mgr: D. Story

WESTINGHOUSE ELEC., Architectural Sys., 4300 36th St., S.E., Grand Rapids, Mich., 49508, Tel: 616-949-1050; Sls. Mgr: J. Munsey

WESTINGHOUSE ELEC. CORP., Computer & Instr. Div., Westinghouse Bldg., Pittsburgh, Pa., 15222, Tel: 412-255-3321; Mktg. Mgr: H.E. Six

Local Sales Offices & Reps.
Ala Birmingham, Westinghouse Elec. Corp., Computer & Instrumentation Div. 205-879-2089
Cal Orange, Westinghouse Elec. Corp., Computer & Instrumentation Div. 714-637-8100
Cal San Francisco, Westinghouse Elec. Corp., Computer & Instrumentation Div. 415-445-2000
Colo Denver, Westinghouse Elec. Corp., Computer & Instrumentation Div. 303-825-0441
Conn Hartford, Westinghouse Elec. Corp., Computer & Instrumentation Div. 203-249-5792
Ga Atlanta, Westinghouse Elec. Corp., Computer & Instrumentation Div. 404-636-3390
Ill Chicago, Westinghouse Elec. Corp., Computer & Instrumentation Div. 312-461-7162
Kans Lenexa, Matney & Co., Inc. 913-888-6900
La New Orleans, Westinghouse Elec. Corp., Computer & Instrumentation Div. 504-486-6141
Md Cheverly, Westinghouse Elec. Corp., Computer & Instrumentation Div. 301-341-5330
Mass Boston, Westinghouse Elec. Corp., Computer & Instrumentation Div. 617-542-0600
Mich Southfield, Westinghouse Elec. Corp., Computer & Instrumentation Div. 313-352-9000
Mo St. Louis, Westinghouse Elec. Corp., Computer & Instrumentation Div. 314-421-6911
NJ Hillside, Westinghouse Elec. Corp., Computer & Instrumentation Div. 201-465-2943
NY Buffalo, Westinghouse Elec. Corp., Computer & Instrumentation Div. 716-854-0321
NC Charlotte, Westinghouse Elec. Corp., Computer & Instrumentation Div. 704-377-3471
Ohio Cincinnati, Westinghouse Elec. Corp., Computer & Instrumentation Div. 513-948-7230
Ohio Cleveland, Westinghouse Elec. Corp., Computer & Instrumentation Div. 216-579-2165
Okla Tulsa, Westinghouse Elec. Corp., Computer & Instrumentation Div. 918-583-3191
Pa Philadelphia, Westinghouse Elec. Corp., Computer & Instrumentation Div. 215-667-7600
Pa Pittsburgh, Westinghouse Elec. Corp., Computer & Instrumentation Div. 412-255-4511
Tex Houston, Westinghouse Elec. Corp., Computer & Instrumentation Div. 713-621-9000
Wash Seattle, Westinghouse Elec. Corp., Computer & Instrumentation Div. 206-623-7001

WESTINGHOUSE ELEC. CORP., Defense & Public Sys, Westinghouse Bldg., Pittsburgh, Pa., 15222, Tel: 412-255-3800; Mktg. Mgr: W.R. Smanko; Mktg. Mgr: J.C. Ryan

WESTINGHOUSE ELEC., Elctrn. Tube, Box 284, Elmira, N.Y., 14902, Tel: 607-739-7951; Mktg. Mgr: J. Baker

WESTINGHOUSE ELCTRN. TUBE Local Distributors
Ala Birmingham, J.W. Clary Co., 1713 Second Ave. S. 205-322-2488
Cal Mt. View, Elmar Elctrn., 2288 Charleston Rd. 415-961-3611
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave. 219-742-4346
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
NJ Paterson, United-Page, Inc, 481 Getty Ave 201-279-7500
NY New York, Midway Ind'l. Elec., 38 E. 29th St. 212-889-0370
Pa Pittsburgh, Cameradio Co., 2801 Liberty Ave. 412-391-7400

WESTINGHOUSE ELEC., General Control, Buffalo, N. Y., 14240, Tel: 716-631-2440; Mktg. Mgr: A.R. Whittemore

WESTINGHOUSE ELEC., Ind'l. Equip., Box 300, Sykesville, Md., 21784, Tel: 301-795-2800; Mktg. Mgr: R.E. Recka

WESTINGHOUSE ELEC., Ind'l. Plastics, 1585 Lebanon School Rd., W. Mifflin, Pa., 15122, Tel: 412-256-3971; Mktg. Mgr: E.G. Bittner

WESTINGHOUSE ELEC. CORP., Ind'l. Systems Div., Westinghouse Bldg., Pittsburgh, Pa., 15222, Tel: 412-255-3321

WESTINGHOUSE ELEC. CORP., Industry Srvcs. Div., 1530 Westinghouse Bldg., Pittsburgh, Pa., 15222, Tel: 412-255-3580; Mktg. Mgr: R.J. Alke

WESTINGHOUSE ELEC., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, N.J., 07003, Tel: 201-465-3325; Mktg. Mgr: R.M. Harris

WESTINGHOUSE, LAMP Local Distributors

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WESTINGHOUSE ELEC. CORP., Relay-Instr. Div., 95 Orange St., Newark, N.J., 07101, Tel: 201-465-0222; Mktg. Mgr: R.G. Lakin

Local Sales Offices & Reps.

Ala	Birmingham	205-871-0366
Ala	Mobile	205-344-4273
Ariz	Phoenix	602-258-7211
Ark	Little Rock	501-376-3462
Cal	Bakersfield	805-327-7633
Cal	Compton	213-638-7781
Cal	Emeryville	415-652-3770
Cal	Fresno	209-233-0576
Cal	Los Angeles	213-482-9660
Cal	Riverside	714-682-6551
Cal	Sacramento	916-922-7071
Cal	San Diego	714-279-0233
Cal	San Francisco	415-445-2000
Cal	Sunnyvale	408-735-2601
Colo	Denver	303-825-0441
Conn	Hartford	203-249-5792
DC	Washington	202-833-5000
Fla	Jacksonville	904-356-5811
Fla	Miami	305-634-5461
Fla	Tampa	813-837-7171
Ga	Albany	912-436-0144
Ga	Atlanta	404-885-5200
Haw	Honolulu	808-839-0311
Idaho	Boise	208-344-2502
Ill	Aurora	312-897-4293
Ill	Chicago	312-461-7200
Ill	Danville	217-442-1901
Ill	Peoria	309-673-0754
Ill	Rockford	815-398-3591
Ind	Evansville	812-425-7146
Ind	Ft. Wayne	219-483-6476
Ind	Hammond	219-844-9400
Ind	Indianapolis	317-632-3301
Ind	So. Bend	219-287-1051
Iowa	Cedar Rapids	319-366-0781
Iowa	Davenport	319-323-2761
Iowa	Des Moines	515-283-2081
Kans	Wichita	316-263-2295
Ky	Louisville	502-459-5440
La	Baton Rouge	504-344-9448
La	New Orleans	504-486-6141
La	Shreveport	318-425-2435
Me	Augusta	207-623-4571
Md	Towson	301-828-5400
Mass	Boston	617-542-0600
Mass	Springfield	413-734-3101
Mass	Worcester	617-853-2680
Mich	Grand Rapids	616-456-1531
Mich	Jackson	517-787-3630
Mich	Saginaw	517-793-8680
Mich	Southfield	313-352-9000
Minn	Duluth	218-727-1541
Minn	Minneapolis	612-927-6551
Miss	Jackson	601-354-2373
Mo	Kansas City	816-421-7122
Mo	St. Louis	314-421-6911
Mont	Butte	406-792-2301
Neb	Omaha	402-397-2820
NJ	E. Orange	201-465-0222
NM	Albuquerque	505-265-6647
NY	Albany	518-459-1820
NY	Buffalo	716-854-3966
NY	New York	212-692-3211
NY	Olean	716-372-0040
NY	Rochester	716-232-4380
NY	Syracuse	315-463-9581
NY	Watertown	315-788-7700
NC	Charlotte	704-377-3471
NC	Greensboro	919-273-5563
NC	Raleigh	919-834-4375
Ohio	Akron	216-376-2171
Ohio	Cincinnati	513-475-7400
Ohio	Cleveland	216-579-2121
Ohio	Columbus	614-272-4000
Ohio	Dayton	513-228-9601
Ohio	Toledo	419-255-2205
Ohio	Youngstown	216-744-8911
Okla	Oklahoma City	405-232-8565
Okla	Tulsa	918-583-3191
Ore	Eugene	503-342-3083
Ore	Portland	503-224-4200
Pa	Allentown	215-433-3296
Pa	Bala Cynwyd	215-667-7600
Pa	Erie	814-453-4381
Pa	Johnstown	814-288-1559
Pa	Pittsburgh	412-255-3800
Pa	Wilkes Barre	717-825-7337
Pa	Williamsport	717-326-4289
SC	Columbia	803-256-1511
SC	Greenville	803-232-5695
Tenn	Chattanooga	615-267-9146
Tenn	Kingsport	615-247-5167
Tenn	Knoxville	615-522-8101
Tenn	Memphis	901-526-8546
Tenn	Nashville	615-327-4911
Tex	Amarillo	806-372-3259
Tex	Beaumont	713-898-1157
Tex	Corpus Christi	512-883-9236
Tex	Dallas	214-631-2811
Tex	El Paso	915-542-1744
Tex	Houston	713-621-9000
Tex	Odessa	915-337-1822
Tex	San Antonio	512-223-9181
Utah	Salt Lake City	801-486-8751
Va	Richmond	703-285-3909
Va	Roanoke	703-342-8925
Wash	Seattle	206-623-7001
Wash	Spokane	509-535-3521
WVa	Bluefield	304-325-3651
WVa	Charleston	304-346-9606
WVa	Fairmont	304-363-0400
WVa	Huntington	304-529-7146
WVa	Wheeling	304-232-4100
Wisc	Appleton	414-739-2313
Wisc	Madison	608-257-4517
Wisc	Milwaukee	414-264-6400

WESTINGHOUSE, RELAY-INSTR. Local Distributors

Cal Los Angeles, Metermaster-Main Off., 5646 Jillson St. 213-685-4340

WESTINGHOUSE ELEC., Semiconductor Div., Youngwood, Pa., 15697, Tel: 412-WA-5-7272, TWX: 510-468-2840; Power Prods. Sls. Mgr: S. Hunt; Volume Prod. Sls. Mgr: B. Burton

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Local Sales Offices & Reps.

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Cal	Los Angeles	213-482-9660
Cal	Sunnyvale	408-735-2191
Conn	New Haven, Gerber Sls. Corp.	203-777-6279
Fla	Indian Rocks Beach, Tech-Rep Assocs.	813-595-2834
Fla	Melbourne, Tech-Rep Assocs.	305-723-9140
Ill	Chicago	312-416-7200
Md	Baltimore, R.L. Wilkinson Inc.	301-377-7800
Mass	Boston	617-542-0600
Mass	E. Longmeadow, Gerber Sls. Corp.	413-525-3059
Mass	Waltham, Gerber Sls. Co.	617-890-8040
Mich	Farmington, Sheridan Assocs.	313-477-3800
Minn	Minneapolis	612-927-6551
Mo	Florissant, Sheridan Assoc.	314-837-5200
Mo	Hazelwood, Dy-Tronix Inc.	314-731-5799
Mo	Kansas City, Dy-Tronix Inc.	816-761-6543
NY	Clinton, Advanced Comps. Corp.	315-853-6438
NY	Endicott, Advanced Comps.	607-785-3191
NY	Great Neck, Cooper-Simon & Co.	516-487-1142
NY	Mineola	516-248-9810
NY	N. Syracuse, Advanced Components	315-699-2671
NY	Rochester	716-232-4380
NY	Scottsville, Advanced Comps.	716-889-1429
Ohio	Cincinnati, Sheridan Assocs.	513-761-5432
Ohio	Cleveland	216-579-2121
Ohio	Cleveland, Sheridan Assocs.	216-524-8120
Ohio	Dayton	513-228-9627
Ohio	Dayton, Sheridan Assocs.	513-277-8911
Pa	Bala Cynwyd	215-667-7600
Pa	Monroeville, Sheridan Assocs.	412-373-1070
Pa	Youngwood	412-925-7272
Tex	Dallas	214-631-2811
Wisc	Milwaukee	414-264-6400

WESTINGHOUSE SEMICONDUCTOR Local Distributors

Ala	Birmingham, Ack Radio Supply, 3101 4th Ave., S.	205-322-0588
Ala	Huntsville, Cramer/Ew Huntsville, 2310 Bob Wallace Ave.SW	205-539-5722
Ariz	Phoenix, Hamilton/Avnet Elctrncs., 1739 N. 28th Ave.	602-269-1391
Ariz	Phoenix, Kierulff - Phoenix, 2633 E. Buckeye Rd.	602-273-7331
Cal	Culver City, Hamilton Electro Sales	213-870-7171
Cal	Inglewood, Newark Elctrns. Corp., 4747 W. Century Blvd.	213-678-0441
Cal	Los Angeles, WESCO Elctrns.-L.A., 5650 Jillson St.	213-685-9525
Cal	Mt. View, Hamilton/Avnet Corp., 340 Middlefield Rd.	415-961-7000
Cal	San Diego, Hamilton/Avnet Corp., 5569 Kearny Villa Rd.	714-279-1550, 279-2421
Colo	Denver, Elctrn. Parts Co., 1212 S. Broadway	303-744-1992
Colo	Denver, Hamilton/Avnet Electronics	303-534-1212
Conn	North Haven, Cramer/Conn., 35 Dodge Ave.	203-239-5641
Fla	Hollywood, Cramer/Ew Hollywood, 4035 North 29th Avenue	305-923-8181
Fla	Orlando, Cramer/Ew Orlando, 345 North Graham Avenue, Box 20214	305-894-1511
Ga	Atlanta, Specialty Distributing, 763 Juniper St. N.W.	404-873-2521
Ga	Augusta, Specialty Distrg. Co., 1251 Gordon Pk. Rd., Box 1401	401-722-1526
Ill	Chicago, Semiconductor Specialists, Inc.	312-279-1000
Ill	Schiller Park, Hamilton-Avnet Elctrs., 3900 N. 25th Ave.	
Ind	Evansville, Ohio Valley Sound, Inc., 20 E. Sycamore St.	812-425-6173
Ind	Ft. Wayne, Ft. Wayne Elctrns. Supply, 3606 Maumee Ave.	219-742-4346
Ind	Indianapolis, Ra-Dis-Co., Inc., 814 N. Senate Ave., Box 1064	317-637-5571
Ind	South Bend, Radio Distr Co Inc, 1212 High St	219-287-2911
Kans	Prairie Village, Hamilton/Avnet Elctrncs., 3500 W. 75th St.	913-362-3250
Md	Gaithersburg, Cramer/Ew Washington, 16021 Industrial Drive	301-948-0110
Md	Hanover, Hamilton/Avnet Elctrns.	301-796-5000
Md	Savage, Pyttronic Ind., 8200 Wellmoor Ct.	
Mass	Burlington, Hamilton/Avnet Elctrns.	617-273-2120
Mass	Newton, Cramer Elctrn. Inc., 85 Wells Avenue	617-969-7700
Mass	Waltham, Schweber Elctrns.	617-890-8484
Mich	Detroit, Semiconductor Specialists, 25127 W. Six Mile Rd.	313-255-0300
Mich	Farmington, Sheridan Sales Co., 33703 Grand River Ave.	313-477-3800
Mich	Livonia, Hamilton/Avnet Elctrns.	313-522-4700
Minn	Minneapolis, Hamilton/Avnet Elctrns.	612-854-8400
Minn	Minneapolis, Harry Stark Electrns. Supply, 112 3rd Ave., N.	612-332-1325
Minn	Minneapolis, Semiconductor Specialists, 8030 Cedar Ave. S.	612-854-8841
Mo	Hazelwood, Hamilton/Avnet Electronics	314-731-1144
Mo	No. Kansas City, LCOMP-Kan City, 1520 Taney St.	910-221-2400
Mo	St. Louis, Hall-Mark Elctrn. Corp., 6100 Madison Ave.	314-521-3800
NJ	Moorestown, Arrow Elctrns., Pleasant Valley Rd.	609-235-1900
NM	Albuquerque, Kierulff-New Mexico, 2524 Baylor Dr., S.E.	505-247-1055
NY	Buffalo, Summit Dist. Inc., 916 Main St.	716-884-3450
NY	East Syracuse, Cramer/Syracuse, 6716 Joy Road	315-437-6671
NY	Endwell, Cramer/Binghamtom, 3220 Watson Blvd.	607-754-6661
NY	Farmingdale, Harrison Elctnc., 20 Smith St.	516-293-7990
NY	Freeport, Milgray/New York, 191 Hanse Ave	516-546-6000
NY	Hauppauge, L.I., Cramer/Long Island, 29 Oser Avenue	516-231-5682
NY	New York, Metropolitan, 468 Park Ave., S.	212-686-2120
NY	Syracuse, Hamilton/Avnet Elctrns.	315-437-2642
NY	Westbury, Schweber Elctrns., Jericho Tpke	516-334-7474
Ohio	Cincinnati, Sheridan Sales Co., 10 Kradlecrest Dr.	513-761-5432
Ohio	Columbus, Hughes-Peters, Inc., 481 E. 11th Ave.	614-294-5351
Ohio	Sheridan Sales Co., Box 4457, 215-524-3120	- 5351
Okla	Tulsa, Hall-Mark Elctrn., 4846 S. 83rd Ave.	918-835-8458
Pa	Pittsburgh, Cameradio Co., 2801 Liberty Ave.	412-391-7400
SC	Greenville, Sawyer Elctrn., 1210 Poinsett Hghwy.	
Tex	Dallas, Hall-Mark Elcton Corp., 9333 Forest La.	214-231-5101
Tex	El Paso, Midland Spec. Co., 2235 Wyoming Ave.	915-533-3555
Tex	Houston, Hall-Mark Elctrn., Box 36739	713-781-6100
Tex	Houston, Lenert Co., Box 2184	713-225-1465
Tex	Richardson, Altair Co., 405 N. Plano Rd.	214-231-5166
Utah	Salt Lake City, Hamilton/Avnet Elctrns.	801-262-8451
Wash	Seattle, Hamilton/Avnet Elctrncs., 2320 6th Ave.	206-624-5930
Wisc	Milwaukee, Taylor Elec. Co., 1000 W. Donges Bay Pk.	

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For: Can., Ottawa, Ont., Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl.
For: Can., Toronto, Ont., Hamilton/Avnet Elctrns. 416-789-1838

For Local Source Data Call Toll-Free 800-645-9200 (In N.Y. State Call 516-294-0990 Collect)

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WESTMORELAND PLASTICS CO., 135 Gertrude St., Latrobe, Pa., 15650, Tel: 412-539-1612; Sls. Mgr: E.R. Hatfield

Local Sales Offices & Reps.
Cal Fremont, Hartfield, Kennan & Freytag 415-863-2200
Cal Los Angeles, Hartfield, Kennan & Freytag 213-225-1318
Ill Skokie, B. Brown Sls. Co. 312-673-0660
Ind Indianapolis, F. R. Burczyk Assoc. 317-849-1636
Mass Woburn, R. W. Hatfield Co. 617-933-2324
Mich Detroit, F. R. Burczyk Assoc. 313-872-6620
Pa Emmaus, J. S. Adams & Co. 215-965-2391
Pa Emmaus, S. D. Adams & Co. 215-965-4544
Tenn Hendersonville, B. Lucas Assocs. 615-824-5818
Wash Vancouver, Hartfield, Kennan & Freytag 503-228-1683
For: Can., Toronto, Ontario, Harvey Waldman & Co., Ltd. 416-787-0133

WESTON COMPS. DIV., Weston-Archbald, Archbald, Pa., 18403, Tel: 717-876-1500, TWX: 510 - 656 - 2902; Prod. Mgr: F.J. Butteri

Local Sales Offices & Reps.
Ala Huntsville, J. L. Highsmith & Co. 205-881-3294
Ariz Scottsdale, Piper Sls. 602-949-8424
Cal Cupertino, PM Sales 408-255-1771
Cal San Diego, Celtec 714-279-7961
Cal Van Nuys, Wes-K Assocs. 213-989-3070
Colo Denver, Vinson Assocs. 303-757-5151
Conn Hamden, Impact Sls. 203-281-1331
Fla Altamonte Springs, WMM Assocs. 305-831-4645
Fla Clearwater, WMM Assocs. 813-726-8871
Fla Pompano Beach, WMM Assocs. 305-943-3091
Ill Skokie, Mar-Con Assocs. 312-675-6450
Iowa Marion, C & M Sales 319-377-6313
Kans Overland Park, Penzer Mankus 913-381-0004
Md Baltimore, S. White & Co. 301-484-5400
Mass Waltham, Impact Sls. Co. 617-893-2850
Mich Dearborn, Mitronic Sls. 313-565-6330
Minn St. Paul, R. Ragon 612-488-0201
Mo Hazelwood, Penzer Mankus Assocs. 314-731-4334
NJ Camden, QED Elctrns. 609-365-2450
NM Albuquerque, Vinson 505-298-7442
NY Albany, Compar Albany 518-489-4777
NY Mt. Vernon, QED Elctrns. 914-664-0080
NC Charlotte, J.L. Highsmith 704-333-7743
Ohio Dayton, J.C. Hofstetter Co. 513-298-0662
Ohio Medina, J.C. Hofstetter 216-241-4880
Pa Archbald, Weston Comp. Div. 717-876-1500
Tex Richardson, Vista Assocs. 214-235-4547
Wash Seattle, Underwood & Underwood 206-243-2133
For: Can., Hamilton 10, Ont., Cartwright Southall Assocs. 416-528-0294
For: Can., Montreal 251, Que., McIntyre Agencies 514-731-9617

WESTON COMPS. Local Distributors
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Ariz Phoenix, Mirco Electrn. Dist., 2104 W. Peoria Ave. 602-944-2281
Cal Carson, Hi-Rel Distr. Sales, 20507 S. Belshaw Ave. 213-537-6500
Cal Gardena, Bell Industries, 306 E. Alondra Blvd. 213-321-5802
Cal Menlo Park, Bell Inds., Elctrn Distr. Div., 1070 Obrien Dr 415-323-9431
Cal San Diego, Milo/Calif., 4955 Mercury St. 714-292-0900
Cal Sunnyvale, Acacia Sales, 384 San Aleso
Colo Denver, Acacia Sales Inc., 785 S. Jason St. 303-744-6356
Colo Denver, Kierulff-Denver, 10990 E. 47th Ave. 303-343-7090
Ind Indianapolis, Graham Elctrncs., 133 S. Penn. St. 317-634-8480
Md Baltimore, Radio Elec. Service Co., 1026 Cromwell Bridge Rd. 301-823-0070
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Cal Santa Clara, XDS 408-246-8330
Colo Denver, Thorson Co. 303-355-3521
Fla Orlando, XDS 305-841-6371
Ill Chicago, XDS 312-693-6060
Md Rockville, XDS 301-424-6700
Mass Wellesley, XDS 617-237-2300
Mich Southfield, XDS 313-353-7360
NM Albuquerque, Thorson Co. 505-265-5655
NY Hartsdale, XDS 212-792-6821
NY Rochester, XDS 716-244-9020
Pa Ft. Washington, XDS 215-643-4250
Tex Houston, Xerox Data Sys. 713-623-0510
Utah Salt Lake City, Thorson Co. 801-322-2127
Wash Seattle, Thorson Co. 206-632-0710
For: Can., Dorval, P.Q., XDS 514-683-3755
XYNETICS, INC., Box 1450, Canoga Pk., Cal., 91304, Tel: 213-887-1022; Sls. Mgr: R.L. Davison
YAMASHINA SEIKI CO., LTD., 20 Kitsone Yaba-cho, Yamashina Higashino, Higashiyama-ku, Kyoto, Japan, Tel: 075 (581) 1161, TWX: YASEC YAMASHINA; Sls. Mgr: Shigenobu Nagamori
Local Sales Offices & Reps.
NY New York, Tokyo Boeki Inc. 212-986-7939
YASKAWA ELEC. AMERICA, INC., 100 Bliss Dr., Oak Brook, Ill., 60521, Tel: 312-654-3950; Gen'l. Mgr: M. Yokota; Mgr. Mktg: Y. Kusuda; Mgr. Sls: H. Matsuo
Local Sales Offices & Reps.
NY New York, Yaskawa Elec. Mfg. Co., Ltd. 212-986-0084
YELLOW SPRINGS INSTR. CO., INC., Comps. Div. EEM, Box 279, Yellow Springs, Ohio, 45387, Tel: 513-767-7241, TWX: 810-450-2730; SM: J. Gerdes; Sls. Promotion Mgr: R. Horn
ZARING INDS., INC., Box 594, Westfield, Ind., 46074, Tel: 317-846-2571; Sls. Mgr: W.S. Zaring; V. Pres.-Chief Engr: J.J. Lisciandra
ZEHNTEL, INC., 2440 Stanwell Dr., Concord, Cal., 94520, Tel: 415-676-4200, TWX: 910-481-9473; Mktg. Mgr: P. Goodrich
Local Sales Offices & Reps.
Ala Huntsville, Gentry Assocs., Inc. 205-534-9771
Cal Los Angeles, Scientific Devices 213-641-4800
Cal Mountain View, Scientific Devices 415-964-4230
Fla Orlando, Gentry Assocs., Inc. 305-894-4401
Ill Chicago, Pivan Engineering Co. 312-539-4838
Ind Indianapolis, Pivan Engineering Co. 317-253-1681
Kans Mission, Pivan Engrg. Co. 913-722-1030
Mass Waltham, McBAR Assocs. 617-890-0233
Minn Minneapolis, Pivan Engrg. Co. 612-537-4501
Mo Manchester, Pivan Engrg. Co. 314-227-3501
NJ Fort Lee, Technical Mktg. Assocs. 201-224-6911
NJ Pennsauken, Megargel/Himmelstein Assocs. 609-662-3081
NY Syracuse, Labtronics, Inc. 315-454-9314
NC Burlington, Gentry Assocs., Inc. 919-227-3639
Tex Houston, Data Mktg. Assocs., Inc. 713-686-9627
Va Arlington, Gans-Fryling, Inc. 703-527-3262
Wash Renton, Johnston Assocs. 206-271-0272
ZELTEX, INC., 1000 Chalomar Rd., Concord, Calif., 94520, Tel: 415-686-6660 Ext. 42, TWX: 910-481-9477; Sls. Mgr: D. Terry
Local Sales Offices & Reps.
Ala Huntsville, Mekco Assocs. Inc. 205-881-3721
Cal Los Altos, Cain-White Co. 415-948-6533
Cal Los Angeles, Q.T. Wiles & Assocs. 213-649-1232
Fla Casselberry, Mekco Assocs., Inc. 305-831-3355
Ill Elmhurst, Scott Assocs. 312-279-5681
Kans Merriam, Tech. Reps., Inc. 913-432-4110
Mass Burlington, J. & J. Assocs. 617-272-2606
Minn Minneapolis, Scott Elctrn. Sls. 612-929-2985
Mo Hazelwood, Tech. Reps., Inc. 314-524-6900
NJ Bordentown, Dyna Rep 609-298-6700
NM Albuquerque, Cleveland Entprs. 505-298-7671
NY Elbridge, L-Tron Corp. 315-689-3787
NY Middletown, Neville & Vespo 212-539-1515
NC Burlington, Mekco Assocs., Inc. 919-226-7177
Ohio Berea, Geotronix Mktg. Assoc. 216-238-8520
Ohio Columbus, Geotronix Mktg. Assoc. 614-457-8472
Tex Ft. Worth, Carey Wolf Assoc. Inc. 817-738-1996
Va Springfield, Dyna Rep 703-321-8630
Wash Bellvue, Vantage Corp. 206-455-3460
For: Can., Quebec, Vitel Elctrns. 514-331-7393
ZENITH CONTROLS INC., 830 West 40th St., Chicago, Ill., 60609, Tel: 312-247-6400; Sls. Engr: R. Tindle; Sls. Engr: R. Cochran
ZENRAD CONTROLS CO., 529 E. Gutierrez St., Santa Barbara, Ca., 93103, Tel: 805-965-4996; Sls. Mgr: A. Radford
ZERO MFG. CO., Zero West Div., 777 Front St., Burbank, Cal., 91503, Tel: 213-846-4191, TWX: 910-498-2237; Sls. Mgr: M.S. Huffman ..... Vol 3•341
Local Sales Offices & Reps.
Ariz Phoenix, Howe & Howe Sls., Inc. 602-264-7971
Cal Burbank, Zero-West Div. 213-846-4191
Cal Palo Alto, Northern Calif. Sls. Office 415-964-7700
Cal San Diego, Clark & Co., Inc. 714-296-6351
Fla Orlando, Datarep, Inc. 305-855-8945
Fla St. Petersburg, St. Petersburg Clearwater Int'l. Airport 813-531-8991
Fla St. Petersburg, Datarep 813-345-8503
Ill Chicago, Carlson Elctrn. Sls. 312-774-0277
Ind Indianapolis, Leslie M. De Voe Co. 317-257-1227
La New Orleans, Davies Assocs. 504-522-9027
Md Baltimore, R.P. Luce & Co. 301-752-8200
Mass Monson, Zero-East Divn. 413-267-5561
Mich Dearborn, Villani Pitcher 313-271-4600
Minn Minneapolis, Stan Clothier Co. 612-869-5945
Mo St. Louis, Carlson Elctrn. Sls. 314-991-0262
NJ Berkeley Heights, R. P. Luce & Co., Inc. 201-464-6440
NM Albuquerque, F.Y. Gates Co., Inc. 505-265-6794
NY New Hyde Park, R.P. Luce & Co., Inc. 516-437-4550
Ohio Dayton, Neal Bear Corp. 513-299-3566
Ohio Richfield, Neal Bear Corp. 216-659-3131
Pa Philadelphia, R. P. Luce Co., Inc. 215-884-8365
Pa Pittsburgh, B.E. Gibson Co. 412-823-8310
Tenn Cleveland, Vaughn Sls. Co. 615-472-0501
Wash Bellevue, Ruggles Technical Sls. 206-455-2778
For: Can., Weston, Ont., C.A. Pipe & Assoc., Ltd. 416-249-1766
ZEUS IND'L. PRODS., Foot of Thompson St., Raritan, N.J., 08869, Tel: 201-526-0800, TWX: 710-480-9346; Pres: R.D. Hoyt; V. P: O.F. Hoyt
ZEVA ELEC. CORP., 3 Greatmeadow La., Hanover, N.J., 07936, Tel: 201-887-1399; Sls. Mgr: W. Plattner
ZI-TECH DIV., Aikenwood Co., Box 26, 223 Forest Ave., Palo Alto, Cal., 94302, Tel: 415-326-2151; Sls. Mgr: G. Ziman
ZIERICK MFG. CORP., Radio Circle, Mt. Kisco, N.Y., 10549, Tel: 914-666-2911; Mgr. Customer Svc: R. Bennett; Ass't. Sls. Mgr: A. Noyes; Sales: J. Tarun
Local Sales Offices & Reps.
Ill Chicago, K. D. Engle Co. 312-539-1820
Ind Indianapolis, K. D. Engle Co. 317-356-3001
NM Albuquerque, The Thorson Co. 505-265-5655
ZIPPERTUBING CO., 13000 S. Broadway, Los Angeles, Calif., 90061, Tel: 213-321-3901, TWX: 910-346-6713; Pres: W.A. Plummer
Local Sales Offices & Reps.
Ariz Phoenix 602-967-8888
Fla Orlando 305-671-7399
Ill Chicago 312-289-3000
Md Baltimore 301-675-3365
Mass Boston 617-429-6780
NJ Totowa 201-256-4980
Ohio Cleveland 216-734-3286
Tex Dallas 214-521-9240
ZIPPERTUBING Local Distributors
Tenn Chattanooga, Curle Elctrns., 1813-S. Market
ZIRCONIUM CORP. OF AMER., See Zircoa Div. Corhart Refractories
ZIRCOA DIV. CORHART REFRACTORIES CO., Box 39217, Solon, Ohio, 44139, Tel: 216-248-0500; Custr. Svc. Supv: N.E. Bednar
ZONIC TECH. LABS., 8927 Rossash Rd., Cincinnati, Ohio, 45236, Tel: 513-891-6390, TWX: 810-461-2470; Sls. Mgr: Terry A. Dunlap
ZOOMAR, INC., 55 Sea Cliff Ave., Glen Cove, N.Y., 11542, Tel: 516-OR-6-1900; VP: W. Steuer; Mktg. Mgr: E.F. Henckel

This is the Last Page of the Manufacturers and Sales Office's Directory

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electronic engineers master
1973-74

Distributors Directory
ALPHABETICALLY AND GEOGRAPHICALLY ARRANGED

This directory consists of two sections ... alphabetic and geographic listings of more than 1,000 electronic distributors and their branch locations. **The alphabetical listing,** which appears first, lists name, address, telephone number, and name of key sales executives for each distributor listed. Listings are in complete alphabetical order, regardless of location in the country.

The geographic portion of the directory (which follows the alpha listing), by contrast, lists distributors by state, alphabetically, and alphabetically by city within that state. The listing for each distributor duplicates the information that appears for him in the alphabetical listing. If you know the name of the distributor you want to reach, you can find it quickly in the alpha directory. If you need to know who the distributors are in your area, use the geo portion of the directory to determine a complete listing of distributors in any given city or state.

This directory was completely revised and updated for this edition prior to publication. Thus the information is current as of Spring 1973.

DISTRIBUTORS DIRECTORY — ALPHABETICAL

— A —

A-Mart Inc., 190 W. Passaic St., Rochelle Park, N. J. 07662, (201) 845-9505, Branch Mgr.: R. De Yoreo

A & W Elctrncs., 491 Riverside Ave., Medford, Mass. 02155, (617) 396-5550, Mktg./Adv. Mgr.: W. Cramer; Gen. Sls. Mgr.: E. Whittier; Ind. Sls. Mgr.: C. Martin; Inside Sls. Cont.:Chuck Martin

Abacus Elctrncs. Co., Mountain View, Calif. 94040, (415) 961-1500, TWX: 910-379-6936, Gen. Sls. Mgr.: F. Landefeld

Abbott Elctrncs. Co., 902 Main St., N. Woburn, Mass. 01801, (617) 935-2024, Gen. Sls. Mgr.: B. R. Nelson

Acacia Sales Inc., 384 San Aleso Ave., Sunnyvale, Calif. 94086, (408) 735-0100, TWX: 910-339-9268, Mktg./Adv. Mgr.: W. Lager; Gen. Sls. Mgr.: W. Lager; Ind. Sls. Mgr.: A. Keuser; Inside Sls. Cont.: J. Bertoni

Acacia Sales Inc., 11111 West 8th Ave. Unit B, Lakewood, Colo. 80215, (303) 777-0511, Branch Mgr.: W. Dumon

Acacia Sls. Inc., 785 S. Jason St., Denver, Colo., (303) 744-6356

A.C.I. Elctrncs. Corp., 28 South Mall, Plainview, N. Y. 11803, (516) 293-6630, Gen. Sls. Mgr.: J. Rosen; Ind. Sls. Mgr.: B. Kobb

Ack Radio Supply Co., 554 Deering Rd. NW, Atlanta, Ga. 30309, (404) 351-6340, Mktg./Adv. Mgr.: R. Naish; Inside Sls. Cont.: T. E. Atkerson, Pres.

Acme Elctrncs. Inc., 224 Washington N., Minneapolis, Mn. 55401, (612) 338-4754, Mktg./Adv. Mgr.: R. Atlas

Acme Radio Supply Inc., 318 Thurston St., Manhattan, Kan. 66502, (913) 778-3300

Acme Radio Supply Inc., 135 Kansas Ave., Topeka, Kan. 66603, (913) CE 5-1363, Gen. Sls. Mgr.: K. Bodine; Inside Sls. Cont.: K. R. Stapleton

A. C. Radio Supply Inc., 1539 W. Passyunk Ave., Philadelphia, Pa. 19145, (215) HO 2-9379, Mktg./Adv. Mgr.: J. Branca; Inside Sls. Cont.: J. Branca

Adams Wayside Inc., 727 Boswell Ave., Norwich, Conn. 06360, (203) 889-8431, Mktg./Adv. Mgr.: F. E. Adams; Gen. Sls. Mgr.: D. Adams; Inside Sls. Cont.: F. Adams

Adirondack Elctrncs. Inc., Box 147 Brandywine Sta., Schenectady, N. Y. (518) 346-4717

Advanced Elctrncs., Inc., 804 Dupont St., Bellingham, Wash. 98225, (206) 734-3400, Branch Mgr.: M. Bostrom

Advent Elctrncs. Inc., 7110 N. Lyndon St., Rosemont, Ill. 60018, (312) 298-4210, Mktg./Adv. Mgr.: A. Halegua; Gen. Sls. Mgr.: R. Einsiedel; Ind. Sls. Mgr.: R. Einsiedel; Inside Sls. Cont.: B. Tovrog

Aerotron Inc., P. O. Box 6527, Raleigh, N. C. 27608, (919) 876-4620, Mktg./Adv. Mgr.: D. D. Ferrell; Inside Sls. Cont.: J. Tryzenski

Aikins Elctrncs. Supplies Inc., 531 Broad St., New London, Conn. 06320, (203) 442-4406, Inside Sls. Cont.: P. Maloney

Aikins Elctrncs. Supplies Inc., 499 N. Main St., Norwich, Conn. 06460, (203) 889-8427, Branch Mgr.: N. Richards

Aikins Elctrncs. Supplies Inc., 884 Orange Ave., West Haven, Conn. 06516, (203) 933-2581, Branch Mgr.: E. Lillo

All American Transistor Corp., 100 N. Village Ave., Rockville Centre, N. Y. 11571, (516) 536-7141

Akron Elctrn. Supply, 107 S. Arlington St., Ohio, Akron, (216) 762-8818

All-State O. E. M. Div. of Summers Electric, 510 S. Good-Latimer Exp., Dallas, Tex. 75226, (214) 651-0242, Gen. Sls. Mgr.: H. Warlick; Inside Sls. Cont.: B. Bigham

All States Elec. Inc., 510 S. Good-Latimer Ex., Dallas, Tex.

Allegheny Elctrncs. Inc., 1100 E. Oldtown Rd., Cumberland, Md. 21502, (301) 722-7671, Branch Mgr.: S. Berry

Allegheny Elctrncs. Inc., 1301 Potomac Ave., Hagerstown, Md. 21740, (301) 739-6460, Branch Mgr.: D. Manspeaker

Allegheny Elctrncs. Inc., 800 Chestnut Ave., Altoona, Pa. 16601, (814) 946-0871, Mktg./Adv. Mgr.: K. O. McGraw; Gen. Sls. Mgr.: K. O. McGraw; Ind. Sls. Mgr.: C. J. Kunstbeck; Inside Sls. Mgr.: P. Reimer

Allegheny Elctrncs. Inc., 46 Valley Pike, Johnstown, Pa. 15905, (814) 536-3589, Branch Mgr.: C. Berkey

Allen & Hurley Industrial Elctrncs. Inc., 23 S. Warren St., Trenton, N. J. 08608, (609) 393-3300, Mktg./Adv. Mgr.: R. Simpkins; Gen. Sls. Mgr.: R. Simpkins; Ind. Sls. Mgr.: J. Leese; Inside Sls. Cont.: D. Leathers

Allen, R. G. Co. Inc., 13609 Saticoy St., Van Nuys, Calif. 91402, (213) 989-1700, TWX: 910-495-1799, Mktg./Adv. Mgr.: R. Allen

Allied Controls Co., 4842 MacCorkie Ave. S.W., S. Charleston, W. Va. 25303, (304) 768-7313

Allied Elctrncs. Corp., 1281 Knott Ave., Garden Grove, Calif. 92641

Allied Elctrncs. Corp., 800 N.W. 57th Ct., Ft. Lauderdale, Fla. 33309, (305) 772-6464, Branch Mgr.: J. Durkin

Allied Elctrncs. Corp., 2400 W. Washington Blvd., Chicago, Ill. 60612

Allied Elctrncs. Corp., 210 S. Meridian St., Indianapolis, Ind. 47225, (317) 634-2591

Allied Elctrncs. Corp., 1205 East River Dr., Davenport, Iowa 52802, (319) 323-8051

Allied Elctrncs. Corp., Falmouth Shopping Center, Falmouth, Me. 04105, (207) 781-2666

Allied Elctrncs. Corp., 4911 Niagara Rd., College Park, Md. 20741, (301) 345-4600, Branch Mgr.: L. Crusco

Allied Elctrncs. Corp., 1 Centur Circle-Campanelli Ind. Pk., Braintree, Mass. 02184, (617) 848-4150

Allied Elctrncs. Corp., 8140 Greenfield Rd., Detriot, Mich. 48448, (313) 634-2591

Allied Elctrncs. Corp., 625 N. 18th St., Omaha, Neb. 68102, (402) 341-7700

Allied Elctrncs. Corp., Lafayette Plaza, Portsmouth, N. H. 03801, (603) 436-0011

Allied Elctrncs. Corp., 401 E. 8th St., Ft. Worth, Tex. 76102, (817) 336-5401

Allied Radio Corp., 2400 W. Lake St., Chicago, Ill., (312) 421-2400

Almac/Stroum Elctrncs., P. O. Box 25444, Portland, Ore. 97225, (503) 292-3534, TWX: 910-464-6105, Branch Mgr.: F. Warnock

Almac/Stroum Elctrncs., 5811 Sixth Ave. S., Seattle, Wash. 98108, (206) 763-2300, TWX: 910-444-2067, Mktg./Adv. Mgr.: J. L. Wandell; Oper. Mgr.: J. Clark; Inside Sls. Cont.: R. Baum

Almo Elctrncs. Corp., 1122 French St., Wilmington, Del. 19801, (302) 656-9467, Branch Mgr.: T. Samuels

Almo Elctrncs. Corp., 2119 W. Main St., Jeffersonville, Pa. 19401, (215) 539-7580, Branch Mgr.: J. Mash

Almo Elctrncs. Corp., 5801 Rising Sun Ave., Philadelphia, Pa. 19120, (215) 342-3556, Branch Mgr.: H. Avart

Almo Elctrncs. Corp., 9815 Roosevelt Blvd., Philadelphia, Pa. 19114, (215) 676-6000, TWX: 710-670-0469, Mktg./Adv. Mgr.: A. J. Peikin; Gen. Sls. Mgr.: A. J. Peikin; Ind. Sls. Mgr.: J. Laphen; Inside Sls. Cont.: J. Laphen

Almo Elctrncs. Corp., 317 Park Heights Ave., Salisbury, Md. 21801, (301) 742-1393, Branch Mgr.: F. Larmore

(Camden) Almo Elctrncs. Corp., 301 N. Black Horse Pike, Mt. Ephraim, N. J. 08854, (609) 933-3800, Branch Mgr.: A. Cappatto

Almo Elctrncs. Corp., P. O. Box 130, Pleasantville, N. J. 08232, (609) 646-1300, Branch Mgr.: A. Greenberg

Almo Elctrncs. Corp., 219 Landis Ave., Vineland, N. J. 08360, (609) 691-6965, Branch Mgr.: A. Fasulo

Alpha Elctrncs. Inc., 1306 40th St., Brooklyn, N. Y. 11218, (212) 633-2800, Mktg./Adv. Mgr.: E. Sochet; Gen. Sls. Mgr.: N. Blatt; Ind. Sls. Mgr.: N. Blatt; Inside Sls. Cont.: N. Blatt

Alpine Elctrncs. Supply, 333 N. 200 West, Provo, Utah 84601, (801) 373-7372, Inside Sls. Cont.: C. A. Lowe

Alta-Land Elctrncs., 2280 S. Main St., Salt Lake City, Utah, (801) 486-7227, Branch Mgr.: L. McElwain

Alverson Sales Co., 217 E. Front St., Bloomington, Ill. 61701, (309) 827-9553, Gen. Sls. Mgr.: D. Richards; Ind. Sls. Mgr.: R. Hertel; Inside Sls. Cont.: H. L. Alverson

Alvo Elctrncs. Distributors Inc., 103 Pugh St., State College, Pa. 16801, (814) 238-0505, Mktg./Adv. Mgr.: T. O. Dissinger; Gen. Sls. Mgr.: H. W. Parks; Ind. Sls. Mgr.: T. O. Dissinger; Inside Sls. Cont.: H. Parks

Amateur Radio Ctr., 2805 E. 2nd Ave., Miami, Fla.

Amateur Radio Equip. Co. Inc., 1203 E. Douglas, Wichita, Kan. 67211, (316) 264-9166

Angus, Inc., 10739 Tucker St., Beltsville, Md., (301) 937-5750

Angus Inc., Pleasant Valley Ave., Moorestown, N. J., (609) 235-1900

Antrim Marine Radio, 325 Blacksmith Rd., Camp Hill, Pa. 17011, (717) 761-4419, Mktg./Adv. Mgr.: D. M. Antrim; Inside Sls. Cont.: D. M. Antrim

Apollo Elctrncs. Inc., 101 Binney St., Cambridge, Mass. 02142, (617) 868-3120, Mktg./Adv. Mgr.: M. Gondelman; Gen. Sls. Mgr.: N. Hurwitz; Ind. Sls. Mgr.: P. Pearson; Inside Sls. Cont. P. Pearson

Appalachian Elctrncs. Supply, 1072 E. Stone Dr., Kingsport, Tenn. 37660, (615) 245-0116, Mktg./Adv. Mgr.: J. Sorah; Gen. Sls. Mgr.: C. Tyler; Inside Sls. Cont.: J. Sorah

Arbuckle, J. C. Co., 500 E. 19th St., Bakersfield, Calif. 93305, (805) 325-5816, Branch Mgr.: G. Birshire

Arbuckle J. C. Co., 2349 Kern St., Fresno, Calif. 93721, (209) 264-6554, Gen. Sls. Mgr.: P. Husclid; Inside Sls. Cont.: P. Husclid

Arcade Elctrncs. Inc., 7048 Columbia Pike, Annandale, Va. 22003, (703) 256-4610, Mktg./Adv. Mgr.: R. L. Jordan; Inside Sls. Cont.: R. L. Jordan

Arch Elctrncs. Co., 1318 Arch St., Philadelphia, Pa. 19107, (215) WA 5-5200, Inside Sls. Cont.: F. Nusbaum, Jr.

Arcal Sound & Video, 2001 El Camino, Sacramento, Calif. 95821, (916) 927-4502, Branch Mgr.: R. Hood

Argil Elctrncs. Ltd., 55 West 16th St., New York, N. Y. 10010, (212) 691-8111, Gen. Sls. Mgr.: A. Gill; Inside Sls. Cont.: F. Gray

Arla Elctrncs. Inc., 2150 East 4 St., Brooklyn, N. Y. 11223, (212) 627-4400, Gen. Sls. Mgr.: E. Pifling, Inside Sls. Cont.: E. Pifling

Arlington Elctrnc. Wholesalers Inc., 3636 Lee Hwy., Arlington, Va. 22207, (703) 524-2412, 524-6256, Gen. Sls. Mgr.: N. L. Wessells; Ind. Sls. Mgr.: W. M. Kohn; Inside Sls. Cont.: W. L. Wessells

Armies Elctrncs., 320 W. Federal St., Youngstown, Ohio 44503, (216) 746-3244, Mktg. /Adv. Mgr.: A. Calderone; Gen. Sls. Mgr.: T. Martino; Inside Sls. Cont.: J. Maro

Arko-Interstate Electric Co., 37 S. 4th St., Ft. Smith, Ark. 72901, (501) 782-4061, Branch Mgr.: J. Storment

Arrow/Angus, Pleasant Valley Ave., Moorestown, N. J., (609) 235-1900

Arrow Elctrncs., 295 Treadwell St., Hamden, Conn. 06514, (203) 248-3801

Arrow Elctrncs., 5207 East Dr., Baltimore, Md. 21227, (301) 247-5200

Arrow Elctrncs., 15 A St., Burlington, Mass. 01803, (617) 273-0100

Arrow Elctrncs., Pleasant Valley Rd., Moorestown, N. J. 08057, (609) 235-1900

Arrow Elctrncs., 285 Midland Ave., Saddlebrook, N. J. 07662, (201) 797-5800

Arrow Elctrncs., 225 Rte. 46, Totowa, N. J. 07512, (201) 256-7331

Arrow Elctrncs., 900 Broad Hollow Rd., Farmingdale, N. Y. 11735, (516) 694-6800, TWX: 510-224-6494

Arrow Elctrncs., 23945 Mercantile Rd., Cleveland, Ohio 44110, (216) 464-2000

Arrow Elctrncs., 3100 Plainfield Rd., Dayton, Ohio 45432, (513) 253-9176, TWX: 810-459-1611

Arrow Elctrncs., 700 Carpenter's Crossing, Folcroft, Pa. 19032, (215) 534-3200

Arrowhead Radio & T. V. Supply Co., 1212-16 "D" St., San Bernardino, Calif. 92405, (714) 884-9011, Mktg./Adv. Mgr.: J. Muir; Gen. Sls. Mgr.: H. Hamilton; Ind. Sls. Mgr.: R. Rice; Inside Sales Cont.: J. Erickson

ARS Elctrncs., 616 S. Holmby Ave., Los Angeles, Calif. 90024, (213) 279-1275, Gen. Sls. Mgr.: R. Sanett; Inside Sls. Cont.: R. Sanett

Artec Distributors Inc., 17-21 Cottage St., Middletown, N. Y. 10940, (914) 343-3173, Gen. Sls. Mgr.: D. Shohet

ASI Elctrn./Astrex, 1728 Whitehead Rd., Baltimore, Md., (301) 265-5100

Atlas Elctrncs. Corp., 1485 First Ave., New York, N. Y. 10021, (212) 879-3331, Inside Sls. Cont.: E. S. Haas, Pres.

Atlas Wire & Cable Co. Inc., Box 3148, Huntsville, Ala. 35810, (265) 854-1616, Branch Mgr.: W. Sanders

Atlas Wire & Cable Co. Inc., 72 North Broadway, Yonkers, N. Y. 10701, (914) 969-5158, Inside Sls. Cont.: S. Z. Hellman

Augusta Wholesale Elctrncs., 1034 Broad St., Augusta, Ga. 30902, (404) 724-5009, Inside Sls. Cont.: F. Lakeman

Automatic Dist. Corp., 5720 Harvey Wilson Dr., Houston, Tex. 77020, (713) 675-6521, Inside Sls. Cont.: J. Alexander

Avec Elctrncs. Corp., 711 Granby St., Norfolk, Va. 23510, (703) 627-3502, Branch Mgr.: P. W. Folse

Avec Elctrncs. Corp., 2002 Staples Mill Rd., Richmond, Va. 23230, (703) 359-6071, Gen. Sls. Mgr.: C. E. Frawner, Jr.

Avec Elctrncs. Corp., 2009 Williamson Rd., Roanoke, Va. 24012, (703) 344-6288

— B —

B - B & W Inc., 2137 Euclid, Berwyn, Ill. 60402, (312) 749-1710, Mktg./Adv. Mgr.: G. Butcher

B & B Distributing, 12 Vassar Rd., Poughkeepsie, N. Y. 12603, (914) 462-7137, Inside Sls. Cont.: D. J. Robie

B & R Elctrn. Co., St. Mary's, Pa.

Badger Elctrnc. Parts Co. Inc., 1018-S. Memorial Dr., Racine, Wisc. 53403, (414) 637-1256, Mktg./Adv. Mgr.: V. J. Pavlik;

Bagliani W. M., 1026 Cromwell Bridge Rd., Baltimore, Md. 21204, (301) 823-0070, TWX: 710-232-1819, Inside Sls. Cont.: W. M. Bagliani

Bailey's Elctrnc. Supply, 803 Davis Blvd. P. O. Box 663, Sikeston, Mo. 63801, (314) 471-6142, Mktg./Adv. Mgr.: C. Bailey; Inside Sls. Cont.: D. Page

Baldwin Park Elctrncs. Supply Corp., %The Shelco Bldg., 305 E. Gladstone St., Azusa, Calif. 91702, (213) 969-1793, Mktg./Adv. Mgr.: L. Schelin; Gen. Sls. Mgr.: L. Schelin

Baldwin Park Elctrncs. Supply Corp., 1842 N. Puente Ave., Baldwin Park, Calif. 91706, (213) 962-1091, Branch Mgr.: G. S. Rubio

Ball Elctrncs., 2960 Ball Rd., Anaheim, Calif. 92640, (714) 828-1310, Branch Mgr.: L. Blake

Ballard Supply Corp., 3109 Washington Blvd., Ogden, Utah 84401, (801) 394-5544, Inside Sls. Cont.: C. Ballard

Ballard Supply Corp., 44 E. 6th South, Salt Lake, Utah 84404, (801) 364-6544, Branch Mgr.: M. Maybe; Engr. Cont.: B. Ballard

Banner Elctrncs., 2304 Chamberlayne Ave., Richmond, Va. 23222, (703) 359-0255, Mktg./Adv. Mgr.: C. E. Joseph; Gen. Sls. Mgr.: M. Newton; Ind. Sls. Mgr.: K. A. Minter; Inside Sls. Cont.: C. Barnes

Baptist Elctrnc. Supply Co. Inc., 419 S. Mauvaisterre, Jacksonville, Ill. 62650, (217) 243-6464, Mktg./Adv. Mgr.: D. Fernandes; Gen. Sls. Mgr.: D. Fernandes; Inside Sls. Cont.: R. McAllister

Baptist Elctrnc. Supply Co., 106-08 W. Jefferson, Springfield, Ill. 62701, (217) 528-1338, Branch Mgr.: T. Knust

Barbey Elctrncs., 622 Columbia Ave., Lancaster, Pa. 17603, (717) 393-5637, Branch Mgr.: E. A. Thomas

Barbey Elctrncs., 821 Quentin Rd., Lebanon, Pa. 17042, (717) 273-1679, Branch Mgr.: C. E. Putt

Barbey Elctrncs., 153 N. York St., Pottstown, Pa. 19464, (215) 326-0702, Branch Mgr.: R. F. Heiser

Barbey Elctrncs., 333 N. 4th St. P. O. Box Z, Reading, Pa. 19603, (215) 376-6116, Mktg./Adv. Mgr.: R. L. Boyer; Ind. Sls. Mgr.: D. K. Greely; Inside Sls. Cont.: H. J. Elbert

Barney Millers Inc., 232 E. Main St., Lexington, Ky. 40507, (606) 252-2216, Mktg./Adv. Mgr.: H. M. Miller; Ind. Sls. Mgr.: D. Atwood; Inside Sls. Cont.: D. Atwood

Barnhill Five, Inc., 7329 E. Stetson Dr., Scottsdale, Ariz. (602) 947-7841

Barnhill Five, Inc., 1170 S. Sheridan Blvd., Denver, Colo., (303) 934-5505

Barnhill Five, Inc., 1410 D. Wyoming NE, Albuquerque, N. M., (505) 299-7658

Barno Radio Co., 226 McKean Ave., Charleroi, Pa. 15022, (412) 483-8259, Branch Mgr.: W. Malego

Barno Radio Co., 5403 W. Smithfield St., McKeesport, Pa. 15135, (412) 462-7475, Gen. Sls. Mgr.: J. Barno

Barno Radio Co., 927 Walnut St., McKeesport, Pa. 15132, (412) 664-9392, Branch Mgr.: G. Barno, Jr.

Barno Radio Co., 239 S. Main St., Washington, Pa. 15301, (412) 222-0730, Branch Mgr.: L. Matullo

Barr-Thorpe, 2601 Madison Ave., Kansas City, Mo. 64108, (816) 531-8840

Barstow Elctrncs. Supply, 876 E. Williams, Barstow, Calif. 92311, (714) 256-8928, Branch Mgr.: J. M. Harris

Basham-Christensen Inc., 2600 Mendocino Ave., Santa Rosa, Calif. 95401, (707) 546-0835, Inside Sls. Cont.: K. W. Christensen

The Bay Co., 2045 Liberty St., Jacksonville, Fla. 32206, (904) 355-2614, Gen. Sls. Mgr.: H. Bay; Inside Sls. Cont.: H. Bay

Baynesville Elctrns., 1631 E. Joppa Rd., Baltimore, Md. 21204

Becker J. A. Co., 1341 E. 4th P. O. Box 247, Dayton, Ohio 45401, (513) 226-1341, Mktg./Adv. Mgr.: R. D. Mint; Inside Sls. Cont.: P. Jenkins

Becker Elctrnc. Div., 522 W. Main St., Springfield, Ohio 45504, (513) 325-0452, Branch Mgr.: B. Earman

Bell Industries Elctrnc. Distributor Div., 306 E. Alondra Blvd., Gardena, Calif. 90247, (213) 321-5802, TWX: 910-346-6336, Branch Mgr.: M. Krupin

Bell Industries, 1880 Century Park E.-Suite 400, Los Angeles, Calif. 90067, (213) 879-1851

Bell Industries Elctrnc. Distributor Div., 1070 Obrien Dr., Menlo Park, Calif. 94025, (415) 323-9431, TWX: 910-373-1222, Branch Mgr.: L. Weis

Bell Industries Elctrnc. Distributor Div., 7701 N. Austin Ave., Skokie, Ill. 60076, (312) 965-7500, TWX: 910-223-4519, Adv. Mgr.: J. Romain; Gen. Sls. Mgr.: H. Schayer

Bell Industries Elctrnc. Distributor Div., 12410 S. E. 32nd St., Bellevue, Wash. 98004, (206) 747-1515, TWX: 910-443-2321, Branch Mgr.: C. Wilson

Bell Radio Supply, 1323 W. Florence Ave., Los Angeles, Calif. 90044, (213) 753-4495, Mktg./Adv. Mgr.: S. M. Schiff; Inside Sls. Cont.: J. Morris

Beltronics Corp., 400 Washington Ave., Belleville, N. J. 07109, Gen. Sls. Mgr.: Mr. Zager; Ind. Sls. Mgr.: J. Knox; Inside Sls. Cont.: Mrs. Spillane

Benton Elctrnc. Supply Inc., 922 Woodward, Benton Harbor, Mich. 49022, (616) 925-0060 and 925-0069, Inside Sls. Cont.: Mr. A. Kopischke

Bintz Co. W. H., 433 W. 3rd St., Salt Lake City, Utah

Black & Ryan Dist., P. O. Box 2935 / 2645 E. Washington, Phoenix, Ariz. 85036, (602) 275-6311, Mktg./Adv. Mgr.: B. Counce; Inside Sls. Cont.: D. Ealy

Blan Elctrncs. Corp., 56 Warren St., New York. N. Y. 10007, (212) BE 3-6288, 233-6090, Gen. Sls. Mgr.: E. L. Blan

Bluff City Distributing Co., 234 East St. P. O. Box 418, Memphis, Tenn. 38101, (901) 725-9500, Mktg./Adv. Mgr.: P. O. Henry; Gen. Sls. Mgr.: A. Cowles Jr.; Ind. Sls. Mgr.: G. Cowles

Bodelle Co. Inc., 13803 S. School St., Chicago Ill. 60627, (312) 468-1016, Mktg./Adv. Mgr.: R. L. Bode; Gen. Sls. Mgr.: R. L. Bode; Ind. Sls. Mgr.: R. L. Bode; Inside Sls. Cont.: T. Scholz, J. French

Bodelle Co. Inc., 20441 Jas Couzens, Detroit, Mich. 48235, (313) 273-6920, Branch Mgr.: C. Mauch

Bond Radio Elect's Inc., 439 W. Main St., Waterbury, Conn. 06702, (203) 757-0546, Gen. Sls. Mgr.: R. Fulliero; Ind. Sls. Mgr.: A. Andrus; Inside Sls. Cont.: V. Boccardi

Bondurant Bros., 906 Seiver Ave., Knoxville, Tenn. 37921

Braid Electric Co., 1100 Demonbreun St., Nashville, Tenn. 37203, (615) 242-6511, Gen. Sls. Mgr.: R. Jarratt; Inside Sls. Cont.: R. Jarratt

Brill Elctrncs., 610 E. 10th St., Oakland, Calif. 94604, (415) 834-5888, TWX: 910-366-7204, Mktg./Adv. Mgr.: W. Wheeler; Gen. Sls. Mgr.: P. Seitz; Ind. Sls. Mgr.: H. Gregor; Inside Sls. Cont.: D. Seitz

Brooks Elctrncs., 1307 Natchitoches P. O. Box 126, W. Monroe, La. 71291, (318) 323-0344, Gen. Sls. Mgr.: J. C. Brooks

Brooks Supply Co., 1307 Natchitoches, W. Monroe, La. 71291, (318) 323-0344, Gen. Sls. Mgr.: J. Brooks

Brownell Electro Inc., 500 Hadley Rd. and Durham Ave., South Plainfield, N. J. 07080, (201) 753-4600

Buchanan & Abrams Inc., P. O. Box 6206, Orlando, Fla. 32803, (305) 423-8995, Branch Mgr.: E. Abrams

Bud Elctrnc. Supply Co., 22 N. Jackson, Danville, Ill. 61832, (217) 446-0926, Mktg./Adv. Mgr.: G. Ries; Gen. Sls. Mgr.: M. Ehrlich; Ind. Sls. Mgr.: G. Ries; Inside Sls. Cont.: M. Ehrlich

Burkin G. W. Elec. Ind. Inc., 2374-60 St., Brooklyn, N. Y. 11204, (212) 339-5300, Mktg./Adv. Mgr.: G. W. Burkin; Inside Sls. Cont.: W. Weisburd

Burks P. I., 842 S. 7th, Louisville, Ky. 40203, (502) 589-3960

Burstein-Applebee Ind. Div., 800 Lincoln, Denver, Colo. 80203, (303) 244-3336, TWX: 910-931-0592, Branch Mgr.: J. Summers

Burstein-Applebee Ind. Div. %Rinaldi Sales, 6319 Central, Chicago, Ill. 60646, (312) 763-4848, Branch Mgr.: J. Rinaldi

Burstein-Applebee Ind. Div., Quincy, Ill. 62301, Enterprise 1102

Burstein-Applebee Ind. Div., 3188 Mercier, Kansas City, Mo. 64111, (816) 561-5460, TWX: 910-771-2089, Mktg./Adv. Mgr.: J. Neustadt Jr.; Gen. Sls. Mgr.: H. Smith; Ind. Sls. Mgr.: O. Herod; Inside Sls. Cont.: L. King

Burstein-Applebee Ind. Div., St. Louis, Mo. 63100, Enterprise 30085

Burstein-Applebee Ind. Div., 620 N. 48th St., Lincoln, Neb. 68504, (402) 434-0678, TWX: 910-621-8113, Branch Mgr.: T. Lyons

— C —

C & G Elctrncs. Co., 401 West Market, Aberdeen, Wash., 98520, (206) LE 2-3531, Branch Mgr.: D. I. Scott

C & G Elctrncs. Co., 1301 Pacific, Bremerton, Wash. 98310, (206) ES 7-5515, Branch Mgr.: R. V. Mallette

C & G Elctrncs. Co., 820 Vandercook Way, Longview, Wash. 98632, (206) 425-5540, Branch Mgr.: J. L. Sherman

C & G Elctrncs. Co., 318 North Capitol Way, Olympia, Wash. 98502, (206) 352-7593, Branch Mgr.: G. L. Bisom

C & G Elctrncs. Co., 2502 Jefferson Ave., Tacoma, Wash. 98402, (206) BR 2-3185, Mktg./Adv. Sls./Mgr.: L. R. Norberg

C & S Elctrnc. Supply Co. Inc., 2500 Silver Star Rd., Orlando, Fla. 32804, (305) 299-4300, Branch Mgr.: C. Sommella

Cain Elctrn., 1530 Ingleside Rd., Norfold, Va. 23502

California Elec. Supply, 1911 Armacost W., Los Angeles, Calif. 90025, (313) 477-8561

California Switch & Signal, 1009 Arbor Vitae, Inglewood, Calif. 90301, (213) 776-3550, TWX: 910-328-6567, Mktg./Adv. Mgr.: I. Perlman; Gen. Sls. Mgr.: R. Andrade; Ind. Sls. Mgr.: I. Perlman; Inside Sls. Cont.: R. Andrade

Cal-State Elctrncs., 5222 Venice Blvd., Los Angeles, Calif. 90019, (213) 933-8187, Mktg./Adv. Mgr.: R. I. Landis; Gen. Sls. Mgr.: D. Dougherty; Ind. Sls. Mgr.: J. Green; Inside Sls. Cont.: D. Dougherty

Calvert Elctrncs. Inc., P. O. Box 5066, San Jose, Calif. 95150, (408) 265-0521, TWX: 910-338-0521, Branch Mgr.: J. Fudim

Calvert Elctrncs. Inc., 220 E. 23 St., New York, N. Y. 10010, (212) 679-1340, TWX: 910-581-4088, Gen Sls. Mgr.: M. E. Klopert; Inside Sls. Mgr.: J. McBride

Calvert Elctrncs. Int'l., Box 5066, Santa Clara, Calif. 95051, (408) 265-0521

Cam Elctrncs. Distributing Corp., 1468 Westchester Ave., Bronx, N. Y. 10472, (212) 893-8300, Inside Sls. Cont.: J. Katz

Cameradio Elctrncs., 2801 Liberty Ave., Pittsburgh, Pa. 15222, (412) 288-2600, TWX: 710-664-2016, Mktg.: P. J. Murphy; Gen. Sls. Mgr.: J. Wilson; Ind. Sls. Mgr.: P. J. Murphy; Inside Sls. Cont.: E. Cooper

Camp J. N. Pres., 961 E. Sullivan St. Box 827, Kingsport, Tenn. 37662, (615) 247-8111, Ind. Sls. Mgr.: J. Camp Jr.; Inside Sls. Cont.: J. N. Camp, Jr.

Capewide Elctrnc. Supply Corp., 20 Willow Ave., Hyannis, Mass. 02601, (617) 775-3277, Mktg./Adv. Mgr.: R. E. White; Gen. Sls. Mgr.: G. T. Lewis; Inside Sls. Cont.: R. S. Twomey

Capitol Elctrnc. Supply, 15219 Stagg St., Van Nuys, Calif. 91405, (213) 781-8410, Mktg./Adv. Mgr.: L. Harding; Gen. Sls. Mgr.: G. Unkeless; Inside Sls. Cont.: R. Reali, H. Turner

Capitol Radio Wholesalers Inc., 12270 Wilkins Ave., Rockville, Md. 20852, (301) 881-2270, Mktg./Adv. Mgr.: W. M. Starling; Gen. Sls. Mgr.: C. T. Williams; Inside Sls. Cont.: R. Greenslade

Capp's TV Elctrncs., 2405 Thompson Blvd., Ventura, Calif. 93003, (805) 648-3189, 485-6533, Mktg./Adv. Mgr.: E. Capp Loughboro, Owner

Carlac Elctrnc. Ind. Sales Inc., 75 Orville Dr. P. O. Box 157, Bohemia, N. Y. 11716, (516) 567-4200, Mktg./Adv. Mgr.: J. Cardi, M. Ellis; Gen. Sls. Mgr.: B. Molter; Ind. Sls. Mgr.: P. Wright; Inside Sls. Cont.: R. Johnson

Carlton-Bates Co., 6821 Scott Hamilton Dr., Little Rock, Ark. 72209, (501) 562-9100, Mktg./Adv. Mgr.: J. Carlton; Gen. Sls. Mgr.: J. Carlton; Inside Sls. Cont.: E. Evans

Carlton-Bates Co., 1510 State St., Pine Bluff, Ark. 71601, (501) 535-1354, Branch Mgr.: M. Hurst

Carmichael Wholesale Supply Co., 138-40 S. Foster St., Dothan, Ala. 36301, (205) 792-0066-67, Mktg./Adv. Mgr.: J. L. Bryan

Carolina Elctrnc. Supply Co., 221 W. Washington, Greenville, S. C. 29602, (803) 239-4272, Branch Mgr.: A. Watson

Carroll Radio & TV Supply, 1123 W. 6th, Topeka, Kan. 66606, (913) 234-6677, Gen. Sls. Mgr.: Benning; Inside Sls. Cont.: Humpert

Carter Elctrnc. Supply Co. Inc., 301 Towson Ave., Fort Smith, Ark. 72901, (501) 783-4129, Mktg./Adv. Mgr.: C. Dunn; Inside Sls. Cont.: C. Dunn

Carter Supply Co., 3208 Washington Blvd., Ogden, Utah 84401, (801) 393-8603, Mktg./Adv. Mgr.: F. E. Carter; Gen. Sls. Mgr.: J. Evertsen; Ind. Sls. Mgr.: V. Steed; Inside Sls. Cont.: V. Steed

Cass Altshuler Co., 801 - 7th Ave., Oakland, Calif. 94606, (415) 834-4225, Mktg./Adv. Mgr.: K. Altshuler; Inside Sls. Cont.: K. Altshuler

Castrup's Radio Supplies, 1014 W. Franklin St., Evansville, Ind. 47710, Inside Sls. Cont.: I. A. Castrup

Central Distributors, 1035 Conger, Eugene, Ore. 97402, (503) 342-1101, Branch Mgr.: G. Carr

Central Distributors, 605 N. Fir St., Medford, Ore. 97501, (503) 773-6677, Branch Mgr.: G. Carr

Central Distributors, 955 N. E. Union, Portland, Ore. 97232, (503) 234-0711, Mktg./Adv. Mgr.: J. Murphy; Gen. Sls. Mgr.: B. Cortes; Inside Sls. Cont.: J. Murphy

Central Elctrnc. Distributors, 1179 Andover Park W., Tukwilla, Wash. 98188, (206) 243-9611, Branch Mgr.: W. Arbaugh

Central Radio TV Inc., 1194 Merchant St., Ambridge, Pa. 15003, (412) 266-6139, Inside Sls. Cont.: J. Mlynko

Central Utah Elctrncs., P. O. Box N, Provo, Utah 84601, (801) 373-7522, Inside Sls. Cont.: G. S. Moore

Certified Elctrn., 1313 Powhatan St., Alexandria, Va. 22314

Certified Elctrnc. Dist. Inc., 5959 W. Fullerton Ave., Chicago, Ill. 60639, (312) NA 2-2291, Gen. Sls. Cont.: Petrucci

Channel Radio Supply Co., 108 Areo Camino, Goleta, Calif. 93017, (805) 968-3918, Branch Mgr.: J. Seerley

Channel Radio Supply Co., 18 E. Ortega St., Santa Barbara, Calif. 93101, (805) 965-8551, Mktg./Adv. Mgr.: T. Shannon; Gen. Sls. Mgr.: B. Shannon; Ind. Sls. Mgr.: B. Shannon

Chavis J. M. Assoc., 6 Byers Ct., Randallstown, Md. 21133, (301) 484-6399

Chester Elctrnc. Supply Co., 1416 Washington St., Waukegan, Ill. 60085, (312) 623-5000, Branch Mgr.: J. Eternicka

Chester Elctrnc. Supply Co., 1220 60th St., Kenosha, Wisc. 53140, (414) 658-4616, Mktg./Adv. Mgr.: W. Wynne; Gen. Sls. Mgr.: B. Pocan; Ind. Sls. Mgr.: B. May; Inside Sls. Cont.: B. Pocan

Chief Elec., 14 N. Bridge St., Poughkeepsie, N. Y. 12601

Chown E., 500 Park Ave., E. Hartford, Conn. 06108, (514) 725-9414, Branch Mgr.: E. Chown

Chris Supply Co. Inc., 403 W. Blvd., Rapid City, S. D. 57701, (605) 342-5900, Inside Sls. Mgr.: H. E. Hensley

City Elctrnc. Supply, 5074 Richmond Ave., Houston, Tex. 77027, (713) 621-1060, Inside Sls. Cont.: A. V. Stalinsky

Coast Elctrncs. Inc., 1901 - S. Dixie Hwy., West Palm Beach, Fla. 33401, (305) 833-5636, Inside Sls. Cont.: P. Heller

Colfax Co. Div. of R/D, 1485 M135 Hwy., Benton Harbor, Mich., (616) 927-3519, Branch Mgr.: W. Glendening

Collins Bros. Elctrncs. Inc., 4946 Marlboro Pike, Washington, D. C. 20027, (301) 420-4400, Mktg./Adv. Mgr.: D. Collins; Gen. Sls. Mgr.: R. Duncan; Inside Sls. Cont.: J. Robertson

Columbia Electric, 9th & "F" St., Lewiston, Idaho 83501, Branch Mgr.: E. Wilponen

Columbia Electric, 407 Fruitland, Kennewick, Wash. 99336, Branch Mgr.: J. Hogg

Columbia Electric, E. 3420 Ferry, Spokane, Wash. 99202, (509) KE 4-0611, TLX: 32-6467, Mktg./Adv. Mgr.: W. M. Bigelow; Gen. Sls. Mgr.: W. M. Bigelow; Ind. Sls. Mgr.: W. M. Bigelow; Inside Sls. Cont.: J. Schmidlkofer

Communications Control Centers Inc., 201 Black Rock Rd., Hampstead, Md. 21074, (301) 239-7330, Mktg./Adv. Mgr.: W. W. Wright; Gen. Sls. Mgr.: W. W. Wright

Communications Sales Co., 4125 Church St., Fort Worth, Tex. 76112, (817) 237-5276, Branch Mgr.: D. P. Beard

Communications Sales Co., 206 Wiggs Lane, Weatherford, Tex. 76086, (817) 594-5770, Mktg./Adv. Mgr.: C. H. Beard

Compar Albany Branch, 6 Highland Ave., Albany, N. Y. 12205, (518) 489-7408, TWX: 710-441-8224

Compar Albany Branch, P. O. Box 135, Endwell, N. Y. 13760, (607) 732-8743, Branch Mgr.: R. Duncan

Compar Albany Branch, 42 Winding Brook Dr., Fairport, N. Y. 14450, (716) 271-2230

Compar Albany Branch, P. O. Box 112, Liverpool, N. Y. 13088, (315) 471-3356, Branch Mgr.: D. Snyder

Compar Arizona, P. O. Box 1607, Scottsdale, Ariz. 85252, (602) 947-4336, TWX: 910-950-1293, Branch Mgr.: V. Adrig, Reg'l. Mgr.

Compar Chesapeeke, 7 Church Lane, Baltimore, Md. 21208, (301) 484-5400, TWX: 710-862-0860, Branch Mgr.: B. White, Reg'l. Mgr.

Compar Corp., 828 Airport Blvd., Burlingame, Calif. 94010, (415) 347-9501, TWX: 910-374-2841, Mktg./Adv. Mgr.: D. Morse; Inside Sls. Cont.: J. Louie, Prod. Mgr.

Compar Denver, 781 Vallejo St., Denver, Colo. 80204, (303) 623-8713, Reg'l. Mgr.: C. Walker

Compar Florida, 6731 1st Ave. S., St. Petersburg, Fla. 33707, (813) 342-8741

Compar Los Angeles, 2014 W. 139th St., Gardena, Calif. 90249, (213) 327-6550, TWX: 910-346-6316, Branch Mgr.: G. Burroughs

Compar Michigan, 53808 Sophia, Utica, Mich. 48087, (313) 781-3900, Branch Mgr.: E. Hufferd

Compar Midwest, 1001 East Touhy, Des Plaines, Ill. 60018, (312) 824-0104, Reg'l Mgr.: S. Coombs

Compar Midwest, 11734 Lackland Industrial Dr., St. Louis, Mo. 63141, (314) 567-3399, TWX: 910-764-0839, Branch Mgr.: D. Napper

Compar Midwest Branch, 5324 Kyle Rd., Ft. Wayne, Ind. 46809, (219) 747-0402, Ans. Serv. 219-743-4611, Branch Mgr.: J. Rigor

Compar New England, 88 Needham St., Newton Highlands, Mass. 02161, (617) 969-7140, TWX: 710-335-1686, Reg'l Mgr.: H. Kaufman

Compar New England Branch, P. O. Box 5204, Hamden, Conn. 06518, (203) 288-9276, TWX: 710-465-1540, Branch Mgr.: F. Byerly

Compar New York, 404 Clifton, N. J. 07011, (201) 546-3660, TWX: 710-989-7239, Reg'l Mgr.: R. Tritchel

Compar Northwest, 13240 Northrup Way, Bellevue, Wash. 98805, (206) 747-6863, TWX: 910-443-2468, Reg'l Mgr.: J. Clark

Compar Ohio, P. O. Box 4791, Fairview Pk., Ohio 44126, (216) 333-4120, TWX: 810-421-8396, Reg'l Mgr.: N. Case

Compar Ohio Branch, 1112 Greentree Dr., Dayton, Ohio 45429, (513) 435-1301, Mktg./Adv. Mgr.: J. Coy

Compar Philadelphia, 116 Haddon Ave., Collingswood, N. J. 08108, (609) 854-1222, TWX: 710-943-0996, Branch Mgr.: S. Shapiro

Compar San Diego, 7138 Convoy Ct., San Diego, Calif. 92111, (714) 565-0444

Compar Southern, 1106 Burke St., Winson-Salem, N. C. 27101, (919) 723-1002, TWX: 510-931-3101, Branch Mgr.: J. F. Zammit, Reg.'l. Mgr.

Compar Southern Branch, 904 Bob Wallace Ave. Suite 114, Huntsville, Ala. 36801, (205) 539-8476, Branch Mgr.: R. L. Sanders

Compar Twin Cities, P. O. Box 16183, Minneapolis, Minn. 55416, (612) 922-7011, Reg'l Mgr.: C. E. Bohlig

Com-Supply Inc., 918 Dragon St. P. O. Box 10431, Dallas, Tex. 75207, (214) 747-6677, 747-7206, Gen. Sls. Mgr.: F. Nall, Inside Sls. Cont.: G. Odom

Connecticut Electro Sales, 1601 Dixwell Ave., Hamden, Conn. 06514, (203) 288-8266, Branch Mgr.: M. D'Angelo; Sls. Cont.: M. D'Angelo

Consolidated Elec. Distr. Inc., 2053 NW Upshur, Portland, Ore., (503) 244-3200

Consumer Elctrncs. Supply Co., 518 N. Appleton St. P. O. Box 975, Appleton, Wis. 54911, (414) 733-6012, Gen. Sls. Mgr.: C. H. Lembeke

Control Comps, 401 Fay Rd., N. Syracuse, N. Y., (315) 458-6709

Control Comps., 401 Fay Rd., Minneapolis, Minn., (612) 721-1629

Control Design Inc., 3433 E. 25th St., Minneapolis, Minn. 55406, (612) 721-1629

Coombs S. & Assoc., 1001 E. Touhy Dr., Des Plaines, Ill. 60018, (312) 298-4830, TWX: 910-233-5890, Branch Mgr.: S. Coombs

Corcoran Assoc., P. O. Box 45897, Los Angeles, Calif. 90045

Corning Elctrncs. Inc., 81-83 W. William St., Corning, N. Y. 14830, (607) 962-0555, Gen. Sls. Mgr.: W. E. Drake; Inside Sls. Cont.: O. E. Hunt

Coron Corp., 2260 Grissom Rd., Creve Coeur, Mo., (314) 432-3444

Cortland Elctrnc. Supply, 23 Clinton Ave., Cortland, N. Y. 13045, (607) 756-2523, Mktg./Adv. Mgr.: D. Musci; Gen. Sls. Mgr.: D. Musci; Ind. Sls. Mgr.: S. Musci; Inside Sls. Cont.: S. Musci

Corvair Elctrncs. Inc., 150 - Fifth Ave., New York, N. Y. 10011, (212) AL 5-7007-8-9

County Supply Co., 3rd Ave. & Fleetwood St., Coatesville, Pa. 19320, (215) 384-4585, Inside Sls. Cont.: F. Jeavons

County Supply Co., 1936 MacDade Blvd., Woodlyn, Pa. 19094, (215) TR 2-2439, Branch Mgr.: E. Curtis

Cramer/Arizona, 2816 N. 16th St., Phoenix, Ariz. 85006, (602) 263-1112

Cramer/Atlanta, 3923 Oakcliff Industrial Ct., Atlanta, Ga. 30340, (404) 448-9050

Cramer/Binghamton, 3220 Watson Blvd., Endwell, N. Y. 13760, (607) 754-6661

Cramer/Bonn, 7275 Bush Lake Rd., Edina, Minn. 55435, (612) 835-7811

Cramer/Chicago, 1911 S. Busse Rd., Mt. Prospect, Ill. 60056, (312) 593-8230

Cramer/Cleveland, 5835 Harper Rd., Cleveland, Ohio 44139, (216) 248-8400

Cramer/Connecticut, 35 Dodge Ave., North Haven, Conn. 06473, (203) 239-5641

Cramer/Denver, 5465 E. Evans Pl. at Hudson, Denver Colo. 80222, (303) 758-2100

Cramer/Detroit, 13193 Wayne Rd., Livonia, Mich. 48150, (313) 425-7000

Cramer/EW Baltimore, 922-24 Patapsco Ave., Baltimore, Md. 21230, (301) 354-0100

Cramer/EW Hollywood, 4035 N. 29th Ave., Hollywood, Fla. 33020, (305) 923-8181

Cramer/EW Huntsville Inc., 2310 Bob Wallace Ave. S.W., Huntsville, Ala. 35805, (205) 539-5722

Cramer/EW Orlando, 345 N. Graham Ave. P. O. Box 20214, Orlando, Fla. 32814, (305) 894-1511

Cramer/EW Washington, 16021 Industrial Dr., Gaithersburg, Md. 20760, (301) 948-0110

Cramer/EW Winston-Salem, 938 Burke St., Winston-Salem, N. C. 27102, (919) 725-8711

Cramer/Florida Elec., 4141 N.E. 6th Ave., Ft. Lauderdale, Fla. 32019

Cramer/International, 85 Wells Ave., Newton, Mass. 02159, (617) 969-7700, TELEX-92-2486, Cable-Cramerel

Cramer/Italia, Via Cristoforo Colombo, 134, Roma, Italy 00147, 51-393-87 & 51-393-90

Cramer/Long Island, 29 Oser Ave., Hauppauge, L. I., N. Y. 11787, (516) 231-5600

Cramer/Los Angeles, 17201 Daimler St., Irvine, Calif. 92705, (714) 979-3000, (213) 771-8300

Cramer/New Jersey, 1 Barrett Ave., Moonachie, N. J. 07074, (201) 935-5600

Cramer/New Mexico, 137 Vermont N.E., Albuquerque, N. M. 87108, (505) 265-5767

Cramer/Pennsylvania Inc., 7300 Route 130 N., Pennsauken, N. J. 08110, (215) 923-5950

Cramer/Rochester, 3259 Winton Rd. S., Rochester, N. Y. 14623 (716) 275-0300
Cramer/San Diego, 8975 Complex Dr., San Diego, Calif. 92123, (714) 565-1881
Cramer/San Francisco, 720 Palomar Ave., Sunnyvale, Calif. 94086, (408) 739-3011
Cramer/Seattle, 5602 6th Ave. S., Seattle, Wash. 98108, (206) 762-5755
Cramer/Syracuse, 6716 Joy Rd., E. Syracuse, N. Y. 13057, (315) 437-6671
Cramer/Systems, 29 Oser Ave., Hauppauge, L. I., N. Y. 11787, (516) 231-5682
Cramer/Texas, 2970 Blystone Lane, Dallas, Tex. 75220, (214) 350-1355, in Houston, Enterprise 2831, Texas Watts (800) 492-6940
Cramer/Tri-States Inc., 666 Redna Terr., Cincinnati, Ohio 45215, (513) 771-6441
Cramer/Utah, 391 W. 2500 S., Salt Lake City, Utah 84115, (801) 487-3681
Cramer/Wisconsin, 5626 N. 91st St., Milwaukee, Wisc. 53225, (414) 462-8300
Cramer elctrncs. Canada Ltd., 920 Alness St., Unit #9, Downsview, Ontario, Canada, (416) 661-9222
Cramer Elctrncs. De Puerto Rico, Subdivision Industrial, BO. Retiro, San German, Puerto Rico 00753, (809) 892-2600
Cramer Elctrncs. Inc., 85 Wells Ave., Newton, Mass. 02159, (617) 969-7700
Crescent Electrncs., 212 W. 10th St. P. O. Box 959, Bowling Green, Ky, 42101, (502) 842-2444, Mktg./Adv. Mgr.: L. R. Deloteus; Gen. Sls. Mgr.: A. M. Gott
Crescent Elctrncs., 101 Jasper St., Somerset, Ky. 42501, (606) 679-1105, Branch Mgr.: R. E. Lankford
Crosstown Elctrncs. Inc., Abbott & Ridge Rds., Lackawanna, N. Y. 14218, (716) 826-2600, Mktg./Adv. Mgr.: H. Haym; Gen. Sls. Mgr.: H. Haym; Ind. Sls. Mgr.: P. Milosevich; Inside Sls. Cont.: A. Antonacci
Cumberland Elctrncs. Inc., 810 N. Hanover St., Carlisle, Pa. 17013, (717) 243-6169, Branch Mgr.: C. Dunkleberger
Cumberland Elctrncs. Inc., 1345 S. 12th St., Harrisburg, Pa. 17104, (717) 232-9715 Ind. No., 233-5883 Dealer No., Mktg./Adv. Mgr.: R. Clave; Gen. Sls. Mgr.: F. Misiti; Ind. Sls. Mgr.: W. Tarbert; Inside Sls. Cont.: C. Polm
Cumberland Elctrncs. Inc., 113 S. Main St., Lewistown, Pa. 17044, (717) 248-9631, Branch Mgr.: D. Yetter
Cumberland Elctrncs. Inc., 1748 6th Ave., York, Pa. 17403, (717) 848-1511, Branch Mgr.: S. Shade
Cuny-Guerber Inc., 3468 Kennedy Blvd., Jersey City, N. J. 07307, (201) 227-7722
Curle Elctrns., 1813-S. Market, Chattanooga, Tenn.
Cushing T. F. Inc., 1026 Bay St., Springfield, Mass. 01101, (413) 788-7341, Gen. Sls. Mgr.: C. Robinson
Custom Fidelity Co., 7925 Santa Monica Blvd., Los Angeles, Calif. 90046, (213) 654-7267, Mktg./Adv. Mgr.: E. Fertig; Gen. Sls. Mgr.: W. Jones; Ind. Sls. Mgr.: V. Levy; Inside Sls. Cont.: S. Ball
C W Elctrnc. Sales Co., 1401 Blake St., Denver, Colo. 80202, (303) 244-5523, Mktg./Adv. Mgr.: H. T. Henley; Gen. Sls. Mgr.: J. Capone; Ind. Sls. Mgr.: J. Capone; Inside Sls. Cont.: J. Capone
C W Y Elctrncs., 405 N. Earl Ave., Lafayette, Ind. 47904, (317) 447-1278, Inside Sls. Cont.: T. French

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D & R Radio Supply Co., 215 S. Third St., Steubenville, Ohio 43952, (614) 283-3643, Inside Sls. Cont.: J. B. Stringer
D & S Electronics, 13425 Telegraph Rd., Whittier, Calif. 90605, (213) 944-8001
Dalis, H. L., 35-35 24th St., Long Island City, N.Y. 11106, Gen. Sls. Mgr.: I. Cohn; Ind. Sls. Mgr.: D. Oberman
Dalis, H. L. Inc., (—) N. J. 1550 Route 9, Woodbridge, N. J. 07095, Branch Mgr.: N. De Luca
Dalis Elctrnc. Supply, 917 N. 7th St., Phoenix, Ariz. 85006, (602) 258-8151, Mktg./Adv. Mgr.: T. Farrah; Gen. Sls. Mgr.: E. Loya; Ind. Sls. Mgr.: K. Camp; Inside Sls. Cont.: E. Loya
Dalis Elec. Supply, 3380 E. Ajo Way, Tucson, Ariz. 85713, (602) 889-6391, Branch Mgr.: B. Gage
Dandreta, W. & Co., 28 Wolcott St., Providence, R. I. 02908, (401) 861-2800, Mktg./Adv. Mgr.: A. O. Costantino; Gen. Sls. Mgr.: A. O. Costantine; Inside Sls. Cont.: W. Dandreta
Dapco, Inc., 3687 N. East Xprsway, Atlanta, Ga. 30340, (404) 458-6341, Branch Mgr.: C. J. Glenn
Davis Elctrncs. Corp., 204 Main St., Hempstead, N. Y. 11550, (516) 483-9200, Mktg./Adv. Mgr.: H. E. Davis; Gen. Sls. Mgr.: B. Lehman; Ind. Sls. Mgr.: M. Landman; Inside Sls. Cont.: H. Davis
Davis Wholesale Elctrnc. Supply Co., 3575 Choctaw Dr., Baton Rouge, La. 70805, Mktg./Adv. Mgr.: F. W. Davis
DCI Distributors, 51 Rear Canal St., Salem, Mass. 01970, (617) 745-3487, Mktg./Adv. Mgr.: K. Hollingsworth; Inside Sls. Cont.: E. Cormier
Dean D. B. & Co., 407 Rte. 44, Raynham, Mass. 02767, (607) 824-4117, Mktg./Adv. Mgr.: P. Dean; Gen. Sls. Mgr.: D. B. Dean
Deeco, Inc., 2500 16th Ave. S.W., Cedar Rapids, Iowa 52406, (319) 365-7551, TWX: 910-325-1551, Mktg./Adv. Mgr.: A. Jacobs; Gen. Sls. Mgr.: A. Jacobs; Ind. Sls. Mgr.: L. Wilkey; Inside Sls. Cont.: P. McGinn
Delta Elctrnc. Center, 13021 S. Western Ave., Blue Island, Ill. 60406, (312) 388-4500, Inside Sls. Cont.: L. F. Catlin
DeMambro Elctrncs. 437 Boston Post Rd., Milford, Conn. 06460, (203) 878-6521, Branch Mgr.: T. Hardy
DeMambro Radio Supply, 97 Preble St., Portland, Me. 04101, (207) 773-4733, Branch Mgr.: R. Burdwood
DeMambro Radio Supply, 1095 Commonwealth Ave., Boston, Mass. 02215, (617) 254-9000, Mktg./Adv. Mgr.: F. DeMambro; Gen. Sls. Mgr.: F. DeMambro; Ind. Sls. Mgr.: F. Mielby; Inside Sls. Cont.: F. Mielby
DeMambro Radio Supply, 198 Broadway, Lawrence, Mass. 01840, (617) 687-7171, Branch Mgr.: C. McNeil
DeMambro Radio Supply, 280 Highland Ave., Salem, Mass. 01970, (617) 745-1363, Branch Mgr.: C. McNeil
DeMambro Radio Supply, 222 Summer St., Worcester, Mass. 01608, (617) 757-5626, Branch Mgr.: N. Joseph
DeMambro Radio Supply, 300 West St., Keene, N. H. 03431, (603) 352-5039, Branch Mgr.: G. LeClare
DeMambro Radio Supply, 1308 Elm St., Manchester, N. H. 03101, (603) 624-4006, Branch Mgr.: G. LeClare
DeMambro Radio Supply, 1290 Westminster St., Providence, R. I. 02909, (401) 521-5600, Branch Mgr.: N. LaPlante
Denison Radio Supply, 426 W. Woodard St., Denison, Tex. 75020, (214) 465-2336, Mktg./Adv. Mgr.: C. Hardy; Inside Sls. Cont.: C. Hardy
Diehl's (Radio & TV Supply), 2120 7th St., Port Arthur, Tex. 77640, (713) 982-6311, Branch Mgr.: J. Orta
Diplomat Elctrncs. Inc., 130 W. 30th St., New York City, N. Y. 10001, (212) 594-3590, Gen. Sls. Mgr.: I. Lane; Inside Sls. Cont.: M. Laurence, A. Nadata
Distro Inc., 12517 Burbank Blvd., N. Hollywood, Calif. 91607, (213) 980-8888, Inside Sls. Cont.: K. Williams
Dixon, 611 E. 3rd St., Sterling, Ill. 61081, Branch Mgr.: G. Hartman
Dixon Elctrncs. Co., 115 N. Galena Ave., Dixon, Ill. 61021, (815) 288-2712, Mktg./Adv. Mgr.: V. Drott
Dixie Radio Supply Co. Inc., 1234 Gordon Park Rd., Augusta, Ga. 30901, (404) 722-2055, Branch Mgr.: R. L. Guess
Dixie Radio Supply Co., Inc., 2220 S. Tryon, Charlotte, N. C. 28203, (704) 377-5413, Branch Mgr.: E. James
Dixie Radio Supply Co. Inc., 507 W. Airline Ave., Gastonia, N. C. 28053, (704) 864-3281, Branch Mgr.: R. H. Williams
Dixie Radio Supply Co. Inc., 1206 S. Murray Ave., Anderson, S. C. 29621, (803) 226-3421, Branch Mgr.: C. T. Propes
Dixie Radio Supply Co. Inc., 1900 Barnwell St. P. O. Box 408, Columbia, S. C. 29202, (803) 253-5333, Branch Mgr.: K. R. Sweet; Gen. Sls. Mgr.: L. H. Shuler; Ind. Sls. Mgr.: R. O. Etheridge; Inside Sls. Cont.: J. Long
Dixie Radio Supply Co. Inc., 531 E. Palmetto St., Florence, S. C. 29501, (803) 669-8201, Branch Mgr.: L. Sprouse
Dixie Radio Supply Co. Inc., 500 Pendleton St., Greenville, S. C. 29602, (803) 232-5357, Branch Mgr.: J. O. Edwards
Dixie Radio Supply Co. Inc., 116 Circular St., Greenwood, S. C. 29646, (803) 229-4954, Branch Mgr.: C. Cottingham
Dixie Radio Supply Co. Inc., 208 E. St. John St., Spartanburg, S. C. 29301, (803) 583-3681, Branch Mgr.: R. Belk
Dixie Radio Supply Co. Inc., 25 Guignard Dr., Sumter, S. C. 29150, (803) 775-2306, Branch Mgr.: S. Calcutt
Dossett Elctrnc. Supply Co., 114 Babcock St., Melbourne, Fla. 32935, (305) 254-0120, Gen. Sls. Mgr.: M. H. Dossett
Douglas Elctrncs., 1118 S. Staples, Corpus Christi, Tex. 78404, (512) 883-5103, Mktg./Adv. Mgr.: D. S. Stephens; Inside Sls. Cont.: R. N. Douglas
Duke's Radio Co., 209 Sixth St., Sioux City, Iowa 51102, (712) 255-5056, Gen. Sls. Mgr.: L. Rider
Dunlap Elctrncs., 824 Cherry St., Chico, Calif. 95926, (916) 342-8313, Branch Mgr.: G. Deming
Dunlap Elctrncs., 1750 McKinley, Fresno, Calif. 93703, (209) 268-6111, Branch Mgr.: L. Barsoian
Dunlap Elctrncs., 25354 Cypress, Hayward, Calif. 94544, (415) 352-1933, Mgr.: T. Hendricks
Dunlap Elctrncs., 1012 Sixth St., Marysville, Calif. 95901, (916) 742-7126, Branch Mgr.: G. Lim
Dunlap Elctrncs., 419 Tenth St., Modesto, Calif. 95354, (209) 524-5191, Branch Mgr.: J. Scholl
Dunlap Elctrncs., 539 Romona Ave., Monterey, Calif. 93940, (408) 373-1828, Mgr.: D. Corona
Dunlap Elctrncs., 2025 Old Middlefield, Mt View, Calif. 94040, (415) 968-7388, Branch Mgr.: J. Minjock
Dunlap Elctrncs., 159 W. 17th, Merced, Calif. 95340, (209) 722-3936, Branch Mgr.: J. Wilson
Dunlap Elctrncs., 1800 18th St., Sacramento, Calif. 95814, (916) 444-8070, Branch Mgr.: D. Schindler
Dunlap Elctrncs., 233 Commercial, San Jose, Calif. 95031, (408) 287-2627, Branch Mgr.: C. Burford
Dunlap Elctrncs., 27 S. Grant St., (Box 1970) Stockton, Calif. 95201, (209) 466-3373, Gen. Sls. Mgr.: J. Clake
Dunlap Elctrncs., 3060 Bechelli La., Redding, Calif. 96001, (916) 243-6513, Branch Mgr.: J. Speicher
Dunlap Elctrncs., 900 E. Fourth, Reno, Nev. 89502, (702) 329-1308, Branch Mgr.: K. Berrett
Dutchess Tel-Audio, Inc., Electronic Distributors, 5 Spackenkill Rd., Poughkeepsie, N. Y. 12603, (914) 462-1700, F. G. Greenberg, Pres.; Gen. Sls. Mgr.: F. W. Jillard, V. P.; Inside Sls. Cont.: F. W. Jillard
Dynaservice Co., 1020 S. Atlantic Blvd., Los Angeles, Calif. 90022, (213) 268-8531, TWX: 910-321-3032, Gen. Sls. Mgr.: R. Marshall

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Eastco, 95 Leggett St., E. Hartford, Conn. 06108, (203) 528-6581, Branch Mgr.: Sam Schwartz
Eastco, 26 Dartmouth St., Westwood, Mass. 02090, (617) 329-3066, Gen. Sls. Mgr.: S. Melanson
East Coast Elctrncs. Co. Inc., 296 Salem St., Medford, Mass. 02155, (617) 395-9050, Mktg./Adv. Mgr.: F. Rinfret; Gen. Sls. Mgr.: J. Stosez; Inside Sls. Cont.: J. Stosez
Eastern Elctrnc. Dist., 1802-04 S. Broad St., Philadelphia, Pa. 19145, (215) HO 3-2400, Mktg./Adv. Mgr.: B. Lacca; Gen. Sls. Mgr.: B. Lacca; Inside Sls. Cont.: J. Daniels
Eastern Elctrncs., Supply Co. Inc., 5009 York Rd., Baltimore, Md. 21212, (301) 323-5100, Gen. Sls. Mgr.: P. Amick; Inside Sls. Cont.: P. Amick
Eastern Radio Corp., 312 Clifton Ave., Clifton, N. J. 07015, (201) 365-2600, TWX: 710-989-7052, Mktg./Adv. Mgr.: J. F. Fabian; Operations Mgr.: J. Aftanis; Ind. Sls. Mgr.: R. Peterson; Inside Sls. Cont.: B. Peterson
Eastern Radio Long Island, 555 Broad Hollow Rd. Melville, N. Y. 11746, (516) 273-5775, Branch Mgr.: J. Fabian; Inside Sls. Cont.: A. D'Ambro
Eastern Radio Television, 280 Hanover St., Meriden, Conn. 06450, (203) 237-2904, Gen. Sls. Mgr.: Charles; Inside Sls. Cont.: Andrew
Edcom, Inc., 74 Bowers St., Newtonville, Mass. 02160, (617) 969-9710
Edwards, W. H. Inc., 55 Electronic Dr., Warwick, R. I. 02888, (401) 781-8000, Gen. Sls. Mgr.: D. Gervais; Ind. Sls. Mgr.: N. Gilbert; Inside Sls. Cont.: M. Schmeller
EL-A-CO Elctrncs. Inc., 235 Lodi St., Elyria, Ohio 44035, (216) 322-2526, Mktg./Adv. Mgr.: J. A. Hottenrott; Gen. Sls. Mgr.: J. A. Hottenrott; Ind. Sls. Mgr.: R. Meko; Inside Sls. Cont.: J. A. Hottenrott
Elec. Sales Pro. Inc., P. O. Box 1938, Honolulu, Hawaii 96813, (808) 533-6095, Mktg./Adv. Mgr.: M. Karren; Gen. Sls. Mgr.: E. Dorman; Inside Sls. Cont.: P. Dorman
Electra Distributing, 1914 W. End Ave., Nashville, Tenn. 37203, (615) 329-3971
Electric Controls Co., 2735 Mercantile Dr., St. Louis, Mo., (314) 645-2400
Electric Specialty Inc., 6505 - Edgewater Dr., Orlando, Fla., (305) 293-3840

Electric Switch, 4111 Beverly Blvd., Los Angeles, Calif. 90004, (213) 664-1141

Electrical Equipment Co., Box 2557, 656 Queen St., Honlulu, Hawaii 96804, 533-3884, TWX: 723-358, Mktg./Adv. Mgr.: R. Yamaoka; Gen. Sls. Mgr.: R. Yamaoka, Ind. Sls. Mgr.: R. Yomaoka; Inside Sls. Cont.: M. Matsuyama

Electrical Equipment Co., 319 Ano St., Kahului (Maui), Hawaii, 877-0222, Branch Mgr.: B. Chun

Electrical Sales Prod., 465 Convention Way, Redwood City, Cal., (415) 364-2621

Electrical Supply Corp., 205 Alewife Brook Pkwy., Cambridge, Mass. 02138, (617) 491-3300, Branch Mgr.: H. J. Leary; Sales Cont.: M. Quigley

Electrical Supplies Inc., 3466 Main St., Hartford, Conn., (203) 527-7111

Electrical Wholesalers, Inc., 1045 S. High St., Harrisonburg, Va. 22801, (703) 434-1751, Mktg./Adv. Mgr.: F. Campbell; Gen. Sls. Mgr.: F. Campbell; Indside Sls. Cont.: F. Mitchell

Electro Air, Atlanta, Ga.

Electro-Com Corp., 3816 Chandler Dr., Minneapolis, Minn. 55421, (612) 788-8601, Branch Mgr.: J. Storch

Electro Comp. Dist., 122 S. Mission Blvd., Los Angeles, Calif. 90033. (213) 264-7100

Electro-Kinetics Inc., 4114 N. Nashville, Ave., Chicago, Ill., (312) 286-4200

Electro Sales, 100 Fellsway W. at Mystic, Somerville, Mass., (617) 666-0500

Electro Sonic, 543 Yonge St., Can. Ont. Toronto, (416) 924-9301

Electro Standard Labs., 3560 N. W. 34th St., Miami, Fla. 33142, (305) 633-6973

Electro-Tech, Inc., 5141 Belhaven Blvd., Charlotte, N. C. 28216, (704) 394-4341

Elctrn. Center, Inc., 127 - 3rd Ave. N., Minneapolis, Minn., (612) 338-5881

Electronic Center, Inc., 1300 Cherry Ave. N. E., Canton, Ohio 44714, (216) 456-7133, Mktg./Adv. Mgr.: B. Feth; Gen. Sls. Mgr.: P. Domenico; Ind. Sls. Mgr.: P. Domenico; Inside Sls. Cont.: H. Forester

Electronic Design Co., 1482 W. County Rd. C, St. Paul, Minn. 55113, (612) 636-3550, Mktg./Adv. Mgr.: S. G. Bridges; Gen. Sls. Mgr.: C. R. Sproat; Ind. Sls. Mgr.: R. Fyten; Inside Sls. Cont.: D. Hunkins

Electronic Discount Store, 1770 Beltline Highway, Mobile, Ala. 36609, (205) 478-5422, Branch Mgr.: R. Reed

Electronic Distributing Co., 720 Tahoe St., P. O. Box 2918, Reno, Nev. 89505, (702) 323-2760, Gen. Sls. Mgr.: H. C. Anderson; Inside Sls. Cont.: R. Cairns

Electronic Distributors, 44539 N. 10th W., Lancaster, Calif. 93534, (805) WH 2-8421, Gen. Sls. Mgr.: H. Gayle; Inside Sls. Cont.: H. Gayle

Electronic Distributors, Inc., 4900 N. Enston, Chicago, Ill. 60630, (312) 283-4800, Ind. Sls. Mgr.: S. Levey; Inside Sls. Cont.: H. Ruby, B. Weiss

Electronic Distributors, Inc., 7421 N. Western Ave., Chicago, Ill. 60645, (312) 761-3250, Branch Mgr.: R. Consamus

Electronic Distributors, Inc., 2412 S. Michigan, Chicago, Ill. 60616, (312) VI 2-0702, Branch Mgr.: S. Vallez

Electronic Distributors, Inc., St. Charles Rd. & Villa Ave., Villa Park, Ill. 60181, (312) 834-5331, Branch Mgr.: R. Kawalcyk

Electronic Distributors, Inc., 2009 W. Washington St., Waukegan, Ill. 60085, (312) MA 3-4000, Branch Mgr.: G. Carnick

Electronic Distributors, Inc., 7015 Calument Ave., Hammond, Ind. 46324, (219) 932-8410, Branch Mgr.: N. Barry

Electronic Distributors, Inc., 1960 Peck St., Muskegon, Mich. 49441, (616) 726-3196, Mktg./Adv. Mgr.: C. Schecter; Gen. Sls. Mgr.: C. Schecter; Ind. Sls. Mgr.: R. Hobbs; Inside Sls. Cont.: C. Conroy

Electronic Equipment, 741-757 Peninsula Blvd., Hempstead, N. Y., (516) 538-5510

Electronic Equipment Co., Inc., 2701 N. W. 42 Ave., Miami, Fla. 33142, (305) 871-3500, TWX: 051520, Mktg./Adv. Mgr.: G. Radell; Gen. Sls. Mgr.: G. Radell; Ind. Sls. Mgr.: S. Goldberger; Inside Sls.Cont.: S. Goldberger

Electronic Equipment Co., Inc., 918 Orange Ave., Winter Park, Fla. 32789, (305) 644-4833, TWX: 564325, Branch Mgr.: K. Barnes

Electronic Expeditors, Inc., 1037 W. Wisconsin Ave., Appleton, Wis. 54910, (414) 731-4181, Branch Mgr.: N. Burton

Electronic Expeditors, Inc., 6045 N. Green Bay Ave., Milwaukee, Wis. 53209, (414) 228-8100, TWX: 910-262-3121, Mktg./Adv. Mgr.: J. Stockhausen; Gen. Sls. Mgr.: R. Hoepfl; Ind. Sls. Mgr.: J. Stockhausen; Inside Sls. Cont.: J. Lassa

Electronic Industries Inc., 19 E. Irving Ave., Oshkosh, Wisc.

Electronic Laboratory Supply Co., 7208 Germantown Ave., Philadelphia, Pa. 19119, (215) 248-2700, Mktg./Adv. Mgr.: J. Snyderman; Inside Sls. Cont.: J. Snyderman

Electronic Mart Inc., 7552 Manchester Ave., Maplewood, Mo. 63143, (314) 781-7643, Mktg./Adv. Mgr.: D. Heil; Inside Sls. Cont.: D. Heil

Electronic Materials Corp., 529 Commerce St., Bluefield, W. Va. 24701, (304) 325-3638, Branch Mgr.: W. L. Haye

Electronic Materials Corp., 1106 Central Ave., Charleston, W. Va. 25302, (304) 344-3577, Mktg./Adv. Mgr.: L. E. McIntyre II; Gen. Sls. Mgr.: F. N. Hayne; Ind. Sls. Mgr.: L. E. McIntyre II; Inside Sls. Cont.: L. E. McIntyre II, F. N. Haye

Electronic Parts, Denver, Colo., (303) 266-3755

Electronic Parts, 1030 S. Ave. W., Missonia, Mont. 59801, (406) 543-3119, Mktg./Adv. Mgr.: M. Smith; Gen. Sls. Mgr.: J. Davies

Electronic Parts & Supply Co., 118 W. Main St., P. O. Box 428, Albertville, Ala. 35950, (205) 878-3041, Inside Sls. Cont.: S. M. Heaton

Electronic Parts & Supplies Inc., 8616 Oak St., New Orleans, La. 70118, (504) 866-1854, Mktg./Adv. Mgr.: G. Planchet; Ind. Sls. Mgr.: D. Pontillas; Inside Sls. Cont.: T. Cazzetta

Electronic Parts Co., 1212 S. Broadway, Denver, Colo. 80210, (303) 744-1992, Gen. Sls. Mgr.: B. Hickman; Ind. Sls. Mgr.: R. Fick; Inside Sls. Cont.: R. Fick, L. Ortiz

Electronic Parts Co., 1301 Orange Ave., Ft. Pierce, Fla. 33450, (305) 464-6821, Mktg./Adv. Mgr.: R. C. Wilson, Jr.; Geh. Sls. Mgr.: R. C. Wilson, Jr.; Ind. Sls. Mgr.: R. C. Wilson, Jr.; Inside Sls. Cont.: F. Acquaro

Electronic Parts Co., 6600 Roosevelt, Allen Pk., Mich., 48101, (313) 383-3700, Branch Mgr.: J. Good

Electronic Parts Co., 20237 John R, Detroit, Mich. 48203, (313) TW 3-3228, Mktg./Adv. Mgr.: H. Wojcik

Electronic Parts Co., 23040 Schoenherr, Warren, Mich. 48089, (313) 773-0030, Branch Mgr.: Sellers; Fruick

Electronic Parts Co., Inc., 222 Truman St. N. E., Albuquerque, N. M. 87108, (505) 265-8401, Mktg./Adv. Mgr.: A. R. Rotruck; Gen. Sls. Mgr.: A. R. Rotruck; Ind. Sls. Mgr.: D. Wagner; Inside Sls. Cont.: D. Wagner

Electronic Sales, 2829 W. Pico Blvd., Los Angeles, Calif., (213) 737-1945

Electronic Specialty Co., Delaware at Randolph St., Chas., W. Va. 25302, (304) 343-5656, Mktg./Adv. Mgr.: J. E. Wolford; Gen. Sls. Mgr.: D. Walls; Inside Sls. Cont.: D. Walls

Electronic Supply, 2486 Third St., Riverside, Calif. 92507, (714) 683-7300, Mktg./Adv. Mgr.: B. G. Hasterok; Gen. Sls. Mgr.: B. G. Hasterok; Ind. Sls. Mgr.: B. Sneed; Inside Sls. Cont.: Order Desk

Electronic Supply, 23rd & Columbus, Anderson, Ind. 46014, (317) 644-3381, Branch Mgr.: G. McCreary

Electronic Supply, 1112 S. Casino Ctr. Blvd., Las Vegas, Nev. 89104, (702) 384-5666

Electronic Supply Co., 561 Holcombe Ave., Mobile, Ala. 36606, (205) 478-0455, Mktg./Adv. Mgr.: D. Guess; Gen. Sls. Mgr.: D. Guess; Ind. Sls. Mgr.: D. Guess; Inside Sls. Cont.: B. Crosby

Electronic Supply Co., 1440 N. Pace Blvd., Pensacola, Fla. 32505, (904) 432-6916, Branch Mgr.: J. Joinek

Electronic Supply Co., 212 N. W. 10, Okla. City, Okla. 73103, (405) 232-5215, Mktg./Adv. Mgr.: E. Lashley; Gen. Sls. Mgr.: D. Lashley; Ind. Sls. Mgr.: L. E. Wood; Inside Sls Cont.: T. Pruett

Electronic Supply Co., 119 E. 1st Ave., Mitchell, S. D. 57301, (605) 996-4300, Mrkt./Adv. Mgr.: M. Pooley; Gen. Sls. Mgr.: S. Beuaregard; Inside Sls. Cont.: M. Pooley

Electronic Supply Co., 23 N. Carter Rd., P. O. Box 848, Petersburg, Va. 23803

Electronic Supply Co., 811 S. Texas Ave., Bryan, Tex. 77801, (713) 822-0884, Gen. Sls. Mgr.: W. C. Coe; Inside Sls. Cont.: K. Burleson

Electronic Supply Co., 1524 Texas Ave., Texas City, Tex. 77590, (713) 945-4401, Mktg./Adv. Mgr.: P. H. Bevelhymer; Gen. Sls. Mgr.: G. V. Green; Ind. Sales Mgr.: G. V. Green; Inside Sales Cont.: J. H. Bevelhymer

Electronic Supply Center, 32 River St., N. Adams, Mass. 01247, (413) 663-6084, Mktg./Adv. Mgr.: R. A. Wildermuth; Inside Sls. Cont.: R. A. Wildermuth, M. Quinn

Electronic Supply, Inc., 2800 Greenup Ave., Ashland, Ky. 41101, (606) 325-1511, Mktg./Adv. Mgr.: H. C. Hodge; Gen. Sls. Mgr.: H. C. Hodge; Ind. Sls. Mgr.: H. C. Hodge; Inside Sls. Cont.: G. Farmer

Electronic Supply of Anderson, Inc., 2228 Columbus Ave., Anderson, Indiana 46014, (317) 644-3381, Branch Mgr.: G. McCreary

Electronic Wholesalers Inc., 1922 Paxton St., Harrisburg, Pa. 17104, (717) 238-8194, Mktg./Adv. Mgr.: D. Hamill; Inside Sls. Cont.: D. Hamill

Electronics California, Av. Reforma 915, Mexicali, B. C. Mexico, 24489

Electronics Center, 307 S. Hill, Oceanside, Calif. 92054, (714) 722-5855, TWX: 722-8711 Mktg./Adv. Mgr.: R. R. Prescott; Gen. Sls. Mgr.: R. R. Prescott

Electronics Center Inc., 2929 N. Haskell, Dallas, Tex., 75204, (214) 526-2023, Branch Mgr.: W. Jackson

Electronics Inc., 227 N. Santa Fe Ave., Salina, Kan. 67401, (913) 827-7377, Inside Sls. Cont.: J. McKim

Electronics, Inc. 643 S. 3rd Ave., Wausau, Wis. 54401, (715) 845-4671, Mktg./Adv. Mgr.: G. Burby; Gen. Sls. Mgr.: D. Bahr; Ind. Sls. Mgr.: J. Burby; Inside Sls Cont.: J. Burby

Electronics Marketing Corp., 1150 W. Third Ave., Columbus, Ohio 43212, (614) 299-4161

Electronics Marketing Corp., 2400 E. Dorothy La., Dayton, Ohio 45420 (513) 294-0434

Electronics Suppliers, Inc., 757 E. St. Charles St., Brownsville, Tex. 78520, (512) 546-7106, Branch Mgr.: R. Espinoza

Electronics Suppliers, Inc., 217 E. Monroe, Box 1670, Harlingen, Tex. 78550, (512) 423-5895, Inside Sls. Cont.: R. Martinez, Jr.

Electronics Suppliers, Inc., 408 S. Broadway, McAllen, Tex. 78501, (512) 682-6337, Branch Mgr.: J. Martinez

Electronics Supply Co. Inc., 4100 Main St., Kansas City, Mo. 64111, (816) 931-0250, Mktg./Adv. Mgr.: R. C. LaBelle; Gen. Sls. Mgr.: J. S. LaBelle; Ind. Sls. Mgr.: L. Gamble; Inside Sls. Cont.: T. Maynard

Electronics Unlimited, 710 County St., Portsmouth, Va. 23704, (804) 399-2446, Mktg./Adv. Mgr.: J. Moscovitz; Gen. Sls. Mgr.: J. Moscovitz; Ind. Sls. Mgr.: T. Crutcher; Inside Sls. Cont.: T. Crutcher

Electrotex, 918 W. 12th, Austin, Tex. 78705, (512) 476-7644, Branch Mgr.: C. Moerbe

Electrotex, 1275 S. 11th St., Beaumont, Tex. 77701, (713) 838-6421, Branch Mgr.: G. Attra

Electrotex, 4019 Brett, Corpus Christi, Tex. 78411, (512) 854-5306, Branch Mgr.: G. Malik

Electrotex, 2300 Richmond Ave., Houston, Tex. 77006, (713) 526-3456, Mktg./Adv. Mgr.: D. R. Simon; Gen. Sls. Mgr.: G. Langston; Inside Sls. Cont.: G. Langston

Electrotex, 8540 Winkler Dr., Houston, Tex. 77017, (713) 941-7016, Branch Mgr.: R. Morrow

Electrotex, 512 Cross Timbers, Houston, Tex. 77024, (713) 695-6851, Branch Mgr.: B. Matta

Electrotex, 3417 E. Carpenter Fwy., Irving, Tex. 75062, (214) 259-4510, Gen. Sls. Mgr.: J. Miller; Inside Sls. Cont.: G. Wingo; Branch Mgr.: J. Miller

Electrotex, 216 Byrd, Lamarque, Tex. 77568, (713) 938-1376, Branch Mgr.: J. Herod

Electrotex, 430 Atkinson Dr., Lufkin, Tex. 75901, (713) 632-4409, Branch Mgr.: G. Henson

Electrotex, 910 W. Laurel, San Antonio, Tex. 78295, (512) 735-9271, Mktg./Adv. Mgr.: J. C. Jones; Gen. Sls. Mgr.: G. Neilson; Ind. Sls. Mgr.: G. Neilson; Inside Sls. Cont.: G. Neilson

Electrotex, 1007 N. William, Victoria, Tex. 77901, (512) 573-6356, Branch Mgr.: G. Marshall

Elkhart Supply, 1129 N. Nappanee, Elkhart, Ind., (219) 264-4156

Ellington Elect. Supply, 1425 Terry Road, Jackson, Miss. (601) 355-0561

Elm Equipment Co., 3492 E. Fulton St., Columbus, Ohio 43227, (614) 236-0880

Elmar Elctrncs., 2288 Charleston, Mt. View, Calif. 94040, (415) 961-3611, TWX: 910-379-6437, Mkgt./Adv. Mgr.: J. Costa; Ind. Sls. Mgr.: C. Trumbull; Inside Sls. Cont.: J. Campagna; Branch Mgr.: M. Chirone

Elmar/Denver, 6777 E. 50th Ave., Commerce City, Colo. 80022, (303) 287-9611, TWX: 936-0700, Branch Mgr.: R. Seale

Elmar Elctrncs. Inc., 5701 E. Evans Ave., Denver, Colo. 80222, (303) 758-5711

EMD Elctrncs., 29 Banta Pl., Hackensack, N. J. 07601, (201) 488-4440, Branch Mgr.: B. Pertile

EMF Co., Inc., 6135 W. Belmont Ave., Chicago, Ill. 60634, (312) 889-8323

Empire Electronic Dist. Inc., 37 E. Union St., Pasadena, Calif. 91103, (213) 681-2711, Mktg./Adv. Mgr.: E. Rimy; Gen. Sls. Mgr.: E. Rimsky; Ind. Sls. Mgr.: E. Rimy; Inside Sls. Cont.: D. Ches

Empire Electrncs, 4907 Rugby Ave., Bethesda, Md. 20034

EMSCO Elctrncs., Inc., 216 State St., Hackensack, N. J. 07601, (201) 488-7788, Inside Sls. Cont.: W. Karps

Enox Resistor Div. Kevtron Elctrncs. Corp., 702 S. 21st St., Irvington, N. J. 07111, (201) 373-6500, TWX: 710-995-4611

Eoff Elec. Co., 509 - N.E. 10th Ave., Portland, Ore., (503) 222-9411

Epcor & Lykes. 3308 Orleans Ave., New Orleans, La., (504) 486-3777

Eric Elctrncs., 111 Glenn Way, Belmont, Calif. 94002, (415) 593-8284, Mkgt./Adv. Mgr.: D. Turnquist

Erie Corporate Contractors, 1968 Buffalo Rd., Erie, Pa. 16510, (814) 455-8110

ESCO, Inc. 221 Crane St., Dayton, Ohio 45403, (513) 224-9192

Eshelman, Milton H. Co., 2902 Sycamore St., Harrisburg, Pa. 17111, (717) 564-2437, Inside Sls. Cont.: M. H. Eshelman

ESL Electronic Dists. Div. Electro Standards Labs. Inc., 3560 N. W. 34th St., Miami, Fla. 33142, (305) 633-6973. Mktg./Adv. Mgr.: Cappy; Gen. Sls. Mgr.: C. Gold; Inside Sls. Cont.: C. Gold

Essex Electronic Supply Inc., 641 Franklin Ave., Nutley, N. J. 07110, (201) 661-2600

ETS Elctrncs. Inc., 380 Lafayette St., N. Y., N. Y. 10003, (212) 674-7979, Mkgt./Adv. Mgr.: B. Fabian; Inside Sls. Cont.: L. Braunstein

Euclid Radio Parts Corp., 16379 Euclid Ave., E. Cleveland, Ohio 44112, (216) 451-1375, Mktg./Adv. Mgr.: H. W. Roman

Evans Electrical Supply Co., 3 Progress Ave., Nashua, N. H. 03060, (603) 882-2761, Branch Mgr.: A. Zapenas

Evans Radio & Electrical Supply Co., P. O. Box 893, Concord, N. H. 03301, (603) 224-9961, Mktg./Adv. Mgr.: I. R. Evans; Gen. Sls. Mgr.: I. R. Evans; Ind. Sls. Mgr.: I. R. Evans; Inside Sls. Cont.: B. Blake

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Fairmont Electrns., 140 Smith St., Farmingdale, N. Y. 11735, (516) 694-8200

Fairmont Elctrnc. Sales Corp., So. Service Rd., Plainview, N. Y. 11803, (516) 694-8200, TWX: 510-224-6445, Mktg./Adv. Mgr.: R. Lewis; Gen. Sls. Mgr.: T. Mango; Ind. Sls. Mgr.: T. Mango; Inside Sls. Cont.: V. LaCapra, J. Jack, M. Riccobono

Farr Elctrn. Co., 5403 Prospect Ave., Cleveland, Ohio 44103, (216) 881-7403

Farwest Elctrncs., 12410 S.E. 32nd St., Bellevue, Wash. 98005, (206) 747-1515, TWX: 910-443-2321, Branch Mgr.: C. Wilson

Federal Elctrn., Vestal Pkwy., Vestal, N. Y.

Federated Purchaser, Inc., 155 U. S. Rte. 22, Springfield, N. J. 07081, (201) 376-8900, Mktg/Adv. Mgr.: H. J. Fallon; Ind. Sls. Mgr.: S. Jordan; Inside Sls. Cont.: J. McDonald.

Federated Purchaser, Inc., 936 Union Blvd., Allentown, Pa. 18108, (215) 437-4481, Branch Mgr.: D. Butz

Fisher Brownell, 13936 S. Broadway, Los Angeles, Calif. 90061, (213) 532-2170, Branch Mgr. D. Colmenero

Fisher Brownell, 3381 Edward Ave., Santa Clara, Calif. 95050, (408) 244-6182, Gen. Sls. Mgr.: C. Kenyon; Inside Sls. Cont.: E. Powell

Fistells Elctrncs., 1001 Bannock St., Denver, Colo. (303) 244-4691

Forbes Dist. Co., 1416 Fourth Ave. S., Birmingham, Ala. 35233

Forbes Dist. Co., 1522 5th Ave., S.E., Decatur, Ala. 35601

Forbes Elec. Dist., 14 Midtown Pk., Mobile, Ala. 36606

Forbes Elec. Dist., 915 Court St., Montgomery, Ala. 36104

Fort Wayne Elctrns. Supply, 3606 E. Maumee Ave., Ft. Wayne, Ind. 52103, (219) 742-4346, Branch Mgr.: D. Hillenburg

Freeman, S. J., 2802 So. MacDill Ave., Tampa, Fla. 33609, (813) 839-5374, Mktg./Adv. Mgr.: J. Freeman; Gen. Sls. Mgr.: C. Brant; Ind. Sls. Mgr.: J. Freeman; Inside Sls. Cont.: L. Fry

Fulton Radio Supply Co., 1208 Greenwood Ave., Jackson, Mich. 49204, (517) 784-6106, Ind. Sls. Mgr.: L. Harley; Inside Sls. Cont.: T. Wilmer

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Gal Elec., 19 Heath St., Hartford, Conn. 06106

Gar-DIT Systems Corp., 24 Central Dr., Farmingdale, N. Y. 11735, (516) 249-0180, Gen. Sls. Mgr.: S. Mirando; Inside Sls. Cont.: P. Shaw

Garden State Industrial Elctrncs Inc., 2816 Morris Ave., Union, N. J. 07083, (201) 964-9424, Mkt/Adv. Mgr.: R. Fischer; Gen. Sls. Mgr.:H. Fischer; Ind. Sls. Mgr.: R. Fischer; Inside Sls. Cont.: H. Fischer

Gateway Elec. Corp., 8123-25 Page Blvd., St. Louis, Mo. 63130

GBL Elctrns., 75 Gaylord St., Elk Grove Village, Ill. 60007, (312) 593-3220

Genelco Industries Inc., 16 Secatoag Ave., Pt. Washington, N. Y. 10050, (516) 883-7070 TWX: 510-223-0813, Mktg./Adv. Mgr.: J. Furco; Gen. Sls. Mgr.: R. Geddes

General Elec. Systems, 4156 Redmont Ave., Oakland, Calif. 94611

Genesee Radio & Parts Co., Inc., 2550 Delaware Ave., Buffalo, N. Y. 14216, (716) 873-9661, Inside Sls. Cont.: F. L. Norwood

Geophysical Supply Co., Box 52230, Houston, Tex. 77052, (713) 224-0621

Gerber Elctrncs., 852 Providence Hwy., Dedham, Mass. 02026, (617) 329-2400, TWX: 710-394-0634, Inside Sls. Cont.: M. Levin

Gerber Elctrncs & Radio Supply, 111 Dunn Ave., Stamford, Conn. 06905, (203) 322-3253

Gilmark Elctrncs. Corp., 1463 Pinewood St., Rahway, N. J. 07065, (201) 381-5700

Goldcrest Elec. Supp. of Bflo. Inc., 1662 Main St., Buffalo, N. Y. 14209, (716) 885-4900, Branch Mgr.: P. Tranquillo

Goldcrest Elec. Supp. of Erie Inc., 1905 Clinton St., Buffalo, N. Y. 14206, (716) 826-3434, Branch Mgr.: A. Schweitzer

Goldcrest Elec Suppl. Inc., J. C. Div., 117 Oakdale Rd., Johnson City, N. Y. 13790, (607) 797-2389, Branch Mgr.: P. Stone

Goldcrest Elec. Suppl. Inc., 1920 Park St., Syracuse, N. Y. 13208, (315) 471-7115, Branch Mgr.: G. Pollock

Goldcrest Elctrncs. Corp. 482 St. Paul St., Rochester, N. Y. 14605, (716) 546-8464, Mktg./Adv. Mgr.: D. Gold; Inside Sls. Cont.: J. L. Pitlick

Gondas Corp./Fla., 3070 N. E. Terrace, Ft. Lauderdale, Fla. 32014, (305) 564-5291

Gopher Elctrncs. Co., 2520 W. Larpenteur Ave., St. Paul, Minn. 55113, (612) 645-0241, Mktg./Adv. Mgr.: R. D. Shivers

Gordon, R.S. & Assoc., Box 677, Parkersburg, W. Va. 26101, (304) 428-3377, Mktg./Adv. Mgr.: R. Gordon; Inside Sls. Cont.: E. Lehman

Gourley Dist. Co., 324 N. Main, Sioux Falls, S. D. 57102, (507) 336-1466, Mktg./Adv. Mgr.: R. Gourley; Gen. Sls. Mgr.: J. Gourley; Ind. Sls. Mgr.: G. Murfield; Inside Sls. Cont.: K. Ackerman

Gracom Distributing Co., 44-29 Kissena Blvd., Flushing, N. Y. 11355, (212) 463-1130, Branch Mgr.: R. H. Gray

Gracom Industries, Inc., 140-11A Cherry Ave., Flushing, N. Y. 11355, (212) 463-1130

Gracom Sound Stage, 44-29 Kissena Blvd., Flushing, N. Y. 11355, (212) 463-1130, Branch Mgr.: R. H. Gray

Graham Elctrncs Dist. Inc., 887 Manhattan Ave., Brooklyn, N. Y. 11222, (212) 383-0835, Gen. Sls. Mgr.: J. Di Santi

Graham Elctrncs., 133 South Pennsylvania, Indianapolis, Ind. 46204, (317) 634-8202, Ind. Sls. Mgr.: B.Lyons, Inside Sls. Cont.: R. Spangler, L. Scheer

Graham Elctrncs., Glendale Shopping Center, 6101 N. Keystone Ave., Indianapolis, Ind. 46220, (317) 253-4261, Branch Mgr.: T. Haught

Great Lakes Elctrncs., 390 E. Michigan, Augusta, Mich 49012, (616) 731-4156, Gen. Sls. Mgr.: R. Greene; Ind. Sls. Mgr.: D. Shrover; Inside Sls. Cont.: D. Shrover

Greene-Shaw Co., 70 Bridge St., Newton, Mass., 01432

Greylock Elctrn. Distributors, 65 Central Ave., Albany, N. Y. 12206, (518) 436-8511, Branch Mgr.: C. Hammer

Greylock Elctrn. Distributors, 763 Albany Ave. Ext., Kingston, N. Y. 12401, (914) 338-7900, Mktg./Adv. Mgr.: D. Parkhurst; Inside Sls. Cont.: M. Michelson

Greylock Elctrnc. Distributors, 5 Parker Ave., Poughkeepsie, N. Y. (914) 452-0550, Branch Mgr.: I. Wildman

Grice Elctrncs., 320 E. Gregory St., Pensacola, Fla. 32501 (904) 433-4616

Grimmer's Elctrnc. Supply Corp., 41 N. Brandywine Ave., Schenectady, N. Y. 12307, (518) 372-0337, Inside Sls. Cont.: L. Grimmer

Guarantee Elctrncs. Corp., 301 Morley Ave., Nogales, Ariz. 85621, (602) 287-5781

Guarantee Radio Supply Corp., 1314 Iturbide St., Laredo, Tex. 78040, (512) 722-3233, Mktg./Adv. Mgr.: R. Cantu

Gulf Elctrns. Corp., 703 S. Main St., Ann Arbor, Mich. 48104, (313) 769-8650

Gulf Tele. & Elctrns. Inc., 3718 Artdale, Houston, Tex. 77042, (713) 781-3066

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Halbleiter Spezialvertrieb (Carroll & Co. GMBH), 6 Frankfurt Main-Sud, Burnitzstrasse 34, West Germany, 0611/62 20 33, Eugen Pfretzschner

Hall, B. & Co., 1014 S. Walnut, P. O. Box 996, Bloomington, Ind. 47401, (812) 336-3856, Gen. Sls. Mgr.: W. M. Hall; Ind. Sls. Mgr.: W. M. Hall

Halley Elctrncs. Co., 713 South Oakwood Ave., Beckley, W. Va. 25801, (304) 253-2561, Gen. Sls. Mgr.: A. Halley; Ind. Sls. Mgr.: W. McClure; Inside Sls. Cont.: T. Williams

Hall Mark Elctrncs., Box 1133, Huntsville, Ala. 35807, (205) 539-0691

Hall-Mark Elctrncs. Corp., 7233 Lake Ellnor Dr., Orlando, Fla. 32809, (305) 855-4020, TWX: 810-850-0183

Hall-Mark Elctrncs. Corp., 180 Crossen Ave., Elk Grove Village, Ill. 60007, (312) 437-8800, TWX: 910-222-2859

Hall-Mark Elctrncs. Corp., 9006 Rosehill Rd., Lenexa, Kan. 66215, (913) 888-4747, TWX: 910-749-6620

Hall-Mark Elctrncs. Corp., 4334 Stemway Dr., New Orleans, La. 70126, (504) 242-7581

Hall-Mark Elctrncs. Corp., 6660 Security Blvd., Baltimore, Md. 21235, (301) 265-8500

Hall-Mark Elctrncs. Corp., 4555 West 77th St., Minneapolis, Minn. 55435, (612) 925-2944, TWX:910-576-3187

Hall-Mark Elctrncs. Corp., 6100 Madison, St. Louis, Mo. 63134, (314) 521-3800, TWX: 910-760-1630

Hall-Mark Elctrncs. Corp., 167 Marine St., Farmingdale, N. Y. 11735, (516) 293-7500, TWX: 510-224-6402

Hall-Mark Elctrncs., 3000 Indust. Dr., Raleigh, N. C. 27609, (919) 832-4465

Hall-Mark Elctrncs. Corp., P. O. Box 12584, Oklahoma City, Okla. 73112, (405) 948-9983

Hall-Mark Elctrncs. Corp., 4846 S. 83rd E. Ave., Tulsa, Okla. 74145, (918) 835-8458, TWX: 910-845-2290

Hall-Mark Elctrncs. Corp., 458 Pike Rd., Huntington Valley, Pa., (215) 355-7300

Hall-Mark Elctrncs., Box 125, Trevose, Pa. 19047 (215) 355-7300

Hall-Mark Elctrncs. Corp., 9333 Forest Lane, Dallas, Tex. 75231, (214) 231-5101, TWX: 910-867-4717

Hall-Mark Elctrns, 9100 Markville Dr., Dallas, Tex., (214) AD-1-6111

Hall-Mark Elctrncs. Corp., 8000 Westglen, Houston, Tex. 77042, (713) 781-6100, TWX: 910-881-2711

Hall-Mark Elctrncs. Corp., 11820 W. Ripley Ave., Milwaukee, Wisc. 53226, (414) 476-1270

Hamburg Brothers, Inc., 24th St. & A. V. R. R., Pittsburgh, Pa. 15222, (412) 471-0808 Ext. 233, Inside Sls. Cont.: R. D. Innamorato

Hamilton/Avnet Elctrncs., 1739 N. 28th Ave., Phoenix, Ariz. 85009, (602) 269-1391

Hamilton/Avnet Elctrncs., 340 E. Middlefield Rd., Mountain View, Calif. 94040, (415) 961-7000

Hamilton/Avnet Elctrncs., 8917 Complex Dr., San Diego, Calif. 92123, (714) 279-2421

Hamilton/Avnet Elctrncs., 935 Montee DeLiesse - St. Laurent, Montreal, Can. 377, (514) 735-6393

Hamilton/Avnet Elctrncs., 880 Lady Ellen Pl., Ottawa, Ontario, Can.

Hamilton/Avnet Elctrncs., 10 Gurney Crescent, Toronto 19, Can., (416) 789-1838

Hamilton/Avnet Elctrncs., 5921 No. Broadway, Denver, Colo. 80216, (303) 534-1212

Hamilton/Avnet Elctrncs., 4020 N. 29th St., Hollywood, Fla. 33021, (305) 925-5401

Hamilton/Avnet Elctrncs., 6700 I-85 Access Rd., Atlanta, Ga. 30071, (404) 448-0800

Hamilton/Avnet Elctrncs., 3901 No. 25th Ave., Schiller Park, Ill. 60176, (312) 678-6310

Hamilton/Avnet Elctrncs., 3500 W. 75th St., Prairie Village, Kan. 66208, (913) 362-3250

Hamilton/Avnet Elctrncs., 7255 Standard Dr., Hanover, Md. 21076, (301) 796-5000

Hamilton/Avnet Elctrncs., 185 Cambridge St., Burlington, Mass. 01803 (617) 273-2120

Hamilton/Avnet Elctrncs., 13150 Wayne Rd., Livonia, Mich. 48150, (313) 522-4700

Hamilton/Avnet Elctrncs., 2850 Metro Dr., Minneapolis, Minn. 55420, (612) 854-4800

Hamilton/Avnet Elctrncs., 400 Brookes La., Hazelwood, Mo. 63042, (314) 731-1144

Hamilton/Avnet Elctrncs., Kansas City, Mo., (913) 362-3250

Hamilton/Avnet Elctrncs., 218 Little Falls Rd., Cedar Grove, N. J. 07009, (201) 239-0800

Hamilton/Avnet Elctrncs., 1608 Marlton Pike, Cherry Hill, N. J. 08034, (609) 662-9337

Hamilton/Avnet Elctrncs., 6500 Joy Rd., E. Syracuse, N. Y. 13057, (315) 437-2642

Hamilton/Avnet Elctrncs., 70 State St., Westbury, N. Y. 11590, (516) 333-5800

Hamilton/Avnet Elctrncs., 2403 Farrington, Dallas, Tex. 75207, (214) 638-2850

Hamilton/Avnet Elctrncs., 4445 Sigma Rd., Dallas, Tex. 75240, (214) 661-8661

Hamilton/Avnet Elctrncs., 1216 W. Clay, Houston Tex. 77019, (713) 526-4661

Hamilton/Avnet Elctrncs., 647 W. Billinis Rd., Salt Lake City, Utah 84119, (801) 262-8451

Hamilton/Avnet Elctrncs., 2320 Sixth Ave., Seattle, Wash. 98121, (206) 624-5930

Hamilton Electro Sales, Culver City, Calif., (213) 870-7171

Hammond Elctrncs., Inc., 719 N. Ridgewood Ave., Daytona Beach, Fla. 32022, (904) 253-0531, Branch Mgr.: S. R. Stephey

Hammond Elctrncs., Inc., 2563 Fourth St., Ft. Myers, Fla. 33901, (813) 334-2277, Branch Mgr.: T. S. Roberts

Hammond Elctrncs., Inc., 250 East First St., Jacksonville, Fla. 32206, (904) 356-4851, Branch Mgr.: F. Womack

Hammond Elctrncs., Inc., 930 E. Oak St., Lakeland, Fla. 33802, (813) 686-4145, Branch Mgr.: R. D. Morris.

Hammond Elctrncs., Inc., 911 W. Central, Orlando, Fla. 32805, (305) 241-6601, TWX: 810-850-4121, Gen. Sls. Mgr.: W. L. Holbrook; Ind. Sls. Mgr.: F. LaLonde; Inside Sls. Cont.: W. L. Holbrook

Hammond Elctrncs., Inc., 1516 Cypress St., Tampa, Fla. 33606, (813) 253-0104, Branch Mgr.: D. Hand

Hammond Elctrncs., 2923 Pacific Ave., Greensboro, N. C. 27406, (919) 275-6391, Branch Mgr.: R. Windsor

Hammond Elctrncs., 100 Augusta St., Greenville, S. C. 29602, (803) 233-4121, Branch Mgr.: A. Clark

Hanson Inc., 609 So. 1st., Pocatello, Idaho 83201, (208) 233-6480, Gen. Sls. Mgr.: B. Hanson; Inside Sls. Cont.: E. Blanco

Harco Elctrncs., Inc., Rt. 22 Carsins Run, Aberdeen, Md. 21001, (301) 838-7990, Mktg/Adv. Mgr.: R. E. Schueler; Gen. Sls. Mgr.: T. Atkins; Ind. Sls. Mgr.: W. Thomas

Harco Elctrncs., Inc., 780 Eden Rd., Lancaster, Pa. 17602, (717) 569-6469, Branch Mgr.: J. Brooks

Hargis-Austin, 410 Baylor, Austin, Tex. 78703, (512) GR 8-6618, Inside Sls. Cont.: B. Bryant

Harpe Elctrncs. Dist., Inc., 1845 Central Ave., Chattanooga, Tenn. 37408, (615) 267-2381, Mktg./Adv. Mgr.: H. K. Harpe; Gen. Sls. Mgr.: H. K. Harpe; Ind. Sls. Mgr.: W. P. Huckabee; Inside Sls. Cont.: W. P. Huckabee

Harrison Elctrncs. Corp., 20 Smith St., Farmingdale, N. Y. 11735, (516) 293-7990, TWX: 510-224-6403, Mktg./Adv. Mgr.: R. Hirsch; Gen. Sls. Mgr.: B. Snyder; Ind. Sls. Mgr.: B. Schreiner; Inside Sls. Cont.: M. Filler

Harrison Electrncs. International, Inc., 14 Smith St., Farmingdale, N. Y. 11735, (516) 293-2020, TWX: 510-224-6403, Gen. Sls. Mgr.: R. Corenthal, Pres.; Sls. Supervisor: W. H. Whitman

Harrison Elctrncs. Int'l, Inc., Horstlindelaan 64, Enshede, Holland, 05420-13096 TWX: 44903, Branch Mgr.: G. A. Evers

Harrison Equipment Co., Inc., 1616 McGowen Ave., Houston, Tex. 77004 (713) 224-9131, Adv. Mgr.: J. C. Robinson; Gen. Mgr.: J. Robinson; Ind. Sls. Mgr.: P. J. Viola

Hart Elctrncs. Corp., 244 Main St., Oneonta, N. Y. 13820, (607) 432-5014, Branch Mgr.: N. Schurko

Hart Elctrncs. Corp., 253 Vestal Pkwy. E., Vestal, N. Y. 13850, (607) 748-3260, Mktg./Adv. Mgr.: D. Lainhart; Gen. Sls Mgr.: J. Watson; Inside Sls. Cont.: D. Tharrat

Hart Elctrncs. Corp., Route 6, Blakely, Pa. 18447, (717) 347-8000, Branch Mgr.: J. Castellano

Hart Elctrncs. Corp., 115 N. Main St., Wilkes Barre, Pa. 18701, (717) 825-5541, Branch Mgr.: K. Heffelfinger

Hartford Elec. Supply Co., Box 748, 571 New Park Ave., Hartford, Conn. 06101, (203) 233-3694

Hartman L. & Sons Inc., 3236 Cove Rd. N. W., Roanoke, Va. 24017, (703) 366-3493, Mktg./Adv. Mgr.: L. C. Hartman; Gen Sls. Mgr.: L. Hartman, Jr.; Ind. Sls. Mgr.: J. Cress; Inside Sls. Cont.: K. Duttin

Harvey Federal Elctrncs., Inc., P. O. Box 1208, Binghamton, N. Y. 13902, (607) 748-8211, TWX: 501-252-0893, Mktg./Adv. Mgr.: R. Steele; Field Sls. Mgr.: J. Dowdle; Ind. Sls. Mgr.: K. French

Harvey R&D Elctrncs., 44 Hartwell Ave., Lexington, Mass., (617) 861-9200

Harvey/Conn., Norwalk, Conn., (203) 853-1515

Harvey/Michigan, 23461 Industrial Pk. Dr., Farmington, Mich. 48024, (313) 477-1650

Harvey/Michigan, 36312 Ecorse Rd., Romulus, Mich., (313) 477-1650

Harvey/Minn., Minneapolis, Minn., (612) 831-0700

Harvey Radio Co., Inc., 2 W. 45th St., New York, N. Y. 10036, (212) 582-1500

Harvey Radio Co., Inc., 60 Crossways Park W., Woodbury, N. Y. 11797, (516) 921-8700

Hatry of Bridgeport, 2465 Main St., Bridgeport, Conn. 06606, (203) 335-3124, Branch Mgr.: P. Wynne

Hatry Elctrnc. Enterprises, DBA Hatry of Hartford, 500 Ledyard St., Hartford, Conn. 06114, (203) 527-1881, Gen. Sls. Mgr.: I. W. Hatry Jr.; Ind. Sls. Mgr.: C. Harrison; Inside Sls. Cont.: E. Kissinger

Hatry of New Haven, 610 Blvd., New Haven, Conn. 06519, (203) 787-5921, Branch Mgr.: A. Fraulo

Hatry of Waterbury, 480 Watertown Ave., Waterbury, Conn. 06708, (203) 755-1181, Branch Mgr.: A. Clementi

Hauer Elctrnc. Supply, 1185 Mission St., San Francisco, Calif. 94103, (415) 621-0552, Gen. Sls. Mgr.: K. Hauer; Inside Sls. Cont.: H. Ullmann

Hayer, F. C. Co., 701 Washington Ave. N., Minneapolis, Minn. 55401, (612) 339-0201, Gen. Sls. Mgr.: J. R. Lieberg; Ind. Sls. Mgr.: L. T. Smith

Hayer, F. C. Co., 505 Broadway, Fargo, N. D. 58102, (701) 232-7479, Branch Mgr.: O. H. Klein

Helwick, E. A. Elctrncs., 2214 25th Ave., Gulfport, Miss. 39501, (601) 863-1295, Mktg./Adv. Mgr.: E. A. Helwick II; Inside Sls. Cont.: W. Wilder; Gen. Sls. Mgr.: E. A. Helwick

Henderson, D. Ind'l Equip., 441 N. Hamilton St., Box 773, Dalton, Ga., (404) 279-8307

Henley & Co., 202 E. 44 St., N. Y., N. Y. 10017 (212) 986-5544, TWX: 710-581-6572, Mktg./Adv. Mgr.: J. G. Butler; Inside Sls. Cont.: J. G. Butler

Henry Radio Inc., 931 No. Euclid St., Anaheim, Calif. 92801, (714) 772-9200, Branch Mgr.: W. Henry

Henry Radio Inc., 11240 West Olympic Blvd., Los Angeles, Calif. 90064, (213) 477-6701, TELEX: 673-625, Mktg./Adv. Mgr.: Mrs. Silva; Gen. Sls. Mgr.: C. Kahn; Inside Sls. Cont.: C. Kahn

Henry Radio, Butler, Mo. 64730, (816) 679-3127, Branch Mgr.: R. Henry

Herbach & Rademan Inc., 401 E. Erie Ave., Phila, Pa. 19134, (215) 436-1700, TWX: 710-670-9760, Mktg./Adv. Mgr.: G. Taplinger; Ind. Sls. Mgr.: M. Gresh; Inside Sls. Cont.: A. Shrager, N. Paone

Hesco, Inc., 1740 Blanding St., Columbia, S. C. 29201, (803) 765-2989, Mktg./Adv. Mgr.: J. B. Harbacher; Gen. Sls. Mgr.: J. Junper; Inside Sls. Cont.: R. Schwintek

Heym, H. C. Assoc., 1615 Charlmers Dr., Ann Arbor, Mich., (313) 971-6552

Hi Fi Sales Inc., 764 W. Main St., Mesa, Ariz. 85201, (602) 969-1338, Mktg./Adv. Mgr.: C. Upchurch; Gen. Sls. Mgr.: D. Ross; Inside Sls. Cont.: D. Ross

Hi-Fi Sound Elctrncs., 67 South 12th St., Minneapolis, Minn. 55403, (612) 339-6351, Mktg./Adv. Mgr.: J. Wright; Gen. Sls. Mgr.: S. Zweig; Inside Sls. Cont.: S. Zweig

Hi Fi Supply Co., 418 Base Line, San Bernardino, Calif. 92410, (714) 886-8407, Mktg./Adv. Mgr.: B. Gillespie; Gen. Sls. Mgr.: D. Swarthout; Ind. Sls. Mgr.: D. Hallock; Inside Sls. Cont.: E. Heddenger

Higgins & Sheer, 123 Dutchess Tpke., Poughkeepsie, N. Y. (914) 471-3510

Hi-Rel Dist. Sales, 20507 S. Belshaw Ave., Carson, Calif., (213) 537-6500

Hi-Rel Distr. Sls., 645 Clyde Ave., Mt. View, Cal., (415) 967-5731

Hisco, 1815 Dallas St., Houston, Tex., (713) 228-6662

Holiday Elctrncs., 286 Walnut St., Blairsville, Pa. 15717

Hollander Dist. Co., M. P. O. Box 792, Springfield, Mo. 65801, (417) 862-4475, Mktg./Adv. Mgr.: F. E. Bolton

Hollenback's Radio Supply, 2221-8th Ave., Altoona, Pa. 16602, (814) 944-6171, Mktg./Adv. Mgr.: W. L. Hollenback; Inside Sls. Cont.: B. C. Megahan

Hollywood Radio & Elec., 5250 Hollywood Blvd., Hollywood, Calif. (213) 466-3181

Holmes Distributors, Inc., 100 Cahill Ave., Manchester, N. H. 03103, (603) 669-5060, Branch Mgr.: R. Pease

Holmes Distributors, Inc., 510 Cumberland Ave., Portland, Maine 04104, (207) 774-5901, Elctrncs. Mgr.: J. C. Miles; Inside Sls. Contact.: D. Woodsum

Holmes Distributors, Inc., 3-5 Pleasant St., Waterville, Me. 04210, (207) 783-8561, Branch Mgr.: C. Shaw

Holmes Distributors, Inc., 23 Ash St., Waterville, Me. 04901, (207) 873-4283, Branch Mgr.: L. Labbe

Holub Dist. Co., 217 E. Tenth St., Newport, Ky. 41071, (606) 431-4211, Branch Mgr.: J. DeHart

Holub Distributing Co., 1521 Reading Rd., Cincinnati, Ohio 45215, (513) 733-4400, Mktg./Adv. Mgr.: P. E. Holub; Gen. Sls. Mgr.: J. DeHart; Inside Sls. Cont.: D. Sunderhaus

Home of Economy, P. O. Box 671, 2nd Ave., 4th St., Devils Lake, N. D. 58301

Home of Economy, 86 E. Sixth St., Grafton, N. D. 58237

Home of Economy, 1000 Northwest St., Grand Forks, N. D. 58201, (701) 772-6611

Home of Economy, P. O. Box 1768, Highway 83 S., Minot, N. D. 58702

Home of Economy, P. O. Box 1402, 137 W. Broadway, Williston, N. D. 58801

Honolulu Elctrncs., 819 Keesumokie St., Honolulu, Haw.

Hooper Elctrncs. Supply Co., Inc., 1917-6th St., Meridian, Miss 39301, (601) 693-2668, Gen. Sls. Mgr.: C. Hooper, Ind. Sls. Mgr.: C. Hooper

Hooper Elctrncs. Supply Co., Inc., 1406 Live Oak Ave., Pascagoula, Miss. 39567, (601) 762-9383, Branch Mgr.: B. Sumrall

Houston Elec. Dist. Co., 1609 Velasco St., Houston, Tex. (713) 224-4771

Hughes-Peters, Inc., 4865 Duck Creek Rd., Cincinnati, Ohio 45227, (513) 351-2000, Branch Mgr.: N. W. Wright

Hughes-Peters, Inc., 481 E. 11th Ave., Columbus, Ohio 43211, (614) 294-5351, Mktg./Adv. Mgr.: C. P. Moras; Gen. Sls. Mgr.: C. P. Moras; Ind. Sls. Mgr.: C. P. Moras; Inside Sls. Cont.: J. B. Vickers

Huntoon, U. J. Assoc. Inc., 272 Centre St., Newton, Mass., (617) 244-5871

Hurley Elect. of Inglewood, 210 E. Hardy Blvd., Inglewood, Calif. 90301, (213) 678-7644, TWX: 679-2276, 674-6113

Hutch & Son, Inc., 300 N. Main St., Evansville, Ind. 47711, (812) 425-7201, Mktg./Adv. Mgr.: D. Korn; Gen. Sls. Mgr.: J. S. Taylor; Ind. Sls. Mgr.: J. P. Taylor; Inside Sls. Cont.: D. Bredhold

Hutch & Son, Inc., 212 N. Franklin St., Madisonville, Ky. 42431, (502) 821-4334, Branch Mgr.: M. Hibbs

Hutch & Son, Inc., 2204 Broad St., New Castle, Ind. 47362, (317) 529-0323, Branch Mgr.: H. Hillyard

Hutch & Son, Inc., 1421 Triplett St., Owensboro, Ky. 42301, (502) 684-6285, Branch Mgr.: L. Ashby

Hydro Electro Equip. Inc., 13740 W. Silver Spring Dr., Box 231, Menomonee Falls, Wisc., (414) 781-3015

Hygrade Elctrns, 9216 Church Ave., B'klyn, N.Y., (212) 495-4100

Hyland Elec. Supply Co., 623 W. Monroe St., Chicago, Ill., (312) 263-4100

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I. C. Elctrncs. Supply, 16723 Roscoe Blvd., Van 'Nuys, Calif. 91406, (213) 893-9311, Mktg./Adv. Mgr. H. Kline; Gen. Sls. Mgr.: D. Scott; Inside Sls. Cont.: D. Scott

ICI I'ndl. Comps. Inc., 4004 W. 78th St., Minneapolis, Minn. 55435, (612) 927-9991

Impact Sls. Co., Inc., 223 Crescent St., Waltham, Mass., (617) 893-2850

Industrial Comp. Corp., 2551 Boston Rd. — Box 668, N. Wilbraham, Mass. 01095, (413) 596-3854, Mktg. Mgr.: R. T. Welch; Gen. Sls. Mgr.: R. L. Eaton; Inside Sls. Cont.: R. Welch

Industrial Components Inc., 5280 W. 78th St., Minneapolis, Minn. 55435, (612) 831-2666, TWX: 910-576-3153, Gen. Sls. Mgr.: R. Bump; Inside Sls. Cont.: B. Hollick

Industrial Distrs. Inc., 710 Papworth Ave., Metairie, La., (504) 835-7281

Industrial Elec. Supply, 2112 Mem'l. Pkwy. S. Huntsville, Ala.

Industrial Elctrns. Supply, 2422 Southern Ave., Shreveport, La. 71104, (318) 422-9459

Industrial Elctrncs. Inc., 810 Passaic Ave., W. Caldwell, N. J. 07006, (201) 575-8420, Gen. Sls. Mgr.: D. Garcia; Inside Sls. Mgr.: H. Jones

Industrial Elctrncs., Inc., 310 Val Verde S. E., Albuquerque, N. M., (505) 266-8721

Industrial Elctrncs., Gov. Sevier Hwy., Knoxville, Tenn. 37920, (615) 573-7135

Industrial Instruments Supply, E. 2121 Riverside, Spokane, Wash. (509) 534-9353

Industrial Service Labs, Inc., 4354 Olive St., St. Louis, Mo., (314) 535-5760

Inland Electronic Suppliers, 461 N. Fresno St., Fresno, Calif. 93701, (209) 266-9666, Inside Sls. Cont.: W. E. Phillips

Inland Elctrnc. Supply Co., 715 E. Broadway, Tucson, Ariz. 85719, (602) 624-4402, Gen. Sls. Mgr.: B. Spivey; Ind. Sls. Mgr.: R. Morrow; Inside Sls. Cont.: D. Cribbs

In-Stock Products Co., 40 Washington St., Wellesley Hills, Mass., (617) 235-6549

Instruments Inc., 570 Hillside Ave., Needham Hgts., Mass., (617) 444-9410

Interface Elctrns. Corp., 300 Second Ave. W., Seattle, Wash, (206) 285-3500

Intermark Elctrncs., Sub. of Intermark, Inc., Palo Alto, Calif.

Intermark, 100 Industrial Way, San Carlos, Cal., (415) 592-1641

Intermark, 7354 Convoy Ct., San Diego, Cal., (714) 279-5200

Intermark, 2920 W. Warner St., Santa Ana, Cal., (714) 540-1322

Intermark, 2600 W. Second St., Cenver, Colo., (303) 936-8284

Intermark, 621 S. Michigan Ave., Seattle, Wash., (206) 767-3160

Intermark Elctrns., Portland, Ore., (503) 224-0330

Intermarket, 71110 Gerald Ave., Van Nuys, Cal.

Intermountain Appliance Supply Corp., 925 S. West Temple, P. O. Box 1406, Salt Lake City, Utah 84110, (801) 328-0505, Mtg./Adv. Mgr.: G. Wilson; Director of Sls. G. Wilson

Interstate Electric Co., 307 E. Front St., Texarkana, Ark. 75501, (501) 772-3751, Branch Mgr.: J. Kelley

Interstate Electric Co., 1419 Culpepper St., Shreveport, La. 71130, (318) 423-6131, TWX: 50-7421, Mktg./Adv. Mgr.: I. P. Wolfe; Gen. Sls. Mgr.: G. A. Tangney

Interstate Electric Co., 418 E. Nelson St., Longview, Tex. 75601, (214) 753-5526, Branch Mgr.: O. Smith

Interstate Elctrn. Supply Corp., 414 Military, Dodge City, Kan. 67801, (316) 227-6772, Branch Mgr.: H. Guthrie

Interstate Elctrn. Supply Corp., 122 W. Ninth, Hays, Kan. 67601, (913) 625-9328, Branch Mgr.: S. Zwenger

Interstate Elctrn. Supply Corp., 325 W. 4th St., Hutchinson, Kan. 67501, (316) 662-7941, Branch Mgr.: S. Lohr

Interstate Elctrn. Supply Corp., 2500 S. Kansas, Topeka, Kan. 66611, (913) 235-2396, Branch Mgr.: B. Batt

Interstate Elctrn. Supply Corp., 230 Ida St., Box 2018, Wichita, Kan. 67201, (316) 264-6316, Mktg./Adv. Mgr.: R. Pfenninger; Ind. Sls. Mgr.: R. Engstrand; Inside Sls. Cont.: G. Helmer

Interstate Ind. Elctrncs., 10525 St. Charles Rk. Rd., St. Ann, Mo. 63074, (314) 428-8522, Gen. Sls. Mgr.: W. Stumpe; Ind. Sls. Mgr.: J. Pellerito; Inside Sls. Cont.: R. Vivano

Interstate Mktg. Assocs., 22030 Ventura Blvd., Woodland Hills, Calif., (213) 883-7606

Iowa Radio Supply Co., Inc., 719 Center Point Rd. N. E., Cedar Rapids, Iowa 52402, (319) 364-6154, Gen. Sls. Mgr.: D. O. Bunce; Inside Sls. Cont.: G. Byse; Ind. Sls. Mgr.: J. Netser

I.P.C. Corp., Cardinal Dr., Little Falls, N. J., (201) 785-1830, Branch Mgr.: J. Burchill

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J-B Distributing Co., 1616 Cass St., Omaha, Nebr. 68102, (402) 341-5525, Mktg./Adv. Mgr.: J. H. Brown

J & B Elctrncs., 820 East State St., Fremont, Ohio 43420, (419) 332-9334, Mktg./Adv. Mgr.: J. Schneider; Gen. Sls. Mgr.: L. Kuzma; Ind. Sls. Mgr.: B. Mader; Inside Sls. Cont.: L. Kuzma

J & M Elctrncs. Inc., DeKalb, Ill. 60115, (815) 758-3409, Branch Mgr.: D. E. Gorsuch

J & M Elctrncs. Inc., 64 Monterey, Freeport, Ill. 61032, (815) 232-7812, Branch Mgr.: V. Roush

J & M Elctrncs. Inc., 2001 9th St., Rockford, Ill. 61101, (815) 963-6445, Mktg./Adv. Mgr.: M. Burke

J & S Elctrnc. Distributors of Newport Inc., 184 Admiral Kalbfus Rd., Newport, R. I. 02840, (401) 847-2977, Mktg./Adv. Mgr.: J. Haddad; Inside Sls. Cont.: D. Haddad

J. C. Elec. Co. Inc., 6870 E. Davison, Detroit, Mich., (313) 365-4250

Jabbour Elctrnc. Supplies, 227 Jefferson Ave., New London, Conn. 06320, (203) 442-4386, Branch Mgr.: J. Christiansen

Jabbour Elctrnc. Supplies, 20 Woodbine St., Pawtucket, R. I. 02860, (401) 722-3240, Branch Mgr.: R. Dargy

Jabbour Elctrnc. Supplies, 1744 Cranston St., Cranston, R. I. 02920, (401) 944-2570, Mktg./Adv. Mgr.: J. Sylvester

Jack S. L. Elctrncs., 2814 Steinway St., Astoria, N. Y. 11103, (212) LH 5-8888, Inside Sls. Cont.: S. Altman

Jackson Elctrncs., 1135 Chattahoochee Ave., Atlanta, Ga., (404) 355-2220

Jaco Electronics, Inc., 21201 Oxnard St., Woodland Hills, Calif. 91364, (213) 887-6400, TWX: 910-494-1923, Branch Mgr.: John Bellew

Jaco Elctrncs., Inc., Farmingdale, N. Y.,(516) 738-3100

Jaco Elctrncs., Inc., 195 Engineers Rd., Hauppauge, N. Y. 11787, (516) 273-5500, TWX: 510-227-6232, Mktg./Adv. Mgr.: J. Girsky; Gen. Sls. Mgr.: C. Girsky; Inside Sls. Cont.: M. Lissner

JaMac Products Co., 8600 N. E. Sandy Blvd., Portland, Ore. 97220, (503) 252-2929, Mktg./Adv. Mgr.: J. W. Jackson

Jan Ind'l., 441-45 N. 5th St., Philadelphia, Pa.

Jaxway Wholesale Supply Co. Inc., 9309 N. Major, Morton Grove, Ill. 60053, (312) 966-0910, Gen. Sls. Mgr.: D. Lyten; Inside Sls. Cont.: B. Gold

Jeff-Tronics, 4582 Pearl Rd., Cleveland, Ohio

Jersey Elect. Dist. Co., 255 Goffle Rd., Hawthorne, N. J. 07506, (201) 423-0300, Inside Sls. Cont.: S. Rosenstein

Jet Elctrncs. Supply Co., Inc., 1455 Florence St., Aurora, Colo. 80010, (303) 364-1000, Mktg./Adv. Mgr.: J. Henken

J. K. Elctrncs., 6841 Westminster, Westminster, Calif. 92683, (714) 894-2532, Inside Sls. Cont.: J. Kennedy

Jolly J. B. Inc., 10119 51st. S. W., Seattle, Wash. 98146, (206) 938-4166, Branch Mgr.: J. Jolly

Jones Elctrncs. Inc., 902 Woodward Ave., Muscle Shoals, Ala. 35660, (205) 385-1241, Mktg./Adv. Mgr.: S. L. Jones; Inside Sls. Cont.: S. L. Jones

Joseph Elctrncs., 1733 N. Harlem Ave., Chicago, Ill., (312) 622-7766

J. R. S. Distributors, Inc., 614 York St., Hanover, Pa. 17331, (717) 632-9294, Branch Mgr.: J. C. Wildasin

J. R. S. Distributors, Inc., 646 W. Market St., York, Pa. 17404, (717) 854-8624, Inside Sls. Cont.: J. Strauss

JSH Elctrncs., Inc., 8549 Higuera St., Culver City, Cal. 90230, (213) 870-4616, TWX: 910-340-6356, Mktg./Adv. Mgr.: C. A. Tepper; Ind. Sls. Mgr.: L. W. Novin; Inside Sls. Cont.: P. S. Quinones

J. V. Elctrns., 690 Main St., East Haven, Conn., (203) 469-2321

JW Elctrncs., Inc., 2030 S. E. 7th Ave., Portland, Ore. 97214 (503) 232-1104, Branch Mgr.: T. Fox

JW Elctrncs., Inc., 2450 State St., Salem, Ore. 97301, (503) 363-2371, Branch Mgr.: C. Wells

JW Elctrncs., Inc., 731 Vandercook Way, Longview, Wash. 98632, (206) 425-6100, Branch Mgr.: B. Fuchs

JW Elctrncs., Inc., 2921 Pacific Ave., Olympia, Wash. 98501, (206) 943-1071, Gen. Mgr.: J. F. Weeks; Gen. Sls. Mgr.: B. Ostrom; Inside Sls. Cont.: J. Coleman

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Kam Electrncs., 1211 E. Denny Way, Seattle, Wash. (206) 323-5100

Kayline Dist. Co., 1801 N. Longwood St. Baltimore, Md.

Kass Elctrncs. Distributors, 2502 Township Line Rd., Drexel Hill, Pa. 19026, (215) 789-7700, Mktg./Adv. Mgr.: A. N. Kass; Gen. Sls. Mgr.: A. N. Kass; Ind. Sls. Mgr.: B. L. Schaefer; Inside Sls. Cont.: B. L. Schaefer

Kaufman Elctrncs, Inc., 73 Frank St., Bridgeport, Conn. 06604, Mktg./Adv. Mgr.: A. Kaufman; Gen. Sls. Mgr.: A. Kaufman; Inside Sls. Mgr.: A. Kaufman

Kearny Elctrncs. Inc., 449 Kearny Ave., Kearny, N. J. 07032, (201) 991-3599, Mktg./Adv. Mgr.: H. Ehrenkranz; Inside Sls. Cont.: H. Ehrenkranz

Kellers Refrigeration, Box 906, Nome, Alaska. (907) 443-2340

Kevtron Elctrncs. Corp., Ste. 803, One Cherry Hill, Cherry Hill, N. J. 08034, (609) 667-7400, Branch Mgr.: S. H. Marder

Kevtron Elctrncs. Corp., Intl. Div., 702 S. 21st St., Irvington, N. J. 07111, (201) 373-6500, TWX: 710-995-4611, Branch Mgr.: R. F. Meisel

Kierulff Airline Supply, 5666 Jillson St., Los Angeles, Calif. 90040, (213) 724-6600

Kierulff Airline Supply—N.Y., 12 Midland Ave., Hicksville, N.Y., 11802, (516) 822-4850

Kierulff—Albuquerque, N. M., 2524 Baylor Dr., S.E., Albuquerque, N. M. 87119, (505) 247-1055, TWX: 910-989-1693

Kierulff—Balt./Wash. D.C., 16021 Industrial Dr., Gaithersburg, Md. 20760, (301) 948-0250

Kierulff—Boston, 14 Charles St., Needham Heights, Mass. 02194, (617) 449-3600

Kierulff—Chicago, 9340 William St., Rosemont, Ill., 60018, (312) 678-8560, TWX: 910-227-3166

Kierulff—Dallas, 2815 National Dr., Garland, Texas 75041, (214) 271-2472

Kierulff—Dayton, 2030 Drill Ave., Dayton, Ohio 45414, (513) 278-9411, TWX: 810-459-1870

Kierulff—Denver, 10890 E. 47th Ave., Denver, Colo. 80239, (303) 343-7090, TWX: 910-932-0169

Kierulff—Los Angeles, 2585 Commerce Way, Los Angeles, Calif. 90040, (213) 685-5511, TWX: 910-580-3106

Kierulff—New Jersey, 5 Industrial Dr., Rutherford, N. J. 07070, (201) 935-2120

Kierulff—New York, 49 Bethpage Rd., Hicksville, N. Y. 11802, (516) 433-5530, TWX: 510-221-1815

Kierulff—Palo Alto, 3969 E. Bayshore Rd., Palo Alto, Calif. 94303, (415) 968-6292, TWX: 910-379-6430

Kierulff—Philadelphia, 1510 Russell Rd., Paoli, Pa. 19301, (215) 647-2612

Kierulff—Phoenix, 2633 East Buckeye Rd., Phoenix, Ariz. 85034 (602) 273-733-, TWX: 910-951-1550

Kierulff—San Diego, 8797 Balboa Ave., San Diego, Calif. 92123, (714) 278-2112, TWX: 910-335-1182

Kierulff—Seattle, 5940 Sixth Ave. S., Seattle, Wash. 98108, (206) 763-1550, TWX: 910-444-2034

Kiesub Corp., 318 21st St., Bakersfield, Calif. 93301, (805) FA 7-5535, Branch Mgr.: R. Kandarian

Kiesub Corp., 311 W. Pacific Coast Hwy., Long Beach, Calif. 90806, (213) 591-1335, Mktg./Adv. Mgr. W. C. Sackman, Inside Sls. Cont. J. Doller

Kiesub Corp., 1162 Industrial Ave., Oxnard, Calif. 93030, (805) HU 3-9541, Branch Mgr.: B. Cerasuolo

Kiesub Corp., 910 W. 11th St., San Bernardino, Calif. 92410, (714) TU5-6807, Branch Mgr.: D. Reilich

Kiesub Corp., 14745 Oxnard St., Van Nuys, Calif. 91401, (213) TR3-1309, Branch Mgr.: F. O. Beane

Kimball Elctrncs. Inc., 418 N. Orchard, Boise, Idaho, 83704, (208) 342-3559, Branch Mgr.: E. McKenzie

Kimball Elctrncs. Inc., 350 Pierpont Ave., Salt Lake City, Utah 84101, (801) 328-2075, Mktg./Adv. Mgr.: R. A. Kimball; Gen. Sls. Mgr.: T. Zucca; Ind. Sls. Mgr.: D. Angell; Inside Sls. Cont.: T. Zucca

King, J. O., Inc., 3300 A. Cessna Rd., Charlotte, N.C., (704) 527-0054

Kirkman Elctrncs. Inc., 901 W. Second St., Winston Salem, N.C., 27108 (919) 724-0541, Inside Sls. Cont.: N. E. Whiteheart

Klaus Radio Inc., 905 S. Neil St., Champaign, Ill. 61820, (217) 356-1896, Branch Mgr.: D. McAfee

Klaus Radio Inc., 227 Bucklin St., La Salle, Ill. 61301, (815) 223-7400, Branch Mgr.: M. Glupczynski

Klaus Radio Inc., 8400 N. Pioneer Pkwy, Peoria, Ill. 61614, (309) 691-4840, TWX.: 910-652-2207, Gen. Sls. Mgr.: E. Schoedel

Klaus Radio Inc., 1008 Jersey St., Quincy, Ill. 62301, (217) 223-7560, Branch Mgr.: W. Lemon

Klaus Radio Inc., 322 E. Fourth St., Davenport, Iowa, 52801, (319) 326-4436, Branch Mgr.: R. Simonton

Klausner Elctrncs., 15418 E. Fairgrove Ave., La Puente, Calif., 91744, (213) 330-3445, Branch Mgr.: G. Foster

Knickerbocker Annunciator Co., 75 Murray St., N. Y., N. Y., (212) 227-5306

Koepsell, J.J., Co., Box 448, 1010 So. 9th St., Sheboygan, Wisc. 53081, (414) 457-3646, Mktg./Adv. Mgr.: J. Koepsell; Gen. Sls. Mgr.: W. Gandre; Inside Sls. Cont.: J. Landgraf

Koontz-Wagner Electric Co., 3801 Voorde Dr., South Bend, Ind., (219) 232-2051

Krueger & Krueger, Inc., 5330 East Ave., Countryside, Ill., (312) 354-8810

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L & S Electronics, 501 S. RoaN St., Johnson City, Tenn. 37601, (615) 926-3021, Gen. Sls. Mgr.: W. R. Livesay

Laco Electronics, 4924 4th Ave., Bklyn., N. Y. 11220, (212) 492-9590, Mktg./Adv. Mgr.: S. Sherman; Gen. Sls. Mgr.: K. Stramka; Ind. Sls. Mgr.: L. Teplin; Inside Sls. Cont.: L. Teplin

Ladd Electrncs. Co., 111 N. 41 St., Omaha, Neb. 68131, (402) 556-3023, Mktg.&Adv. Mgr.: F. H. Ladd

Lafayette Ind. Elctrncs., 1400 Worchester St., Natick, Mass., (617) 969-6100

Lafayette Ind. Elctrncs., 1327 2nd Ave., New Hyde Park, N. Y. (516) 488-6600

Lafayette Radio, 108 W. Otterman St., Greensburg, Pa. 15601

Lafayette Radio, Bel Air Plaza, Johnstown, Pa. 15901

Lafayette Radio Elctrncs., 1252 E. Colorado Blvd., Pasadena, Cal.

Lafayette Radio Electronics, 8976 Jennings Rd., St. Louis, Mo. 63136, (314) 868-3055, Gen. Sls. Mgr.: T. Goonan

Lafayette Radio Electrncs., 111 Jericho Tpke., Syosset, N. Y.

Lafayette Radio Supply, 408 North St., Lafayette, Ind. 47901, (317) 742-4006, Branch Mgr.: B. Hiatt

Lake Engnrng. Co., Ltd., 123 Manville Rd. Scarborough, Ont., Canada (416) 751-5980, Telex: 02-2684, TWX: 610-492-2728

Lakeland Electronics, 2451 Brickvale Dr., Elk Grove Village, Ill. 60007, (312) 595-1000, Branch Mgr.: H. Baron

Land Electronics, 9R Franklin St., Lynn, Mass. 01902, (617) 592-2220, Mktg./Adv. Mgr.: J. Stein; Gen. Sls. Mgr.: P. Perry; Ind. Sls. Mgr.: P. Perry; Inside Sls. Cont.: J. Stein

Lapirow Brothers, 1649-57 Hoffner St. Cincinnati, Ohio 45223, (513) 541-1285. Mktg./Adv. Mgr.: S. Lapirow

Lasalle Electronics, 240 S. Seminary St., Galesburg, Ill. 61401, (309) 343-4165, Mktg./Adv. Mgr.: G. R. Bowers; Gen. Sls. Mgr.: E. D'Aleo; Ind. Sls. Mgr.: E. Lendsey; Inside Sls. Cont.: E. D'Aleo

LaSalle Electronics, 154 Second St., LaSalle, Ill. 61301, (815) 223-0577, Mktg./Adv. Mgr.: R. Anderson; Inside Sls. Cont.: G. J. Bowers

LaSalle Electronics, 10 Westside Sq., Macomb, Ill. 61455, (309) 837-3914. Branch Mgr.: J. H. Elson

LaSalle Electronics, 523 Main St., Peoria, Ill. 61602, (309) 837-4205. Branch Mgr.: G. Bowers

LaSalle Elec. Supply Co., 470 Brainard St., Detroit, Mich., (313) 831-0470

Lashen Elctrncs. Inc., 21 Broadway, Denville, N. J. 07834, (201) 627-9504, Mktg./Adv. Mgr.: L. Lashen; Inside Sls. Cont.: A. M. Ehrensal

Latus, D. N. & Co., Airport Rd., Helena, Mont. 59601, (406) 442-3940, Gen. Sls. Mgr.: D. N. Latus

LCOMP-Chicago Inc., 9870 Derby Lane, Westchester, Ill. 60153, (312) 344-0522, Branch Mgr.: W. Keally

LCOMP-Kansas City, Inc., 1520 Taney, N. Kansas City, Mo. 64116, (816) 221-2400, TWX: 910-771-3148, Branch Mgr.: L. Laswell

LCOMP-St. Louis, Inc., 2605 S. Hanley Rd., St. Louis, Mo. 63124, (314) 647-5505, TWX: 910-761-0493, Mktg./Adv. Mgr.: L. Steiner; Inside Sls. Cont.: L. Steiner

Leader Elctrnc. Dist. Inc., 3411 S. Dale Mabry, Tampa Fla 33611, (813) 833-9251, Gen. Sls. Mgr.: H. Kitchen; Ind. Sls Mgr.: W. Charles; Inside Sls. Cont.: W. Charles

Lectronic Dist. Inc., 1423 Ferry Ave., Camden, N. J. 08104, (609) 966-7520, Gen. Sls. Mgr.: T. Butto; Inside Sls. Cont.: T. Butto

Lectronic Kit & Prts. Inc., 513 State St., Santa Barbara, Cal. 93101, (805) 962-4817, Mktg./Adv. Mgr.: W. Meyer; Inside Sls. Cont.: W. Meyer

Lectronix Inc., P. O. Box 188, St. Charles, Mo. 63301, (800) 325-3348, Mktg./Adv. Mgr.: J. Buce; Ind. Sls. Mgr.: J. Hinton; Inside Sls. Cont.: N. Buse.

Leff, M. Radio Parts Co., 225 Braddock Ave., Braddock, Pa. 15140, (412) 271-2800, Mktg./Adv. Mgr.: J. Leff; Gen. Sls. Mgr.: J. Leff; Ind. Sls. Mgr.: B. Zeff; Inside Sls. Cont.: J. Leff, B. Zeff

Leff M., Radio Prts. Co., 401 S. Main St., Greensburg, Pa. 15602, (412) 834-5400, Branch Mgr.: T. Marianni

Lenert Co., Box 2184, Houston, Tex., (713) 225-1465

Liberty Elctrncs., 124 Maryland St., El Segundo, Cal. 90245, (213) 322-8100, Branch Mgr.: I. Samuels

Liberty Elctrncs/Northwest, 5305 2nd Ave. S., Seattle, Wash. 98108, (206) 763-8200, TWX: 910-444-1379, Branch Mgr.: C. M. Olson

Liberty Elctrncs/Arizona, 3612 N. 16th St., Phoenix, Ariz. 85016, (602) 264-4438, Branch Mgr.: C. Blum

Lifetime Elctrncs. Inc., 1501 Adams St., Toledo, Ohio 43624, (419) CH1-5643, Mktg. Mgr.: H. J. Rosenthal; Genl Sls. Mgr.: H. J. Rosenthal; Ind. Sls. Mgr.: J. E. Keisser; Inside Sls. Cont.: J. E. Keisser

Lima Radio Prts. Co. Inc., 1414 S. Main St. Findlay, Ohio 45840, (419) 423-1032, Branch Mgr.: D. Smith

Lima Radio Prts. Co. Inc., 150 W. Grand Ave., Lima, Ohio 45802, (419) 228-1220, Gen. Sls. Mgr.: C. Frueh; Inside Sls. Cont.: W. Jennings

Lima Radio Prts. Co. Inc., 233 N. Market, Van Wert, Ohio 45891, (419) 238-1268, Branch Mgr.: R. Marquis

Lippman A. & Co., 99-107 Newark, St., Newark, N. J. 07103, Inside Sls. Cont.: R. Lifshin

Lippman A. of Bradley Beach, 504 Main St., Bradley Beach, N. J. 07720, Branch Mgr.: A. Basen

Lippman A. of Highland Park, 1001 Raritan Ave., Highland Park, N. J. 08904, Branch Mgr.: D. Prepon

Lippman A. of Morristown, 91 Ridgedale Ave., Morristown, N. J. 07960, Branch Mgr.: R. Stantley

Lippman A. of Paterson, 394 Main St., Paterson, N. J. 07501, Branch Mgr.: L. Perks

Lippman A. of Roselle, 1017 Walnut St., Roselle, N. J. 07203, Branch Mgr.: H. Gilligan

Lofgren Dist. Co., 1202-4 Ave., Moline, Ill. 61265, (309) 764-7436 Gen. Sls. Mgr.: D. Kehoe; Inside Sls. Cont.: J. Kehoe

Logicomp Elctrns. Inc., Box 37 H, Scarsdale, N. Y. (914) 723-3334

Leuking Elctrncs., Rock Rd. & W. Lueking Dr., De Soto, Mo. 63020, (314) 586-3977, Mktg./Adv. Mgr.: N. R. Lueking

Lybtronics Intl., 130 W. 30th St., New York, N. Y. 10001, (212) 594-4460, Branch Mgr.: M. Drucker

Lykes Elctrncs. Corp., P. O. Box 359, 2615 Ninth St., Bradenton, Fla. 33505, (813) 747-3035, Branch Mgr.: R. Langman

Lykes Elctrncs. Corp., 1208 Rogers St., P. O. Box 667, Clearwater, Fla. 33516, (813) 447-3887, Mgr.: E. Newton

Lykes Elctrncs. Corp., 540 St. Johns St., P. O. Box 3346, Cocoa, Fla. 32922, (305) 636-6331, Mgr.: K. Jones

Lykes Elctrncs. Corp., 566 Ballough R., P. O. Box 6042, Daytona Beach, Fla. 32014, (914) 252-0504, Mgr.: C. Anderson

Lykes Elctrncs. Corp., 901 N. E. 13th St., P. O. Box 497, 33302, Fort Lauderdale, Fla. 33304, (305) 764-0011, Mgr.: R. Lioy

Lykes Elctrncs. Corp., 2336 Fowler St., P. O. Box 1529, Fort Myers, Fla. 33901, (813) 334-0543, Mgr.: R. English

Lykes Elctrncs. Corp., 87 N. Beal Pkwy., Cinco Bayou P. O. Box 1428, Fort Walton Beach, Fla., 32548, (904) 243-7691, Mgr.: R. Harris

Lykes Elctrncs. Corp., 1032 S. Main St., P. O. Box 838, Gainesville, Fla. 321601, (904) 376-8231, Mgr.: M. H. Alderman

Lykes Elctrncs. Corp., 395 N. Flagler Ave., P. O. Box 1078, Homestead, Fla. 33030, (305) 247-2858, Mgr.: R. Dahdah

Lykes Elctrncs. Corp., 956 Liberty St., P. O. Box 1318, Jacksonville, Fla. 32206, (904) 356-8427, Mgr.: F. Mitchell

Lykes Elctrncs. Corp., 1696 Roosevelt Blvd., Key West, Fla. 33040, (305) 296-2335, Mgr.: R. Johnson

Lykes Elctrncs. Corp., 402 N. Ingraham Ave., P. O. Box 15, Lakeland, Fla. 33801, (813) 686-8193, Mgr.: J. C. Flynn

Lykes Elctrncs. Corp., 1800 N. W. 23 St., P. O. Box 36, Biscayne Annex, Miami, Fla. 33142, (305) 635-0651, Mgr.: H. Belinky

Lykes Elctrncs. Corp., 603 S. Magnolia St., P. O. Box 1239, Ocala, Fla. 3670, (904) 622-7172, Mgr.: L. L. Hutcheson

Lykes Elctrncs., Corp., 822 W. Central Ave., P. O. Box 3121, Orlando, Fla. 32805, (305) 841-4650, Mgr.: W. R. Arnold

Lykes Elctrncs. Corp., 528 E. 6th St., P. O. Box 792, Panama City, Fla. 32401, (904) 763-6651, Mgr.: W. G. Skipper

Lykes Elctrncs. Corp., 99 S. Alcaniz St., P. O. Box 49, Pensacola, Fla., 32501, (904) 432-9891, Mgr.: S. Denton

Lykes Elctrncs. Corp., 4852 28th St., N., P. O. Box 11058, St. Petersburg, Fla. 33714, (813) 527-6445, Mgr.: E. Patz

Lykes Elctrncs. Corp., 303 W. Brevard St., P. O. Box 1087, Tallahassee, Fla. 32301, (904) 224-5101, Mgr.: J. Sheffield

Lykes Elctrncs. Corp., 121 S. Ashley, Tampa, Fla. 33601, (813) 229-1885, Mktg. Mgr.: T. E. Allinder; Gen. Sls. Mgr.: C. Janke; Ind. Sls. Mgr.: T. E. Allinder

Lykes Elctrncs. Corp., 6007 N. Armenia, Tampa, Fla. 33604, (813) 876-5163, Mgr.: D. Goodrich

Lykes Elctrncs. Corp., P. O. Box 3050, West Palm Beach, Fla. 33402, (305) 832-7551, Mgr.: B. York

Lykes Elctrncs. Corp., 1135 Chattahoochee Ave., N. W., P. O. Box 19837, Sta. N, Atlanta, Ga. 30318, (404) 355-2223, Mgr.: T. Gunnin

Lykes Elctrncs. Corp., 304 N. Ashley St., P. O. Box 1373, Valdosta, Ga., (912) 244-4882, Mgr.: H. Foster

Lykes Elctrncs. Corp., 723 Franklin St., Gretna, La. 70053, (504) 368-3355, Mgr.: A. Bellande

Lykes Elctrncs. Corp., 3308 Orleans Ave., P. O. Box 19205, New Orleans, La. 70119, (504) 486-7441, Mgr.: M. Spiro

Lynch-Gentry Assocs., 6731 First Ave., St. Petersburg, Fla., (813) 347-5131

Lynch-Gentry Assocs., 3470 Bowman Dr., Winter Park, Fla., (303) 671-7649

Lytron Dist. Co., Box 7382, Daytona Bch., Fla. 32016, (904) 767-2329, Gen. Sls. Mgr.: C. Pollard

Lytron Dist. Co., 2032 York Rd., Timonium, Md. 21093, (301) 252-7857, Branch Mgr.: W. F. Shock

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M & C Assocs., 31 Tanner St., Haddenfield, N. J., (609) 429-7055

M & C Sls. Inc., 904 Bob Wallace Ave., Huntsville, Ala., (205) 539-8476

M & C Sls. Inc., 500 Plasamur Dr. N. E., Atlanta, Ga., (404) 875-2525

M & C Sls. Inc., 1106 Burke St., Winston Salem, N. C., (919) 723-1001

Mace Elctrncs., 2631 W. 8th St., Erie, Pa., (814) 838-3544

MacPherson Control Products, 526 North Ave., Westfield, N. J. (201) 233-4010

Maddux Supply, Box 6787, Greensboro, N. C., (919) 275-9603

Magnuson Elctrns., 1246 W. 7th St., St. Paul, Minn., (612) 227-8495

Magnuson Elctrncs., 2420 Oakden St., Mt. Prospect, Ill., (312) 956-0700

Malco Elctrncs. Inc., 5 Wolcott Ave., Lawrence, Mass. 01843, (617) 685-4383, Mktg./Adv. Mgr.: J. Musumarra; Gen. Sls. Mgr.: J. Musumarra; Ind. Sls. Mgr.: R. Goulet, Inside Sls. Cont.: J. Scarera

Mann H., Inc., 925 Pennsylvania Blvd., Feasterville, Pa. 19047, (215) 355-7200, Mktg./Adv. Mgr.: S. Patrick; Ind. Sls. Mgr.: L. Tepper; Inside Sls. Cont.: J. Massi

Mannie's Elect. & Photo Supply Inc., 802 S. Solano Dr., Las Cruces, N. M. 88001, (505) 524-3646, Mktg./Adv. Mgr.: M. Blumkin; Gen. Sls. Mgr.: M. Blumkin; Ind. Sls. Mgr.: D. Blumkin

Mar Vac Elctrncs., 1829 Newport Blvd., Costa Mesa, Calif. 92627, (714) 540-3280, 642-0952

March Radio Supply Co., 6047 W. Beloit Rd., Milwaukee, Wisc., (414) 545-6500

Mark Elctrncs. Inc., 2315½ Artesia Blvd., Redondo Beach, Calif. 90278, (213) 722-2141, Mktg./Adv. Mgr.: R. Levinson; Gen. Sls. Mgr.: R. Weil; Inside Sls. Cont.: G. Burchette

Marshall, G. S. Co., 4674 Telstar Ave., El Monte, Calif.

Marshall, G. S. Co., 7990 Engineer Rd., San Diego, Calif.

Marshall, G. S. Co., 732 N. Pastoria Ave., Sunnyvale, Calif.

Marshall, G. S. Co., 5047 W. 64 Ave., Aruada, Colo.

Marshall, G. S. Co., 10385 Riverside Dr., Palm Beach Gardens, Fla.

Marshall, G. S. Co., 2425 S. 57th Ave., Cicero, Ill.

Marshall, G. S. Co., 230 Sherwood Ave., Farmingdale, N. Y.

Marshall, G. S. Co., 2077 Embury Park Rd., Dayton, Ohio

Marshall, G. S. Co., 2607 Andjon St., Dallas, Tex.

Martin, M. H. Co., 1118 Lincoln Way E., Massillon, Ohio 44646, (216) 832-7467, Mktg./Adv. Mgr.: M. H. Martin; Gen. Sls. Mgr.: R. L. Allen; Ind. Sls. Mgr.: J. Rice; Inside Sls. Cont.: R. Rosenbury

Masline Elctrncs., 511 Clinton Ave. S., Rochester, N. Y.

Master Distributors, 1553 17th Street, Santa Monica, Calif. 90404, (213) 395-2637, Mkgt./Adv. Mgr.: K. Nizam; Gen. Sls. Mgr.: J. Yednock; Ind. Sls. Mgr.: J. Yednock; Inside Sls. Cont.: J. Yednock

Master Elctrncs, Inc., 8118 S. 71 Highway, Kansas City, Mo. 64132, (816) 444-6418, Mkgt./Adv. Mgr.: D. W. Peters; Gen. Sls. Mgrt.: L. Kralicek; Inside Sls. Cont.: D. W. Peters, L. Kralicek

Masters Electronic Supply, 17 Colfax St., Raritan, N. J. 08869, (201) 725-3533, Inside Sls. Cont.: J. V. Masters

Mattoon Radio & Television Supply Co., 400-404 S. 21st St., Mattoon, Ill. 61938, (217) 235-5457, Mkgt./Adv. Mgr.: G. W. Durre; Gen. Sls. Mgr.: G. Englund; Ind. Sls. Mgr.: G. W. Durre; Inside Sls. Cont.: S. Cooper

Mavis Mobile Radio, Box 282, Auburn, Ind. 46706, (219) 925-2618, Inside Sls. Cont.: K. E. Mavis

May Elctrncs. Supply Co., 1412 Ingalls Ave., Pascagoula, Miss. 39567, (601) 762-1900

Mayer, A. W. Co., 38 Border St., West Newton, Mass., (617) 965-1111

Mayes, J., 121 E. Broad St., Gadsden, Ala., (205) 547-1636, Branch Mgr.: J. Mayes

McJunkin Corp., 312 MacCorkle Ave., S. E. Charleston, W. Va., (304) 348-4995

McJunkin Corp., Box 2119, Columbus, Ohio, (614) 294-3711

McNaughton-McKay-Elec. Co., 1357 E. Lincoln Ave., Madison Hts., Mich. (313) 399-7500

McNichol Inc., 3012 E. Yandell Dr., El Paso, Tex., (915) 566-2936

Measurement Equipment Co., 591 North Ave., Wakefield, Mass. 01880, (617) 245-4870, Branch Mgr.: M. Arness

Mekco Assocs., 217 Curtis Dr., Huntsville, Ala. 35801, (205) 881-3721

Melville Radio Corp., 1 Nepperhan Ave., Elmsford, N. Y., (914) 592-7100, Ind. Sls. Mgr.: G. Wiesel; Inside Sls. Cont.: C. Mann

Mentor Elec. Co., 7444 Tyler Blvd., Mentor, Ohio, (216) 946-8950

Meridian Elctrncs. Inc., 1001 W. Broad St., Richmond, Va. 23220, (703) 353-6648, Mkgt./Adv. Mgr.: D. W. Tinsley; Gen. Sls. Mgr.: D. W. Tinsley; Ind. Sls. Mgr.: D. L. Cooper; Inside Sls. Cont.: D. L. Cooper

Merquid Elctrncs., 7701 N. Austin Ave., Skokie, Ill. 60076, (312) 965-7500, TWX: 910-223-4519, Branch Mgr.: O. A. Sheade

Merrill Elctrncs. Inc., 3563 N. Milwaukee Ave., Chicago, Ill. 60641, (312) 286-2525, Mktg./Adv. Mgr.: N. M. Gertz; Gen. Sls. Mgr.: D. Green; Ind. Sls. Mgr.: R. Kurowski; Inside Sls. Cont.: D. Green

Metermaster—Dallas, 2809 National Dr., Garland, Tex., (214) 271-2471

Metermaster—Main Office, 5646 Jillson St., Los Angeles, Calif. 90040, (213) 685-4340

Metermaster — Palo Alto, 3969 E. Bayshore Rd., Palo Alto, Calif. 94303, (415) 968-6192

Metermaster Phoenix, 2633 E. Buckeye Rd., Phoenix Ariz., (602) 273-7331

Metermaster — San Diego, 8797 Balboa Ave., San Diego, Calif. 92123, (714) 278-2112

Metropolitan Supply Co. Div. Metropolitan Overseas Supply Co., 463 Park Ave. S., New York, N. Y. 10016, (212) 686-2120, Gen Sls. Mgr.: H. Rosen; Ind. Sls. Mgr.: H. Rosen; Inside Sls. Cont.: E. Zupsam, S. Sussman

MG Electric & Equip. Co., 3112 6th Ave. South, Birmingham, Ala., (205) 328-4525

Mid Atlantic Elctrncs. Corp., 140 Haddon Ave., Haddonfield, N. J., (609) 428-8288

Mid Mountain Distributing, P. O. Box 5210 N. 2025 Div., Spokane, Wash. 99205, (509) 328-3021, Inside Sls. Cont.: L. Pfeifer

Midland Specialty Company, 2235 Wyoming Ave., El Paso, Tex. 79903, (915) 533-9555, Mktg./Adv. Mgr.: J. Qualtrough; Gen. Sls. Mgr.: C. E. Pretto; Ind. Sls. Mgr.: J. Qualtrough; Inside Sls. Cont.: A. Garza

Midland Specialty Company, 2101 Andrews Hwy., Odessa, Tex. 79760, (915) 337-7365, Branch Mgr.: F. Bountin

Mid-State Elctrncs., 611A N. Wenatchee Ave., Wenatchee, Wash. 98801, (509) 662-8103, Gen. Sls. Mgr.: J. Miller; Inside Sls. Cont.: J. Miller

Midstate Radio Supply Co., 157 W. White Horse Pike, Berlin, N. J. 08009, (609) 767-1605, Mktg./Adv. Mgr.: D. J. Chiaravalloti

Midstate Radio Supply Co., 653 N. Pearl St., Bridgeton, N. J. 08032, (609) 455-2665, Branch Mgr.: T. Colella

Midway Industrial Elctrncs. Inc., 38 East 29 St., N. Y., N. Y. 10016, (212) 889-0370, TWX: 710-581-4014, Mktg./Adv. Mgr.: B. Cohen; Gen. Sls. Mgr.: H. Kahn; Ind. Sls. Mgr.: J. Danziger; Inside Sls. Cont.: F. Kriss

Midwestern Elec. Co., 3801 N. 35th St., Milwaukee, Wisc., (414) 871-9700

Midwestern Equito Co., 11315 Williamson Rd., Cincinnati, Ohio

Mid-West Associated, Inc., 225 S. 6th St., Rockford, Ill. 61108, (815) 962-8036, Mktg./Adv. Mgr.: A. Ahlstrand; Gen. Sls. Mgr.: A. Ahlstrand; Ind. Sls. Mgr.: H. Wilcop; Inside Sls. Cont.: H. Wilcop

Midwest Supply Electronics, Inc., 2015 Garfield Ave., Terre Haute, Ind. 47804, (812) 232-9649, Mktg./Adv. Mgr.: F. E. Tomlinson; Ind. Sls. Mgr.: D. Maxwell; Inside Sls. Cont.: F. E. Tomlinson

Midwest Supply Elctrncs., 1216 Wabash Ave., Terre Haute, Ind. 47807, (812) 232-0187, Branch Mgr.: M. D. Springer

Midwestern Region, 1305 Dennison Dr., Springfield, Ill. 62704, (217) 546-2638, Branch Mgr.: R. Hunsicker

M. I. L. Elctrncs. Inc., 971 Main St., Waltham, Mass. 02154, (617) 891-6730, Mktg./Adv. Mgr.: I. Cohen

Mil-Comm Distributors, Inc., 1609 Pontius Ave., Los Angeles,calif., 90025, (213) 477-2068, Mktg./Adv. Mgr.: E. M. Landa; Gen. Sls. Mgr.: M. Andrews; Ind. Sls. Mgr.: M. Smith; Inside Sls. Cont.: R. May, L. Womack

Mil-Spec Wire & Cable Corp., 404 N. Main St., Freeport, N. Y. 11520, (516) 546-5454 Mktg./Ad. Mgr.: Joe Barnett; Gen. Sls. Mgr.: L. Bonzani

Milgray/California, 8718 Woodley Ave., Sepulveda, Calif. 91343, (213) 894-4011, TWX: 910-496-1487

Milgray/Cleveland, 1821 East 40th St., Cleveland, Ohio 44103, (216) 881-8800, TWX: 810-421-8573

Milgray/Delaware Valley, Philadelphia, Pa., (215) 228-2000

Milgray/Deleware Valley, 1165 Marlkress Rd., Cherry Hill, N. J. 08002, (609) 424-1300, Phila. (215) 228)2000, TWX: 710-896-0405

Milgray/Florida, 5400 Diplomat Circle, Orlando, Fla. 32810, (305) 647-5747, TWX: 510-225-3673

Milgray/International, Avenue Brugmann, 26, 1060 Bruxelles, Belgium, 44.49.93, Telex: 24770

Milgray/International, 191 Hanse Ave., Freeport, N. Y. 11520, (516) 546-6000, TWX: 510-225-3674

Milgray/New England, 79 Terrace Hall Ave., Burlington, Mass. 01803, (617) 272-6800, TWX: 710-332-6508

Milgray/Washington, 5405 Lafayette Pl., Hyattsville, Md. 20781, (301) 864-1111, TWX: 710-826-1127

Milgray Elctrncs, Inc., 191 Hanse Ave., Freeport, N. Y. 11520 (516) 546-6000, TWX: 510-225-3673, Mktg./Adv. Mgr.: L. Wingate; Gen. Sls. Mgr.: M. Spivak

Mill Elctrncs. Supply Co., 2480 65 St., Brooklyn, N. Y. 11204, Mktg./Adv. Mgr.: O. D. Wolff; Gen. Sls. Mgr.: I. Deutsch

Miller Electro-Research Labs., 14800 W. Grange Ave., New Berlin, Wis., 53151, (414) 425-6303, Inside Sls. Cont.: A. W. Miller

Miller, Herman & Co., 2812 Cottman Ave., Philadelphia, Pa. 19149, (215) 338-1100, Mktg./Adv. Mgr.: H. Miller; Inside Sls. Cont.: M. Ballasy

Millers Electronic Supply, 21726 Meekland Ave., Halward, Cal. 94541, (415) 537-5833, ranch Mgr.: T. Bolman

Millers Electronic Supply Inc., 530 E. 8th St., Oakland, Cal. 94606, (415) 834-9185, Mktg./Adv. Mgr.: N. Miller; Inside Sls. Cont.: N. Miller

Millers Electronic Supply, 1391 N. 10th St., San Jose, Cal. 95112, (408) 295-6818, Branch Mgr.: H. Lewis

Millers Electronic Supply, 134 Jacoby St., San Rafael, Cal. 94901, (415) 453-1130, Branch Mgr.: R. Clever

Millers Electronic Supply, 59 Maxwell Court, Santa Rosa, Cal. 95401, (707) 542-5423, Branch Mgr.: J. Bowes

Millers Electronic Supply, 1263 Arroyo Way, Walnut Creek, Cal. 94596, (415) 934-3000, Branch Mgr.: T. Bletsoe

Milner Elec. Co., 1320 St. Clair Ave., Cleveland, Ohio, (216) 696-9300

Milo Connector Center, 6320 Kansas Ave., Kansas City, Kan. 66111, (913) 287-2100, TWX: 4-2308, Branch Mgr.: R. Ketterer

Milo Elctrncs. Corp., 170 Eileen Way, Syosset, N. Y. 11791, (516) 364-1111, TWX: 96-7808, Gen. Sls. Mgr.: G. Cooney; Ind. Sls. Mgr.: M. Kneller; Inside Sls. Cont.: A. Sterman

Milo of California, Inc., 1620 Cotner Ave., Los Angles, Cal. 90025, (213) 478-9854, TWX: 67-4066, Branch Mgr.: B. Nino

Milo of California, Inc., 4955 Mercury St., San Diego, Cal. 92111, (714) 292-0900, TWX: 695-064, Branch Mgr.: J. Petrie

Micro Elctrn. Dist., 2104 W. Peoria Ave., Phoenix, Arix., (602) 944-2281

Mitchell, C. H. Co., 14614 Raymer St., Van Nuys. Cal., (213) 994-9466

Mock Elctrncs. Inc., 2310 Memorial Pkwy. S. W., Huntsville, Ala.

Modern Electronic Supply Co., 1224 Farmington Ave., Berlin, Conn. 06037, (203) 828-3586, Pres.: J. Adolew

Moltronics, 5610 E. Imperial Hwy., South Gate, Cal. 90280, (213) 773-6521, TWX: 910-583-1947, Mktg./Adv. Mgr.: D. Cassidy; Gen. Sls. Mgr.: B. Perry; Inside Sls. Cont.: V. Vorris

Moltronics Inc., 2746 W. Palm La., Phoenix, Ariz. 85009, (602) 272-7951, TWX: 910-951-1512, Mktg./Adv. Mgr.: G. L. Higgins; Inside Sls. Cont.: R. Walhgren

Moltronics of San Diego, 7969 Engineer Rd., San Diego, Cal. 92111. (714) 278-5020 TWX: 910-335-2015, Branch Mgr.: E. Hutchinson

Moltronics of Santa Clara, 337 Mathews St., Santa Clara, Cal. 95050, (408) 244-7600, TWX: 910-338-0036, Branch Mgr.: R. Lee

Morris Elctrncs., 305 Court St., Binghamton, N. Y. 13904, (607) RA 3-9445, Branch Mgr.: J. Heiyen

Morris Elctrncs., 75 Stillson St., Rochester, N. Y. 14605, (716) 546-8147, Branch Mgr.: L. Levy

Morris Elctrncs., 1153 W. Fayette St., Syracuse, N. Y. 13201, (315) 475-3191, Gen. Sls. Mgr.: J. Horowitz; Ind. Sls. Mgr.: R. Butler; Inside Sls. Cont.: R. Butler

Morrison's Radio Supply, 331 Center St., Ashtabula, Ohio 44004, (216) 997-6161, Mktg./Adv. Mgr.: H. Morrison; Inside Sls. Cont.: N. Loose

Morrison's Radio Supply, 1430 Mentor Ave., Painesville, Ohio 44071, (216) 352-3444, Branch Mgr.: H. Warner

Muncie Elctrncs. Supply, 222 N. Madison, Muncie, Ind. 47303, (317) 288-8837, Mktg./Adv. Mgr.: E. L. Nuckols; Gen. Sls. Mgr.: E. L. Nuckols; Ind. Sls. Mgr.: R. Flannery; Inside Sls. Cont.: R. Flannery; Branch Mgr.: L. Nuckols

Mundix Co., 5495 Marion St., Denver, Colo., (303) 893-2390

Muntz Elec. Supply Co., 1211 23rd Ave., Box 1028, Rockford, Ill. (815) 968-8866

Mytronic Co., 1843 N. Reading Rd., Cincinnati, Ohio 45215, (513) 733-1661, Inside Branch Mgr.: B. Class; Outside Branch Mgr.: J. Klasmeier

— N —

Nappco Fastner, 11260 Hempstead Hwy., Houston, Tex., (713) 688-2521

National Euphonics Corp., 572 Albany Ave., Brooklyn, N. Y. 11203, (212) 778-0800

National Radio Parts Dist. Co., 572 Albany Ave., Brooklyn, N. Y. 11203

Nat'l. Precision Products, 10549 Denton Dr., Dallas, Tex., (214) 357-3921

Neptune Elctrncs. Inc., 921-925 N. Pacific Ave., San Pedro, Calif. 90731, (213) 833-5291/775-2039, Gen. Sls. Mgr.: J. Harrison; Inside Sls. Cont.: Mrs. J. Harrison

Net Elctrncs, Inc., 8218 Firestone Blvd., Downey, Cal. 90241, (213) 923-4591, Gen. Sls. Mgr.: D. Levy; Inside Sls. Cont.: S. Tyras

New Yorker Elctrncs. Co. Inc., 40 E. 21 St., New York, N. Y. 10010, (212) 674-5120, Gen. Sls. Mgr.: A. Bressler; Inside Sls. Cont.: A. Slivka

Newark Elctrncs., 4747 W. Century Blvd., Inglewood, Calif. 90304, (213) 678-0441, TELEX: 65-3518 Newark INW, Inside Sls. Cont.: M. Gallucci

Newark Elctrncs., 2170 S. Grape St., Denver, Colo. 80222, (303) 757-3351, Inside Sls. Cont.: L. Rose

Newark Elctrncs., 7200 Griffin Rd., Davie, Fla. 33314, (305) 587-2372, TELEX: 51-4305, Branch Mgr.: M. Eisenberg, Newark

Newark Elctrncs., 2500 E. Devon, Des Plaines, Ill. 60018, (312) 298-1420, Branch Mgr.: D. Kryza

Newark Elctrncs., 500 N. Pulaski Rd., Chicago, Ill. 60624, (312) 638-4411, TELEX: 25-3218 Newark CGO, Mktg./Adv. Mgr.: J. Rubin; Gen. Sls. Mgr.: W. M. Hamilton; Ind. Sls. Mgr.: J. Wood; Inside Sls. Cont.: D. Danielson

Newark Elctrncs., 24 Circle Dr., Carmel, Ind. 46032, Branch Mgr.: G. Staley

Newark Elctrncs., 3737 Eastmont Dr., S. Bend, Ind. 46628, (219) 272-2992, Branch Mgr.: J. Lynn

Newark Elctrncs., 13A Wheeling Ave., Woburn, Mass. 01801, (617) 935-8350, TELEX: 94-9316, Branch Mgr.: R. LaRue, Newark WOBN

Newark Elctrncs., 20700 Hubbell Ave., Oak Park, Mich. 48327, (313) 548-0250, TELEX: 23-5638 Newark OPRK., Branch Mgr.: G. Laidler

Newark Elctrncs., 3645 Linden Ave. S.E., Wyoming, Mich. 49508, (616) 241-6681, TELEX: 22-6681, Branch Mgr.: W. Thomison, Newark GDR

Newark Elctrncs., 336 Hoover St. N.E., Minneapolis, Minn. 55413, (612) 331-6350, TELEX: 29-0682, Branch Mgr.: T. Schmid, Newark MPS

Newark Elctrncs., 11646 Tescord Dr., St. Louis, Mo. 63128, (314) VI-3-2080, Branch Mgr.: C. Logsdon

Newark Elctrncs., 80 Express St., Plainview, N. Y. 11803, (516) 822-5000, TELEX: 96-0241, Branch Mgr.: P. Potto, Newark PLVW

Newark Elctrncs., 3000 Winton Rd. S., Rochester, N. Y. 14623, (716) 473-6600, TELEX: 97-8262, Branch Mgr.: M. Sanow, Newark ROC

Newark Elctrncs., 303 Monroe Ave., Kenilworth, N. J. 07033, (201) 272-8410, TELEX: 13-8150 Newark KENL, Branch Mgr.: M. Nolan

Newark Elctrncs., Lyndon Lawn Trailer Park, Central Square, N. Y. 13036, Branch Mgr.: L. Jobin

Newark Elctrncs., 112 E. Liberty St., Cincinnati, Ohio 45210, (513) 421-5282, TELEX: 21-4174, Branch Mgr.: B. Trotter, Newark CIN

Newark Elctrncs., 3304 E. 87th St., Cleveland, Ohio 44127, (216) 641-2800, TELEX: 98-0176, Branch Mgr.: E. Kramar, Newark CLV

Newark Elctrncs., 1153 Northridge Rd., Columbus, Ohio 43224, (614) 267-9474, Branch Mgr.: J. Flovin

Newark Elctrncs., 3865 Wilson Blvd., Arlington, Va. 22203, (703) 528-4500, TELEX: 89-9436, Branch Mgr.: E. Goetz, Newark AGTN

Newark Elctrncs., 707 Easy St., Garland, Tex. 75042, (214) 271-2511, TELEX: 73-0793, Branch Mgr.: C. Swann, Newark DAL

Newark Elctrncs., 6902 Harwin Dr., Houston, Tex. 77036, (713) 782-4800, TELEX: 76-2031 Newark HOU, Branch Mgr.: W. Phelps

Newark Elctrncs., 259 Crossroad Sq., Salt Lake City, Utah 84115, (801) 486-1048, TELEX: 38-8415 Newark SLC, Branch Mgr.: G. Evans

Newark Elctrncs., 3695 N. 126th St., Brookfield, Wisc. 53005, (414) 781-2450, TELEX: 26-7710 Newark BKFD, Branch Mgr.: R. Brunette

Newark Elctrncs., P. O. Box 2551, Madison, Wisc. 53701

Newark Elctrncs., 4950 S. Jonathan Lane, New Berlin, Wisc. 53151, Branch Mgr.: D. R. McBride

Newark Ind'l. Elctrncs., 2114 S. Division, Grand Rapids, Mich., (616) 452-1411

Nicholson's High Fidelity Ctr., 113 19th Ave. S., Nashville, Tenn. 37203, (615) 327-4312, Mktg./Adv. Mgr.: G. Esslinger; Gen. Sls. Mgr.: G. Esslinger; Ind. Sls. Mgr.: R. Satterfield; Inside Sls. Cont.: A. M. Nicholson

Nidisco Inc., 55 State St., Hackensack, N. J. 07601, (201) 489-2000, Branch Mgr.: W. Schaffer

Nidisco Inc., 713 Newark Ave., Jersey City, N. J. 07306, (201) 653-2360, Branch Mgr.: J. Girardo

Nidisco Inc., 294 Passaic St., Passaic, N. J. 07055, (201) 779-4962, Branch Mgr.: W. Intelisani

Nidisco Inc., 484 Bergen Blvd., Ridgefield, N. J. 07657, (201) 943-0510, Branch Mgr.: A. Moleti

Nidisco Inc., 985 Princeton Ave., Trenton, N. J. 08638, (609) 396-0838, Branch Mgr.: F. Laske

Nidisco Inc., 2401 Vaux Hall Rd., Union, N. J. 07083, (201) 964-7070, Branch Mgr.: L. Braun

Nidisco Inc., 2812 Kennedy Blvd., Union City, N. J. 07087, (201) 863-2111, Mktg./Adv. Mgr.: W. J. Newman; Inside Sls. Cont.: W. J. Newman

Niles Radio Supply, 933 N. 5th St., Niles, Mich. 49120, (616) 684-0550, Mktg./Adv. Mgr.: K. L. Geideman; Gen. Sls. Mgr.: C. Lane; Ind. Sls. Mgr.: K. Geideman; Inside Sls. Cont.: K. Geideman

Nitze's Elctrncs. Dist., 718-20 N. 8th St., Sheboygan, Wisc. 53081, Ind. Sls. Mgr.: H. R. Nitze

Norelcom Elctrncs. Inc., 200 Allen Blvd., Farmingdale, N. Y. 11735, (516) 249-7262, Mktg./Adv. Mgr.: J. Waite; Gen. Sls. Mgr.: A. Baldon; Ind. Sls. Mgr.: M. Martinez; Inside Sls. Cont.: A. Baldon

Norman Radio Dist. Inc., 94-29 Merrick Blvd., Jamaica, N. Y. 11433, (212) RE 9-4651, Ind. Sls. Mgr.: D. Gans; Inside Sls. Cont.: D. Gans

North Eastern Region, 442 Main St., Ft. Lee, N. J. 07024, (201) 947-3460, Branch Mgr.: N. Diamond

North Pacific Supply Co. Inc., 2950 N.W. 29th St., Portland, Ore. 97210, (503) 228-9576, Gen. Sls. Mgr.: R. G. Vavrek; Inside Sls. Cont.: P. Stangarone

Northern Elctrncs., 218 First St., Havre, Mont. 59501, (406) 265-2417, Inside Sls. Cont.: F. DeRosa

Northern Radio & Television Corp., 1585 Main St., Green Bay, Wisc. 54302, (414) 435-8331, Mktg./Adv. Mgr.: F. J. McDougal

Northland Elctrncs. Inc., 32708 W. 8 Mile Rd., Farmington, Mich. 48024, (313) 477-3200, Branch Mgr.: H. Ross

Northwest Elctrncs., 730 E. 1st, Spokane, Wash. 99220, (509) 535-7652, Mktg./Adv. Mgr.: S. L. Sullivan; Gen. Sls. Mgr.: J. P. McGoldrick

Northwest Radio of Duluth Inc., 123 E. 1st St., Duluth, Minn. 55802, (218) 727-1565, Gen. Sls. Mgr.: D. Granholm; Inside Sls. Cont.: E. M. Peterson

North Pacific Supply Co. Inc., 2950 N.W. 29 - P. O. Box 3766, Portland, Ore. 97210, (503) 228-9576

Norvell Elctrncs. Inc., 3340 S. Memorial Dr. Ste. 131, Tulsa, Okla. 74145, (918) 663-1247

Norvell Elctrncs. Inc., 10210 Monroe Dr., Dallas, Tex. 75229, (214) 350-6771, TWX: 910-861-4512, Mktg./Adv. Mgr.: K. Norvell; Inside Sls. Cont.: J. Collard

Norvell Elctrncs. Inc., 6440 Hillcroft Ave., Houston, Tex. 77036, (713) 774-2568, TWX: 910-881-2560, Branch Mgr.: L. H. Arcement

Nuclear Elctrncs., 1446 N. W. Ballard, Seattle, Wash. 98107, (206) 784-6200, Mktg./Adv. Mgr.: E. Hansen; Gen. Sls. Mgr.: E. Hansen, Ind. Sls. Mgr.: E. Hansen; Inside Sls. Cont.: Mr. E. Hansen

Nunn Elec Supply, 2221 Canada Dry, Houston, Tex., (713) 928-5511

NWR Elctrns. Corp., 1010 W. Washington St., Marquette, Mich., (906) 226-7578

Nylen Bros. & Co. Ltd., 820 S. Beretania St., Honoluluy, Hawaii 96813, Inside Sls. Cont.: R. C. Arasaki

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Ohio Instrument Co., 505 Whitney Ave., Worthington, Ohio 43085, (614) 885-0743, Branch Mgr.: K. Greggerson

Ohio Valley Sound Inc., 20 E. Sycamore St., Evansville, Ind. 47713, (812) 425-6173, Mktg./Adv. Mgr.: J. Kane; Gen. Sls. Mgr.: J. Kane; Ind. Sls. Mgr.: J. Kane; Inside Sls. Cont.: W. Oistad

Ohio Valley Sound Inc., 902 Main St., Vincennes, Inc. 47591, (812) 882-3615, Branch Mgr. D. Frederick

Ohio Valley Sound, Inc., 600 W. 3rd St., Ownesboro, Ky. 42302, (502) 683-6727, Branch Mgr.: G. Carey

OHM/Elctrns., 645 Vermont Ave., Palatine, Ill., (312) 359-5500

Oil Capitol Elctrncs. Corp., 700 E. Frank Phillips Blvd., Bartlesville, Okla. 74003, (918) 336-4448, Branch Mgr.: J. Cummins

Oil Capitol Elctrncs. Corp., 708 S. Sheridan Box GG, Tulsa, Okla. 74115, (918) 836-2541, Gen. Sls. Mgr.: J. Deming; Inside Sls. Cont.: J. Deming

Olive Industrial Elctrncs. Inc., 6662 Olive Blvd., St. Louis, Mo. 63130, (314) 863-7800, TWX: 910-761-1166, Mktg./Adv. Mgr.: M. Busch; Ind. Sls. Mgr.: M. Busch; Inside Sls. Cont.: G. Davis

O'Loughlin's Radio Supply, 115 E. 3rd S., Salt Lake City, Utah 84111, (801) 355-7553, Inside Sls. Cont.: W. F. Roberg

Omaha Elctrncs. Co., 2222 Leavenworth, Omaha, Neb. 68102, (402) 341-3440, Inside Sls. Cont.: E. Wright

Omni Spectra Inc., 1040 W. Alameda Dr., Tempe, Ariz., (606) 966-1471

Omnitronix, 4180 De Countrai, Montreal, Canada, (514) 725-9414

Orbit Elctrnc. Sales Inc., 69-18 Roosevelt Ave., Woodside, N. Y. 11377, (212) 426-9718, Mktg./Adv. Mgr.: H. Ashauer; Gen. Sls. Mgr.: H. Ashauer; Ind. Sls. Mgr.: H. Ashauer; Inside Sls. Cont.: J. Pelikan

Ossmann Comp. Sls., 395 Cleveland Dr., Buffalo, N. Y., (716) 832-4271

Ossmann Comp. Sls., 411 Washington Ave., Kingston, N. Y., (914) 338-5505

Ossmann Comp. Sls., 280 Metro Park, Rochester, N. Y., (716) 442-3290

Ossmann Comp. Sls., 132 Pickard Bldg., Syracuse, N. Y., (315) 454-4477

Ossmann Comp. Sls., 1911 Vestal Pkwy. E., Vestal, N. Y., (607) 785-9949

Otis J. & Assoc. Inc., 4520 River Dr., Moline, Ill. 61625, (390) 762-9311

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Pace Elctrns., 344 Rte. 104, Ontario Center, N. Y., (315) 524-2491

Pacific Switch Controls, 14048 Burbank Blvd., Van Nuys, Calif., (213) 4802

Pamco Elctrns Inc., 146 U. S. Hwy #1 - Edison, N. J., (201) 985-6950

Parham Elctrncs. Co., 300 Carrollton Ave. Box 486, Greenwood, Miss. 38930, (601) 453-4241, Gen. Sls. Mgr.: B. Parham; Inside Sls. Cont.: E. Ambrose

Parts Mart, 1314 N. 7th St., Milwaukee, Wisc., (414) 276-4160

Parts Master, 411 Main Ave., Clifton, N. J.

Patane Avionics Inc., 5937 Kester Ave., Van Nuys, Calif. 91401, (213) 988-4455, TWX: 910-495-2034, Mktg./Adv. Mgr.: A. Patane; Gen. Sls. Mgr.: A. Patane; Ind. Sls. Mgr.: G. Hannasch; Inside Sls. Cont.: M. Mosca

Pattison Supply Co., 4550 Willow Parkway, Cleveland, Ohio 44125, (216) 441-4000, Mktg./Adv. Mgr.: E. C. Lipster; V. P. Sls.: J. T. Leonard; Elect. Mgr.: J. P. Owen; Inside Sls. Cont.: S. Kolodey

Pavlik V. J., 4801 Kinzie Ave., Racine, Wisc. 53406, (414) 637-1256, Inside Sls. Cont.: V. J. Pavlik

Payette Radio Ltd., 730 St. Jacques, Montreal, Canada, (514) 866-6681

Peerless Elctrnc. Equip. Co., 1815 S. 7th St., Louisville, Ky. 40208, (502) 637-7677, Mktg./Adv. Mgr.: J. E. Ebel; Gen. Sls. Mgr.: G. Ebel; Ind. Sls. Mgr.: T. Marshall

Peerless Radio Corp., 19 Wilbur St., Lynbrook, N. Y. 11563, (516) 593-2121, Mktg./Adv. Mgr.: T. Griffin; Pres.: A. Shankman; Ind. Sls. Mgr.: T. Griffin; Inside Sls. Cont.: L. Levine, B. Weiman

Peerless Radio Corp. of Florida, Inc., 1040 N.E. 43 Ct., Oakland Park, Fla. 33308, (305) 566-5966, TWX: 510-955-9852, Branch Mgr.: T. Griffin

Peninsula Elctrnc. Supply Inc., 40 W. Gabilan St., Salinas, Calif. 93901, (408) 422-5318, Branch Mgr.: R. Henderson

Peninsula Elctrnc. Supply Inc., 980 S. First St., San Jose, Calif. 95110, (408) 294-3594, Mktg./Adv. Mgr.: S. Domingues; Gen. Sls. Mgr.: R. Johnson; Ind. Sls. Mgr.: R. Davis; Inside Sls. Cont.: R. Davis

Peoples Radio & TV Co. Inc., 1015 Moorman Rd., Roanoke, Va. 24017, (703) 342-8933, Mktg./Adv. Mgr.: E. Wiggins; Inside Sls. Cont.: T. Carroll

Perdue Radio Co., 10 S. Park St., Montclair, N. J. 07042, (201) 744-4343, Mktg./Adv. Mgr.: R. F. Perdue; Inside Sls. Cont.: R. F. Perdue

Perdue Radio Co., 1103 Bloomfield Ave., West Caldwell, N. J. 07006, (201) 575-8264, Branch Mgr.: B. Logan

Peters A. A., 404 Union Blvd., Allentown, Pa.

Philadelphia Elctrnc. Inc., 1225 Vine St., Philadelphia, Pa. 19107, (215) 568-7444

Piedmont Elec. Supply, 1150 Rose Hill Dr., Charlottesville, Va., (703) 296-6167

Pioneer-Standard Elctrncs., 4800 E. 131 St., Cleveland, Ohio 44105, (216) 587-3600, TWX: 810-422-2211, Sls. Mgr.: C. E. Marling

Pioneer/Cincinnati, Cincinnati, Ohio, (513) 628-1072

Pioneer/Cleveland, 4800 E. 131 St., Cleveland, Ohio 44105, (216) 587-3600, TWX: 810-422-2211

Pioneer/Dayton, 1900 Troy St., Dayton, Ohio 45404, (513) 236-9900

Pioneer/Indiana, (317) 632-5676

Pioneer/Instrumentation, 4800 E. 131 St., Cleveland, Ohio 44105

Pioneer/Michigan, 6337 N. Beverly Plaza, Romulus, Mich. 48174, (313) 729-8500, TWX: 810-422-2211

Pioneer/Washington, 1037 Taft St., Rockville, Md. 20850, (301) 424-3300

Pioneer/Washington Elctrns., 15 Park Ave., Ambler, Pa. 19002, (215) 542-8484

Pioneer/Washington Elctrns., 1025 Homeland Ave., Greensboro, N. C. 27405, (919) 273-4441

Pioneer Elctrncs. Inc., 228 E. Mountain, Fort Collins, Colo. 80521, (303) 484-1044, Mktg./Adv. Mgr.: R. M. Johnsen; Gen. Sls. Mgr.: R. M. Johnsen; Ind. Sls. Mgr.: G. Freitag; Inside Sls. Cont.: J. Honer

Pittsburg Radio Supply, 212 S. Broadway, Box 668, Pittsburg, Kan. 66762, (316) 231-2150, Gen. Sls. Mgr.: E. Alexander

P. J. Engrg. Supply Co., 360 N. Beacon St., Boston, Mass., (617) 783-0510

Plaintronics Co., Box 2265, 3100 Plainfield Rd., Kettering, Ohio, (513) 253-9176

Plante Elctrncs. Inc., 521 Mendocino Ave., Santa Rosa, Calif. 95401, (707) 544-0755, Mktg./Adv. Mgr.: F. Plante; Gen. Sls. Mgr.: B. Pintane; Inside Sls. Cont.: F. Plante

Platt Elec. Supply Co., 1305 N.W. Davis, Portland, Oreg., (503) 222-9633

Plough Electric Supply Co., 1155 Bryant St., San Francisco, Cal., (415) 431-6300

Powell Elctrncs. Inc., 803 Oster Dr., Huntsville, Ala. 35807, (205) 539-2731, TWX: 810-726-2231; Branch Mgr.: T. McCarty

Powell Electrncs. Inc., 411 Fairchild Dr., Mt. View, Calif., 94040, (415) 964-0820, TWX: 910-379-6970, Brtanch Mgr.: K. Howser

Powell Elctrns. Inc., 5258 Kearny Villa Way, San Diego, Cal., (714) 565-4444

Powell Elctrncs. Inc., 1740 N.W. 69th Ave., Miami Springs, Fla. 33166, (305) 885-8761, TWX: 810-848-8040, Branch Mgr.: R. Pacetelli

Powell Elctrncs. Inc., 2032 Palmridge Way, Orlando, Fla. 32809, (305) 859-1450, TWX: 810-850-0155, Branch Mgr.: J. Eppright

Powell Elctrncs. Inc., 10728 Hanna St., Beltsville, Md. 20705, (301) 937-4030, TWX: 710-828-9710, Branch Mgr.: M. Ayars

Powell Elctrncs. Inc., P. O. Box 8765, Philadelphia, Pa. 19101, (215) 365-1900, TWX: 710-670-0465, Mktg./Adv. Mgr.: C. T. Calderaro; Gen. Sls. Mgr.: J. Harris; Ind. Sls. Mgr.: W. Hooven; Inside Sls. Cont.: R. Howell

Powell Elctrncs. Inc., 2860 Walnut Hill Lane, Dallas, Tex. 75229, (214) 350-4186, TWX: 910-861-4094, Branch Mgr.: C. McCormick

Precision Radio Ltd., P. O. Box 2573, Honolulu, Hawaii 96803, (808) 537-5291, Inside Sls. Cont.: G. Kai

Prehler Electric, 2300 N. Kilbourn, Chicago. Ill., (312) 384-6100

Prelco Elctrns., 480 Port Royal St. W., Montreal, Canada, (514) 389-8051

Priebe R. E. Co., 2211 5th Ave., Seattle, Wash. 98121, (206) 682-8242, Mktg./Adv. Mgr.: T. Bode; Gen. Sls. Mgr.: J. Hillary; Inside Sls. Cont.: G. Ouhl

Priest Elctrncs. Inc:, 6431 Tidewater Dr., Norfolk, Va. 23509, (703) 855-2021

Pringle Elctrncs., 2101 Colby, Everett, Wash. 98206, (206) 259-9121, Branch Mgr.: J. Mullen

Progress Elctrncs. Inc., 205 Express St., Plainview, N. Y., (516) 433-1700

Prudential Dist. Inc., 3303 E. Ferry, Spokane, Wash. 99220, (509) 535-2003, Inside Sls. Cont.: D. Woehrin

Puget Electro Prods., 5319 Fourth Ave. S., Seattle Wash., (206) 762-7373

Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor, Mich.

Pursell Elctrncs., 1221 N. Washington Ave., Scranton, Pa. 18509, (717) 346-2011, Mktg./Adv. Mgr.: D. Watson; Gen. Sls. Mgr.: D. Watson; Ind. Sls. Mgr.: L. Larue; Inside Sls. Cont.: D. Watson

Pyramid Supply Co., 1707 New York Ave., Union City, N. J. 07087, (201) 866-3900, Inside Sls. Cont.: M. Leviton

Pyttronic Ind., 2035 Worcester St., Baltimore, Md., (301) 539-6525

Pyttronic Ind., 8220 Wellmoor Ct., Savage, Md. 20863, (301) 953-3000, Branch Mgr.: L. Hassman

Pyttronic Ind., 4509 Creedmore Rd., Raleigh, N. C. 27609, (919) 833-7552, Branch Mgr.: B. Barnhill

Pyttronic Ind., 14 E. Mall Plaza, Carnegie, Pa. 15106, (412) 923-2575, Branch Mgr.: H. Warren

Pyttronic Ind., 2525 N. 7th St., Harrisburg, Pa. 17105, (717) 233-6591, TWX: (800) 232-0640, Mktg./Adv. Mgr.: D. Henshell; Gen. Sls. Mgr.: J. George; Inside Sls. Cont.: G. Hubley

Pyttronic Ind., 2 Stump Rd., Montgomeryville, Pa. 18936, (215) 643-2850, Branch Mgr.: J. Cohen

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QAR Ind'l Elect. Sales Inc., 621 S. Columbus Ave., Mt. Vernon, N. Y. 10550, (914) 699-2224, Mktg./Adv. Mgr.: A. Sobelmon; Gen. Sls. Mgr.: C. Keone; Ind. Sls. Mgr.: M. Filler; Inside Sls. Cont.: G. Ortiz

QAR/New Jersey, 601 Palisades Ave., Englewood Cliffs, N. J. 07632, (201) 567-7532, Branch Mgr.: A. Sobelmon

QPL Elctrncs., 75 N. Beacon St., Watertown, Mass., (617) 924-4100

Quement Elctrncs., P. O. Box 6000, San Jose, Cal. 95150, (408) 998-5900, TWX: 910-338-0039, Mktg./Adv. Mgr.: D. Ravanelli; Gen. Sls. Mgr.: Azevedo

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R & R Elctrnc Supply Co., 605 E. 2nd, Roswell, N. M. 88201, (505) 622-0670, Branch Mgr.: J. Burt

R & R Elctrnc Supply Co., 1441 Butternut, Abilene, Tex. 79604, (915) 677-2974, Branch Mgr.: K Deatherage

R & R Elctrnc. Supply Co., 914 W. 7th, Box 2648, Amarillo, Tex. 79105, (806) 374-2866, Branch Mgr.: D. Davis

R & R Electrnc Supply Co., 2103 Irving Blvd., Dallas, Tex. 75207, (214) 742-1431, Branch Mgr.: G. Connally

R & R Electrnc Supply Co., 2631 E. Yandell, Box 3037, El Paso, Tex. 79903, (915) 566-9693, Branch Mgr.: R. West

R & R Electrnc Supply Co., 1607 Ave. G, Box 1860, Lubbock, Tex. 79408, (806) 765-5737, Mktc./Adv. Mgr.: R. N. Hewett; Gen. Sls. Mgr.: J. Williams; Inside Sls Cont.: J. Biggs

R & R Electrnc Supply Co., 2404 W. Wall, Midland, Tex. 79701, (915) 563-1355, Branch Mgr.: A. Wemple

R & R Electrnc. Supply Co., 300 E. 23rd St., Odessa, Tex. 79760, (915) 332-9166, Branch Mgr.: D. Shivers

R & R Elctrnc. Supply Co., 1911 - 9th, Wichita Falls, Tex. 76301, (817) 322-0731, Branch Mgr.: L. Kilpatrick

R.A.E. Ind. Electrns. — Can., Vancourver, B.C., (604) 687-2621

Ra-Elco Inc., 2312 S. W. Temple, Salt Lake, Utah 84115, (801) 485-5806, Gen. Sls. Mgr.: R. Gunnell; Ind. Sls. Mgr.: R. Gunnell; Inside Sales Contact: V Reese

Ra-Dis-Co. Inc., 814 N. Senate Ave., Indianapolis, Ind. 46206, (317) 637-5571, Mktg./Adv. Mgr.: S. Nyikos; Gen. Sls. Mgr.: L. Harrell; Ind. Sls. Mgr.: L. Harrell; Inside Sls. Cont.: J. Gifford, D. McVickier, R. Hickok

Radar Electric Co., Inc., 168 Western Ave. W., Seattle, Wash. 98119, (206) 282-2511, TWX: 910-444-2052, Gen. Sls. Mgr.: W. McPherson; Ind. Sls. Mgr.: J. Knapp; Inside Sls. Cont.: T. Rockney

Radio Communications Co., 2313 S. Brentwood Blvd., St. Louis, Mo. 63144, (314) 968-4444, Mktg./Adv. Mgr.: J. A. Stiffelman; Inside Sls. Cont.: S. Stiffelman

Radio Dist. Co., 6832 W. North Ave., Chicago, Ill. 60635, (312) 237-1105, Branch Mgr.: D. Hamilton

Radio Dist. Co., 111 E. 54th., Indianapolis, Ind. 46220, (317) 257-2231, Branch Mgr. B. Cohen

Radio Dist. Co., Inc., 1212 High, South Bend, Ind. 46624, (219) 287-2911, Gen. Sls. Mgr.: W. Davidson; Ind. Sls. Mgr.: G. Medich; Inside Sls. Cont.: T. Gore

Radio Dist. Co., 1821 University Ave., St. Paul, Minn. 55104, (612) 645-0631, Branch Mgr.: M. Dass

Radio Dist. & Supply Co., 125-27 W. 10th St., Anniston, Ala. 36201, (205) 236-8654, Gen. Sls. Mgr.: W. B. Craven; Pres: G. T. Mosteller

Radio Dist. & Supply Co., 121 E. Broad St., Gadsden, Ala., (205) 547-1636, Mgr.: J. Mayes

Radio Electric Prods. Inc., 1398-1400 Main St., Buffalo, N. Y. 14209, (716) 833-5570, Gen. Sls. Mgr.: E. Adel; Inside Sls. Cont.: J. Helfant

Radio Electric Srv. Co. of Balto., 1026 Cromwell Bridge Rd., Baltimore, Md. 21204, (301) 823-0070, TWX: 710-232-1819, Mktg./Adv. Mgr.: W. M. Bagliani; Gen. Sls. Mgr.: J. Bagliani; Ind. Sls. Mgr.: W. Bagliani; Inside Sls Con.: W. M. Bagliani

Radio Electric Suply Co., 961 E. Sullivan St., Kingsport, Tenn 37662, (615) 247-8111, Mktg./Adv. Mgr.: J. N. Camp, Sr.; Gen. Sls. Mgr.: J. N. Camp, Sr.; Ind. Sls. Mgr.: J. N. Camp, Jr.; Inside Sls. Cont.: J. N. Camp. Sr.

Radio-Electrnc. Equip. Co., Inc., 480 Skain Ave., P. O. Box 1212, Lexington, Ky. 40501, (606) 255-6661, Mktg./Adv. Mgr.: R. W. Caywood, Jr.; Inside Sls. Cont.: E. S. Chrisman

Radio & Electrnc. Parts Co. (REPCO), 6835 Cochran Rd., Solon, Ohio 44139 (216) 248-8900, Mktg./Adv. Mgr.: J. Goldfarb; Gen. Sls. Mgr.: D. J. Roalsen; Ind. Sls. Mgr.: L. Schwartz; Inside Sls. Cont.: H. Cole

Radio & Electrnc Supply Co., 640 White Ave., Grand Jct., Colo. 81501, (303) 243-3346, Mktg./Adv. Mgr.: Q. L. DeWeese; Gen. Sls. Mgr.: Q. L. DeWeese; Ind. Sls. Mgr.: K. C. DeWeese; Inside Sls. Cont.: K. C. DeWeese

Radio Equipment Co., 1104 W. 3rd, P. O. Box 1013, Grnd Island, Neb. 68801, (308) 384-2910, Branch Mgr.: L. Rogers

Radio Equipment Co., 620 Dorsey St., P. O. Box 23, Beatrice, Neb. 68310, (402) 223-3231, Branch Mgr.: E. Thomassen

Radio Equipment Co., 625 N. 18th St., P. O. Box 3843, Omaha, Neb. 68103, (402) 341-7700, Mktg./Adv. Mgr.: H. Nestander; Ind. Sls. Mgr.: J. Egusa; Inside Sls. Cont.: J. Egusa

Radio Equipment Corp., 5 Center St., Batavia, N. Y. 14020, (716) FI3-1626, Branch Mgr.: G. Gluck

Radio Equipment Corp., 196 Vulcan St., Buffalo, N. Y. 14207, (716) 874-2690, Mktg./Adv. Mgr.: J. Abelson; Gen. Sls. Mgr. A. Sarles; Inside Sls. Cont.: S. Okun

Radio Equipment Co., 2619 Holdrege St., P. O. Box 82204, Lincoln, Neb. 68503, (402) 475-7668, Branch Mgr.: D. Eberl

Radio Equipment Corp., 1720 Pierce Ave., Niagara Falls, N. Y. 14301, (716) BU5-9366, Branch Mgr.: S. Anderson

Radio Equipment Co., 200 Braasch ave., P. O. Box 724, Norfolk, Neb. 68701, (402) 371-2728, Branch Mgr.: R. Middleton

Radio Equipment Corp., 1615 W. State St., Olean, N. Y. 14760, (716) FR2-8560, Branch Mgr.: L. Freed

Radio, Inc., 903 N. Hudson, Oklahoma City, Okla. 73102, (405) 235-1551, Telex 71-405, Branch Mgr.: F. Kudlacek

Radio, Inc., 1000 S. Main, Tulsa, Okla. 74119, (918) 587-9123, Telex 49-2429, Mktg./Adv. Mgr.: J. A. Durham; Gen Sls. Mgr.: J. A. Durham; Ind. Sls. Mgr.: G. Cox; Inside Sls. Cont.: G. Cox

Radio Lab, Inc., 3814 Main St., Kansas City, Mo., (816) 561-9935

Radio Labs., Inc., 475 E. Bay St., Charleston, S. C.

Radio Maintenancer Supply Co., 1334 Water St., Fitchburg, Mass. 01420, (617) 334-7473 , Branch Mgr.: Ralph Cristian

Radio Maintenance Suply Co., 80 Thomas St., Worcester, Mass. 01608, (617) 756-8311 Gen. Sls. Mgr.: A. Joseph; Ind. Sls. Mgr.: H. Bergquist

Radio Parts Dist. Co., 5652 E. Virginia Beach, Norfolk, Va.

Radio Parts, Inc., 1125 Church St., Selma, Ala. 36701, (205) 872-7451, Branch Mgr.: R. Mills

Radio Parts, Inc., 208 College St., Troy, Ala. 36081, (205) 566-0375, Branch Mgr.: J. Schury

Radio Parts, Inc., 402 20th Ave., Tuscaloosa, Ala. 35401, (205) 758-5585, Inside Sls. Cont.: J. Smith

Radio Parts, Inc, 1331 Prytania St., New Orleans, La. 70002, (504) 581-5959, Inside Sls. Cont.: W. R. Pietri

Radio Parts Sales, Inc., 5220 S. Vermont Ave., L. A. Cal. 90037, (213) 759-9177, Mktg./Adv. Mgr.: B. Movel; Inside Sls. Cont.: B. Movel

Radio Products Sales-Goleta, 350-E S. Kellogg Ave., Goleta, Cal. 93017, (805) 964-6823, Branch Mgr.: J. Reynolds

Radio Products Sales, Inc., 1501 S. Hill St., Los Angeles, Cal, 90015, (213) 748-1271, TWX: 910-321-2416, Adv. Mgr.: C. F. Sexton; Gen. Sls. Mgr.: C. F. Sexton; Ind. Sls. Mgr.: E. J. Bedwell; Inside Sls. Cont.: R. Balling

Radio Products Sales-San Diego, 7889 Clairemont Mesa Blvd., San Diego, Cal. 92111, (714) 292-5611, Branch Mgr.: Rudy Blair

Radio Supply Co., Inc., 1910 Tenth St., Gt. Bend, Kan. 67530, Branch Mgr.: L. White

Radio Supply Co., Inc., 1809 S. Broadway, Salina, Kan. 67401, Branch Mgr.: R. Olson

Radio Supply Co., Inc, 115 Laura, P. O. Box 1220, Wichita, Kan. 67201, (316) 267-5214, Gen. Sls. Mgr.: L. Wolf; Ind. Sls. Mgr.: D. Gilbert; Inside Sls. Cont.: R. Miller

Radio Supply Co., 724 N. Hudson, Oklahoma City, Ok.a.

Radio Trade Supply Co., 1013-1017 High St., Des Moines, Iowa 50309, (515) 288-7237, Gen. Sls. Mgr.: B. Ashpole; Inside Sls. Cont.: J. Ives

Radio Trade Supply Co., 18 S. Third St., Fort Dodge, Iowa 50501, (517) 576-5121, Branch Mgr.: B. Awe

Radio Trade Supply Co., 107 3rd Ave. S., Marshalltown, Iowa 50158, (517) 752-2500, Branch Mgr.: B. Capron

Radio Trade Supply Co., 621 E. Fourth St., Waterloo, Iowa 50703, (319) AD4-2664, Branch Mgr.: B. Renz

Radio & Television Parts Co., 1828 N. St. Mary's St., San Antonio, Tex. 78212, (512) 226-5329, Mktg./Adv. Mgr.: H. Steinle; Gen. Sls. Mgr.: H. Steinle; Inside Sls. Cont.: M. J. Chelkowski

Radio TV & Refrigeration Supply, Inc., 1129 Walnut St., Cincinnati, Ohio 45210, (513) 621-2940, Gen. Sls. Mgr.: R. J. Hagemeyer; Inside Sls. Cont.: R. J. Hagemeyer, G. Hoffman

Radio Wholesale & Supply, Inc., 610 Ward Ave., P. O. Box 3768, Honolulu, Hawaii 96812, (808) 538-3831, Mktg./Adv. Mgr.: F. H. Murai

Radonics-Alton, Inc., 211 Main St., Alton, Ill. 62005, (618) 462-0076, Branch Mgr.: W. Riffey

Radonics Elctrncs., Inc., 817 Broadway, Cape Girardeau, Mo. 63701, (314) 334-3094, Branch Mgr.: W. Doughty

Radonics Elctrncs., Inc., 10525 St. Charles Rock Rd., St. Ann, Mo. 63074, (314) 426-4414, Branch Mgr.: V. Konersman

Radonics Elctrncs., Inc., 4445 Gustine, St. Louis, Mo. 63116, (314) 481-2222, Mktg./Adv. Mgr.: W. Stumpe; Gen. Sls. Mgr.: W. Stumpe; Inside Sls. Cont. R. Holtkamp

Radonics Elctrncs., Inc., 2171 Big Bend, St. Louis, Mo. 63117, (314) 781-3710, Branch Mgr.: A. Muich

Ragon, 1136 W. Larpenteur St., St. Paul, Minn. 55113, (612) 488-0201

Ralph's, 715 Brashear St., Morgan City, La. 70380, (504) 384-9831, Branch Mgr.: F. Thibodeaux

Ralph's, 1903 E. Main St., New Iberia, La. 70560, (318) 369-9816, Branch Mgr.: C. Thibodeaux

Ralph's/Central Radio, 601 N. Third St., Alexandria, La. 71301, (318) 443-4517, Branch Mgr.: E. Cooley

Ralph's Industrial Elctrncs., 1293 Broadway, Beaumont, Tex. 77704, (713) 833-9443, Branch Mgr.: D. Dedrickson

Ralph's of Baton Rouge, Inc., 1732 Plank Rd., Baton Rouge, La. 70802, (504) 344-3761, Branch Mgr.: J. A. White

Ralph's of Lafayette, Inc., 3004 Cameron St., Lafayette, La. 70501, (381) 234-4507, Mktg./Adv. Mgr.: D. M. Menard; Gen. Sls. Mgr.: D. M. Menard; Ind. Sls. Mgr.: K. Comeaux; Inside Sls. Cont.: K. Comeaux

Ralph's of Lake Charles, Inc., 911 Fourth Ave., Lake Charles, La. 70601, (318) 439-2493, Branch Mgr.: D. A. Voorhies

Ralph's/New Orleans, 4334 Stemway Dr., New Orleans, La. 70126, (504) 242-2731, Branch Mgr.: C. E. Marr

Ralph's of Pascagoula, Inc., 2102 Ingalls Ave., Pascagoula, Miss. 39567, (601) 769-1672, Branch Mgr.: R. R. Menard

Randolph & Rice, Inc., 1213 McGavock St., Nashville, Tenn. 37203, (615) 255-5601; Mktg./Adv. Mgr.: E. W. Rice; Gen. Sls. Mgr.: J. R. Vandergriff

Ram Meter, Inc, 1100 Hilton Rd., Ferndale, Mich. 48220, (313) 547-1000, Mktg./Adv. Mgr.: R. M. Whalen; Inside Sls. Cont.; D. Jones

Ramco Co., 1207 Maple St., Box 310, West Des Moines, Iowa, (515) 274-2548

Rampart Components, Inc., 21201 Oxnard St., Woodland Hills, Calif. 91364, (213) 887-7260, TWX: 910-494-1923, Branch Mgr.: D. Ruddell

Rampart Components, Inc., 195 Engineers Rd., Hauppauge, N.Y. 11787, (516) 273-1111, TWX: 510-227-6232, Branch Mgr.: M. Gentile

Randolph, Hale & Meredith, Inc., 319 State St., Bowling Green, Ky. 42101, (502) 781-1460, Mktg./Adv. Mgr.: C. Meredith; Inside Sls. Cont.: C. Meredith

Rankin and Houser, Inc., 2015 Springboro Rd., Dayton, Ohio 45439, (513) 298-9823, Mktg./Adv. Mgr.: O. Kerr; Gen. Sls. Mgr.: J. Rankin; Inside Sls. Cont.: R. Gallaher

Ratel Elctrns., 815 Maude Ave., Mt. View, Cal., (415) 965-2010

Recso Elctrns. Div. of Astex, Airport & Central Hwys., Pennsauken, N. J., (609) 662-4000

Reed Radio & Supply, 1610 Main St., Joplin, Mo. 64801, (417) 623-1608, Branch Mgr.: L. Veach

Reed Radio & Supply, 805 Boonville, Springfield, Mo. 65802, (417) 869-0752, Mktg./Adv. Mgr.: D. Reed; Gen. Sls. Mgr.: C. Lemons; Inside Sls. Cont.: P. Deschamp

Reed Radio & Supply, P. O. Box 277, West Plains, Mo. 65775, (417) 256-4821, Branch Mgr. B. Jarman

Relay Specialties Inc., 1300 Plaza Rd., Fair Lawn, N. J. 07410, (201) 797-3313, Mktg./Adv. Mgr.: J. G. Sauer; Gen. Sls. Mgr.: S. Gershberg; Inside Sls. Cont.: J. Goodrich

Reliance Merchandizing, 2223 Arch St., Philadelphia, Pa. 19103, (215) 563-4927

REM Elctrncs. Supply Co., 264 W. Market St., Warren, Ohio 44481, (216) 399-2777, Gen. Sls. Mgr.: G. C. Heath; Inside Sls. Cont.: R. Soos

Remor Elect. Inc., 10670 W. 9 Mile, Oak Park, Mich. 48237, (313) 541-5666, Mktg./Adv. Mgr.: E. Holowicki; Gen. Sls. Mgr.: E. Holowicki; Ind. Sls. Mgr.: J. Hnatowich; Inside Sls. Cont.: E. Holowicki

Renna's T. Sch'dy Elctrnc. Dist. Corp., 1708 Altamont Ave., Schenectady, N. Y. 12303, (518) 355-4840, Mktg./Adv. Mgr.: T. Renna; Gen. Sls. Mgr.: T. Renna; Ind. Sls. Mgr.: F. Renna; Inside Sls. Cont.: F. Renna

Reno Radio Co., 1314 Broadway, Detroit, Mich. 48226, (313) 962-6852, Mktg./Adv. Mgr.: B. Spilker; Inside Sls. Cont.: B. Spilker

Requa Elec. Supply Co., 2005 Brighton Henrietta, Rochester, N. Y., (716) 442-2020

Revere Elec. Supply Co., 2501 W. Washington Blvd., Chicago, Ill. 60612, (312) 738-3636

Richey Elctrncs. Arizona, 4527 Exeter Blvd., Phoenix, Ariz. 85018, (602) 959-2301, Branch Mgr.: J. Wright

Richey Elctrncs. Inc., 5258 Kearny Villa Way, San Diego, Calif. 92123, (714) 565-4444, Branch Mgr.: A. Kucela

Richey Elctrncs. Inc., 10871 La Tuna Canyon Rd., Sun Valley, Calif. 91352, (213) 875-2862, TWX: 910-498-2205, Mktg./Adv. Mgr.: P. E. McClellan; Gen. Sls. Mgr.: J.Graham; Inside Sls. Cont.: M. Hampton

Robertson Elctrncs. Inc., 612 Mulberry St., Jefferson City, Mo. 65101, (314) 636-4763, Mktg./Adv. Mgr.: H. L. Walz; Gen. Sls. Mgr.: R. Bloss; Ind. Sls. Mgr.: H. L. Walz; Inside Sls. Cont.: H. L. Walz

Roburn Agencies, Inc., 349 W. 14th St., New York, N. Y., (212) 989-5939

Rochester Elctrncs. Corp., 950 Hudson Ave., Rochester, N. Y. 14621, (716) 342-9270, Gen. Sls. Mgr.: A. Andzer, Inside Sls. Cont.: A. Andzer

Rochester Radio Supply Co., 140 W. Main St., Rochester, N. Y. 14603, (716) 454-6300, TWX: 97-8422, Mktg./Adv. Mgr.: C. C. Bellanca; Gen. Sls. Mgr.: C. C. Bellanca; Ind. Sls. Mgr.: P. G. Fileri; Inside Sls. Cont.: P. G. Fileri

Rodefeld Co., 8641 E. 30th St., Indianapolis, Ind. 46219, (317) 898-0670, Branch Mgr.: G. Fagan

Rodefeld Co., 340 N. W. 5th, Richmond, Ind. 47374, (317) 966-3505, Branch Mgr.: J. Petry

Rodefeld Co., 96 W. Main St., Richmond, Ind. 47347, (317) 966-1571, Mkt./Adv. Mgr.: C. Rodefeld; Inside Sls. Cont.: J. Petry

Roden Electrical Supply Co., 205 Oklahoma Ave. N. W., Knoxville, Tenn. 37917, (615) 524-9851, Mktg./Adv. Mgr.: E. Goins; Ind. Sls. Mgr.: E. Glass; Inside Sls. Cont.: J. Mahoney; Mgr.: H. Lakin

Rome Elctrncs. Inc., 108 Spring St., Rome, N. Y. 13440 (315) 337-5400, Mkt./Adv. Mgr.: R. Daviale

Roosevelt TV Supply Co., 249-253 Roosevelt Ave., York, Pa. 17404, (717) 854-6814, Mkt./Adv. Mgr.: R. Grossman; Gen. Sls. Mgr.: E. A. Wise; Ind. Sls. Mgr.: C. E. Wise; Inside Sls. Cont.: E. A. Wise

Rose Electronics, 846 Stanton Rd., Burlingame, Cal. 94010, (415) 697-0244, TWX: 910-371-7250, Mktg./Adv. Mgr.: J. Logan; Gen. Sls. Mgr.: B. Hubbs; Inside Sls. Cont.: D. Sprague

Rosen Elctrncs. Inc., 1323 N. Front St., Harrisburg, Pa. 17102, (717) 232-9966, Branch Mgr.: G. Trout

Rosen Elctrncs. Inc., 215 S. George St., York, Pa. 17403, (717) 843-7881, Mktg./Adv. Mgr.: A. Rosen; Gen. Sls. Mgr.: A. Rosen; Ind. Sls. Mgr.: C. Gladfelter; Inside Sls. Cont.: C. Gladfelter

Ross Dist. Co., Inc., 112 S. 1st West, Preston, Idaho 83263, (208) 852-0830, Mktg./Adv. Mgr.: R. J. Hansen

Ross Radio Co., 325 W. Federal St., Youngstown, Ohio 44503, (216) 746-8881

Round-up Electronics, 2927 Riverside Ave., Pendleton, Ore. 97801, (503) 276-3152, Mktg./Adv. Mgr.: J. Fields; Gen. Sls. Mgr.: A. Hummell; Ind. Sls. Mgr.: J. Fields; Inside Sls. Cont.: B. Manny

Route Elctrncs. Inc., Echo Plaza, U. S. Route 22, Springfield, N. J. 07081, (201) 379-7710, Mktg./Adv. Mgr.: B. Kornhauser; Ind. Sls. Mgr.: R. Zaentz; Inside Sls. Cont.: B. Jonas

RPC Elctrncs., 719 Miner Rd., Cleveland, Ohio (216) 461-4700

RPC Elctrns., 620 Alpha Dr., Pittsburgh, Pa., (412) 782-3770

RS Electronics, Executive Offices: 12775 Lyndon, Detroit, Mich. 48227, (313) 491-1000, Pres.: W. Litt

R S Elctrncs., 14405 Wyoming, Detroit, Mich. 48238, (313) 834-8420, Branch Mgr.: T. Turkowski

R S Electronics-Grand Rapids, 300 36th St. S. E., Grand Rapids, Mich. 49508, (616) 241-3483

RS Electronics, 3219 Kilgore Rd., Kalamazoo, Mich. 49002, (616) 381-5470, Branch Mgr.: G. Maneke

R S Electronics, 27882 Gratiot, Roseville, Mich. 48066, (313) 779-2450, Branch Mgr.: J. Renick

R S Electronics, 4663 W. Bancroft, Toledo, Ohio 43615, Branch Mgr.: R. Bay

R S Electronics, 425 S. Airport, Traverse City, Mich. 49684, (616) 946-5153, Branch Mgr.: L. Klingbeil

R S Electronics, 3450 Biddle, Wyandotte, Mich. 48192, (313) 282-5880, Branch Mgr.: T. Crider

R S L Dist. Inc., 23-25 Palm St., Bangor, Maine 04401, (207) 947-7396, Branch Mgr.: R. Lavoie

R S L Dist. Inc., 117 Anderson St., Portland, Maine 04101, (207) 773-0297, Branch Mgr.: L. O'Connor

R S L Dist. Inc., 670 Chestnut St., Manchester, N. H. 03105, (603) 625-5444, Mktg./Adv. Mgr.: A. Sanborn; Inside Sls. Cont.: R. H. Gagnon

R S L Dist. Inc., 703 Pine St., Burlington, Vt. 05402, (802) 862-5771, Branch Mgr.: H. Skinner

Rush, L. K. Co. Inc., 425-431 N. Royal St., Jackson, Tenn. 38301, (901) 422-6533, Mktg./Adv. Mgr.: L. K. Rush

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S & H Terminals, Inc., 323 W. 1410 South, Salt Lake City, Utah, (801) 484-7649

S/S Elctrncs., Inc., 503 No. 7th St., Fargo, N. D. 58102, (701) 237-5003, Mktg/Adv. Mgr.: T. Sample; Gen. Sls. Mgr.: L. Schrade; Inside Sls. Cont.: T. Reski

S. J. Elctrncs., Inc., 6001 Beach Blvd., Buena Park, Cal. 90621, (714) 521-1906, Mktg./Adv. Mgr.: L. Vaccher; Gen. Sls. Mgr.: A. E. Duhamell; Ind. Sls. Mgr.: R. Tyree; Inside Sls. Cont.: M. Newton

S-S Elctrncs., Inc., 503 No. 7th. St., Fargo, N. D. 58102, (701) 237-5003, Mktg./Adv. Mgr.: T. Sample; Inside Sls. Cont.: L. Schrade

Sacramento Elctrn. Supply Co., 1219 South St., Sacramento, Ca. (916) 441-4821

Sager Elec. Sup. Co., 172 High St., Boston, Mass., (617) 542-2281

Saginaw Distributors Inc., 1761 E. Genesee Ave., Saginaw, Mich. 48601, (517) 754-0441, Gen. Sls. Mgr.: C. N. Barnett; Inside Sls. Cont.: R. R. Thompson

Salina Elctrncs., Inc., 2100 Park St., Syracuse, N. Y. 13208, (315) 422-2336, Gen. Sls. Mgr.: C. R. Ricks; Inside Sls. Cont.: R. Cebeniak

Sanmar Elctrncs. Corp., 310 Rt. 46, Rockaway, N. J. 07866, (201) 625-0415, Mktg./Adv. Mgr.: S. Dudek

Santa Ana Elctrncs., 832 E. Fourth St., Santa Ana, Cal. 92701, (714) 547-7021, Mktg./Adv. Mgr.: D. Hench; Gen. Sls. Mgr.: J. Angel; Ind. Sls. Mgr.: J. Angel; Inside Sls. Cont.: D. Hench

Santa Monica-Bell Elctrncs., 306 E. Alondra Blvd., Gardena, Cal. 90247, (213) 321-5802, TWX: 910-346-6336, Mktg./Adv. Mgr.: A. Adler; Gen. Sls. Mgr.: A. Adler; Inside Sls. Cont.: L. Fenberg

Satterfield Elctrncs., Inc., 1900 S. Park St., Madison, Wisc. 53701, (608) 257-4801, Mktg./Adv. Mgr.: R. L. Henry; Ind. Sls. Mgr.: P. Maloney; Inside Sls. Cont.: R. L. Henry

Satterfield Communications, 2001 Freeport Rd., Madison, Wisc. 53711, (608) 271-2133, Branch Mgr.: R. Grundgeiger

Satterfield Elctrncs., Inc., 201 DeWitt, Portage, Wisc. 53901, (608) 742-6454, Branch Mgr.: R. Remington

Satterfield Elctrncs., Inc., 1900 8th St. S., Wisc. Rapids, Wisc. 54494, (715) 423-2910, Branch Mgr.: M. Kruger

SAV-ON Elctrncs., 13225 Harbor Blvd., Garden Grove, Cal. 92643, (714) 530-0555, Branch Mgr.: M. Levy

Sawyer Elctrncs. Cp., Box 3786, Greenville, S. C. 29608, (803) 235-0438, Mktg./Adv. Mgr.: O. M. Sawyer; Gen. Sls. Mgr.: B. Echols; Ind. Sls. Mgr.: H. Dismuke; Inside Sls. Cont.: S. Reeves

Saynor Elctrncs., Ltd., 99 Scarsdale Rd., Don Mills, Ont., Can., (416) 445-2340

Scanlon P. J. Co., Inc., 724C S. Sherman St., Richardson, Tex., (214) 231-4661

Sceli Elctrncs., Inc., 78 Maple Ave., Hartford, Conn. 06114, (203) 249-8415, Mktg./Adv. Mgr.: B. S. Prague; Gen. Sls. Mgr.: B. S. Prague; Ind. Sls. Mgr.: A. W. Lundeew; Inside Sls. Cont.: R. Sopelak

Schad John E. Inc., 1740 Broadway, Redwood City, Cal. 94063, (415) 368-3858, Branch Mgr.: H. Brasch

Schad John E. Inc., 975 South Bascom, San Jose, Cal. 95128, (408) 275-6484, Inside Sls. Cont.: J. E. Schad

Schneider Elec. & Equip. Co., 1102-08 Farnah St., Omaha, Neb., (402) 346-5000

Schuster Elec. Co., 2410 Gilbert Ave., Cincinnate, Ohio, (513) 221-5040

Schuster Electric Co., 11320 Grooms Rd., Cincinnati, Ohio 45242, (513) 984-1600, Mktg./Adv. Mgr.: S. Rogers; Gen. Sls. Mgr.: J. T. Ludeke; Ind. Sls. Mgr.. T. W. Ludeke

Schweber Elctrncs., 60 Pleasant Blvd., Toronto, Can., (416) 925-2471

Schweber Elctrncs., Hollywood, Fla., (305) 927-0511

Schweber Elctrncs., Atlanta, Ga., (404) 449-9170

Schweber Elctrncs., Cedar Rapids, Iowa, (319) 366-0774

Schweber Elctrncs., Chicago, Ill., (312) 593-2740

Schweber Elctrncs., Rockville, Md., (301) 881-2970

Schweber Elctrncs., Waltham, Mass., (617) 890-8484

Schweber Elctrncs., Detroit, Mich., (313) 583-9242

Schweber Elctrncs., Somerset, N. J., (201) 469-6008

Schweber Elctrncs., Rochester, N. Y., (716) 328-4180

Schweber Elctrncs., Westbury, N. Y. 11590, (516) 334-7474

Schweber Elctrncs., Raleigh, N. C., (919) 832-8881

Schweber Elctrncs., Beachwood, Ohio, (216) 464-2970

Schwendiman Wholesale Inc., P. O. Box 2047, Idaho Falls, Idaho 83401, (208) 522-2492, Mktg./Adv. Mgr.: K. Slusser; Inside Sls. Cont.: J. O. Crow

Scott Elctrncs. Supply Corp., 4040 Adams St., Lincoln, Neb. 68504, (402) 434-8308, Mktg./Adv. Mgr.: R. E. Coons; Gen. Sls. Mgr.: R. E. Coons; Ind. Sls. Mgr.: D. Porath; Inside Sls. Cont.: D. Porath

Scott Elctrncs. Supply Corp., 516 N. Poplar St., North Platte, Neb. 69101, (308) 532-9260, Branch Mgr.: G. Woodhead

Seattle Radio Supply, Inc., 2117 2nd Ave., Seattle, Wash. 98121, (206) MA 4-2341, Mktg./Adv. Mgr.: R. Bliven; Gen. Sls. Mgr.: A. Owen; Ind. Sls. Mgr.: V. Ecland

Seaway Elctrncs., Inc., Box 488, Massena-Winthrop Rd., Massena, N. Y. 13622, (315) 769-9997, Mktg./Adv. Mgr.: J. McKelvey; Inside Sls. Cont.: L. Martin

Selectronic Supplies Inc., 3185 Bellevue Rd., Toledo, Ohio 43606, (419) 474-5477, Branch Mgr.: G. Ingersol

Semicomp, 4100 Birch, Newport Beach, Cal., (714) 833-3070

Semicon 2000, 107 Trumbull St., Elizabeth, N. J. 07206, (201) 965-2000, TWX: 710-5888, Branch Mgr.: C. T. Schafer

Semiconductor Concepts, Inc., 21201 Oxnard St., Woodland Hills, Cal. 91364, (213) 887-4560, TWX: 910-494-1923

Semiconductor Concepts, Inc., 195 Engineers Rd., Hauppage, N. Y. 11787, (516) 273-1234, TWX: 510-227-6232, Branch Mgr.: M. Pepper

Semiconductor Products Inc., 250 Canal St., Lawrence, Mass. 01842, (617) 686-0197, Gen. Sls. Mgr.: L. King; Inside Sls. Cont.: L. King

Semiconductor Specialists (Can.), Ltd., 7540 Bath Rd. Slough Estates, Malton, Ont., Can., (416) 678-1444, TWX: 610-492-4363, Branch Mgr.: H. Rubinoff

Semiconductor Specialists, Inc., P. O. Box 66125, O'Hare Int'l Airport, Chicago, Ill. 60666, (312) 279-1000, TWX: 910-254-0169, Mktg./Adv. Mgr.: P. A. Nelson; Gen. Sls. Mgr.: W. Archbold; Inside Sls. Cont.: R. Couture

Semiconductor Specialists, Inc., P. O. Box 41630, Weir Cook Arprt., Indianapolis, Ind. 46241, (317) 243-8271, TWX: 810-341-3126, Branch Mgr.: M. Scherer

Semiconductor Specialists, Inc., 25127 W. Six Mile Rd., Detroit, Mich. 48240, (313) 255-0300, TWX: 810-221-9485, Branch Mgr.: R. Weaire

Semiconductor Specialists, Inc., 8030 Cedar Ave. S., Minneapolis, Minn. 55420, (612) 854-8841, TWX: 910-576-2812, Branch Mgr.: T. Strabel

Semiconductor Specialists, Inc., 3805 N. Oak Trafficway, Kansas City, Mo. 64116, (816) 452-3900, TWX: 910-771-2114, Branch Mgr.: J. Eberenz

Semiconductor Specialists, Inc., 10068 Natural Bridge, St. Louis, Mo. 63134, (314) 428-6100, TWX: 910-765-0934, Branch Mgr.: N. Schroeder

Semiconductor Specialists, Inc., 4500 Wadsworth Rd., Dayton, Ohio 45414, (513) 278-9455, TWX: 810-459-1625, Branch Mgr.: J. Murphy

Semiconductor Specialists, Inc., 538 Alpha Dr., Pittsburgh, Pa. 15238, (412) 781-8120, TWX: 710-664-4285, Branch Mgr.: F. Phelps

Semiconductor Specialists, Inc., 9990 Monroe Dr., Dallas, Tex. 75220, (214) 358-5211, TWX: 910-861-4511, Branch Mgr.: P. Miller

Semiconductor Specialists, Inc., 10855 W. Potter Rd., Wauwatosa, Wisc. 53226, (414) 778-0606, Branch Mgr.: B. Siebert

Semiconductor Specialists (UK) Ltd., Premier House, Fairfield Rd., Yiewsley, W. Drayton, Middlesex, England and West Drayton 6415, TWX: 710-599-3131, Branch Mgr.: G. Ager

Semiconductor Specialists, (UK) Ltd., Shiel House, Craigshill, Livingston, W. Lothian, Scotland, Livingston 31967, Branch Mgr.: D. Brown

Servex Elctrnc. Dist., Inc., 775 Springmill Rd., Mansfield, Ohio 44906, (419) 524-1811, Branch Mgr.: F. Laughlin

Servex Elctrnc Dist., Inc., 224 N. Prospect St., Marion, Ohio 43302, (614) 383-3117, Mktg./Adv. Mgr.: C. E. Sens

Servex Elctrnc. Dist., Inc., 534 Columbus Ave., Sandusky, Ohio 44870, (418) 626-5265, Branch Mgr.: A. Lauro

Servex Elctrc. Dist., Inc., 302 E. Liberty St., Wooster, Ohio 44691, (216) 264-9006, Branch Mgr.: D. Williamson

Servi-Tronics Inc., 1200 S. Main, Kokomo, Ind. 46901, (317) 457-7261, Inside Sls. Cont.: M. Godlove

Shand Elctrncs., Inc., 2401 S. Dort Hwy., Flint, Mich. 48507, (313) 743-8940, Gen. Sls. Mgr.: J. Driver; Inside Sls. Cont.: R. Anderson

Shand Elctrncs., Inc., 3710 East St., Saginaw, Mich. 48601, (517) 755-2191, Branch Mgr.: C. Glanton

Shanks & Wright Inc., 2045 Kettner Blvd., San Diego, Cal. 92101, (714) 239-0176, Gen. Sls. Mgr.: R. E. Brubaker; Ind. Sls. Mgr.: R. B. Shanks

Shap Elctrncs., Co., 2727 Philmont Ave., Huntingdon Valley, Pa. 19006, (215) 722-6330, Gen. Sls. Mgr.: R. Henry; Ind. Sls. Mgr.: R. Mazza; Inside Sls. Cont.: N. Shapiro

Shapiro S. Assoc., 1464 Sylvia La., East Meadow, N. Y. 11554, (516) 483-4185

Shelborne Elctrncs., 169 No. Penn Ave., Wilkes Barre, Pa. 18701, (717) DI 6-4639, Branch Mgr.: G. Gracely

Shelco Elctrncs. Supply, 501 S. Brookhurst St., Anaheim, Cal. 92804, (714) 772-1441, Branch Mgr.: D. D. Simons

Shelco Elctrncs. Supply, 305 E. Gladstone St., Azusa, Cal. 91702, (213) 969-1793, Branch Mgr.: W. C. Conkling

Shelley F. Elctrncs., Inc., 11803 W. Pico Blvd., Los Angeles, Cal., (213) 478-0613

Shelley F., Elctrncs., Inc., 3347 Industrial Court, San Diego, Cal., (714) 459-3701

Shelley-Rodabaugh, Inc., 2455 Old Middlefield Way, Mt. View, Cal., (415) 969-1820

Sheridan Sales Co., 33708 River Ave., Farmington, Mich. 48024, (313) 477-3800, TWX: 810-461-2670, Branch Mgr.: R. E. Steiner

Sheridan Sales Co., P. O. Box 677, Florissant, Mo. 63033, (314) 837-5200, TWX: 810-461-2670, Branch Mgr.: L. O. Johnston

Sheridan Sales Co., P. O. Box 423, Dayton, Ohio 45405, (513) 277-8911, TWX: as above, Branch Mgr.: J. G. Nemanich

Sheridan Sls. Co., P. O. Box 37826, Cincinnati, Ohio 45222, (513) 761-5432, TWX: 810-461-2670, Adv. Mgr.: J. G. Nemanich; Gen. Sls. Mgr.: C. J. Sheridan; Inside Sls. Cont.: B. Vaughn

Sheridan Sales Co., P. O. Box 4457, Cleveland, Ohio 44125, (216) 524-8120, TWX: 810-461-2670, Branch Mgr.: J. R. Thornberry

Sheridan Sales Co., 4268 Northern Pike, Monroeville, Pa. 15146, (412) 373-1070, TWX: 810-461-2670, Branch Mgr.: D. L. Coster

Shermon Elctrncs. Supply, Inc., 702 San Pedro, San Antonio, Tex. 78212, (512) 224-1001, Mktg./Adv. Mgr.: W. Sherman; Gen. Sls. Mgr.: L. Dittfurth

Shiflet & Dickson, Inc., P. O. Box 815, 914 E. Franklin, Gastonia, N. C. 28052, (704) 867-7284, Mktg./Adv. Mgr.: A. Beatty; Gen. Sls. Mgr.: B. Absher; Ind. Sls. Mgr.: C. Dees; Inside Sls. Cont.: B. Absher

Siclari, V., 247 Rathbun Ave., Annadale, S. I., N. Y. 10312

Signal Center Inc., 589 New Park Ave., W. Hartford, Conn. 06110, (203) 233-8551, Inside Sls. Cont.: G. Edlin, R. Ferris

Signal Center of Springfield, Inc., 484 Worthington St., Springfield, Mass. 01105, (413) 739-3893, Branch Mgr.: A. Freidman

Simco Inc., 3907-11 N. Broad St., Philadelphia, Pa., (215) BA 9-1880

Simcona Elctrncs. Corp., 275 Mt. Read Blvd., Rochester, N. Y. 14611, (716) 328-3230, TWX: 510-253-2139, Mktg./Adv. Mgr.: L. P. Iacona; Gen. Sls. Mgr.: Simon Braitman; Inside Sls. Cont.: J. Scally

Simmonds A.C. & Son Ltd., 285 Yorkland Blvd., Can. Willowdale, Ont., (416) 491-1010

*Skagit-Whatcom Electrnc. Supply, Inc., 204½ Unity, Bellingham, Wash. 98225, (206) 733-4200, Branch Mgr.: D. Hunter

Skagit-Whatcom Elctrnc. Supply, Inc., 620 W. Div., Mt. Vernon, Wash. 98273, (206) 336-3073, Mktg./Adv. Mgr.: G. E. Springer; Inside Sls. Cont.: G. C. Stratton

Slone H. M., Co., Dayton, Ohio, (513) 424-9840

Smith Elctrncs., Inc., 307 E. Magnolia Ave., Knoxville, Tenn. 37917, (615) 524-1487, Inside Sls. Cont.: B. White, B. Goush

Smith, S. W., Co., 325 E. Water St., Syracuse, N. Y.

Solid State Elctrncs. Co. of Texas, P. O. Box 20299, Dallas, Tex. 75220 (214) 352-2601, TWX: 910-861-4394, Mktg./Adv. Mgr.: W. W. Brown; Ind. Sls. Mgr.: W. W. Brown; Inside Sls. Cont.: G. Maynard

Solid State Elctrncs. Co. of Texas., 6400 Westpark Dr., Houston, Tex. 77036, (713) 785-5205, Branch Mgr.: B. Heppel

Sooner Radio & TV Supply Inc., 110 Callahan, Murhoger, Okla. 74401, (918) 682-1385, Mktg./Adv. Mgr.: R. B. Simpson

Sound Service Center Inc., Lafayette Radio Assoc. Store, 40 Main St., Danbury, Conn. 06810, Mktg./Adv. Mgr.: S. Hepp

Sound Service Center Inc., Lafayette Radio Assoc. Store, 37 Danbury Rd., New Milford, Conn. 06776, Branch Mgr.: L. Dumas

Soundco Elec. Supply, 2095 Roosevelt Ave., Springfield, Mass.

Southeastern Radio Supply Co., 1065 Patton Ave., Asheville, N. C. 28806, (704) 253-1446, Branch Mgr.: G. Holt

Southeastern Radio Supply Co., 401 Foster St., Durham, N. C. 27706, (919) 688-8204, Branch Mgr.: R. D. Beard

Southeastern Radio Supply Co., 325 Rowan St., Box 846, Fayetteville, N. C. 28301, (919) 483-0371, Branch Mgr.: C. Small

Southeastern Radio Supply Co., 445 English St., Box 20123, Greensboro, N. C. 27420, (919) 273-8675, Branch Mgr.: G. Price

Southeastern Radio Supply Co., 907 Second Ave. N. W., Hickory, N. C. 28601, (704) 322-9493, Branch Mgr.: L. Shrewsberry

Southeastern Radio Supply Co., 1009 Lejeune Blvd., Jacksonvolle, N. C. 28541, (919) 347-3207, Branch Mgr.: W. Gooding

Southeastern Radio Supply Co., 1005 E. Highland Ave., Kinston, N. C. 28501, (919) 523-5113, Branch Mgr.: G. Dupree

Southeastern Radio Supply Co., 414 Hillsborough St., Raleigh, N. C. 27603, (919) 828-2311, Mktg./Adv. Mgr.: G. Hoke; Gen. Sls. Mgr.: G. Hoke; Ind. Sls. Mgr.: A. L. Macklin; Inside Sls. Cont.: A. L. Macklin

Southeastern Radio Supply Co., 316 N. Depot St., Salisbury, N. C. 28144, (704) 633-0741, Branch Mgr.: J. C. Hilton

Southeastern Radio Supply Co., 1002 So. College, Rd., Wilmington, N. C. 28401, (919) 791-7365, Branch Mgr.: B. Kerr

Southeastern Radio Supply Co., 200 S. Marshall St., Winston Salem, N. C. 27101, (919) 724-0504, Branch Mgr.: B. Newell

Southeastern Radio Supply Co., 215 Cragheas St., Danville, Va. 24541, (703) 792-0811, Branch Mgr.: L. Cruise

Southeastern Radio Supply Co., 1330 Courtland Rd. N. E., Roanoke, Va. 24012, (703) 344-6611, Branch Mgr.: B. Graves

Southeastern Region, 9 Lancelot La., Asheville, N. C. 28806, (704) 298-5504, Branch Mgr.: K. McHenry

Southern Electric Corp., 242 E. Water St., Harrisonburg, Va. 22801, (703) 434-9907, Branch Mgr.: F. Rhodes

Southern Electric Corp., 818 Greenville Ave., Staunton, Va. 24401, (703) 886-6218, Mktg./Adv. Mgr.: D. Campbell; Inside Sls. Cont.: J. Harlow

Southern Electric Corp., 490 N. Charlotte Ave., Waynesboro, Va. 24401, (703) 942-1119, Branch Mgr.: J. B. Fitzgerald

Southern Elctrncs. Corp., 309 So. 10th St., Opelika, Ala. 36801, (205) 745-5298, Ind. Sls. Mgr.: R. C. Scott, Jr.

Southern Pump & Supply, Box 1223, Washington & Meridian Sts., Tampa, Fla., (813) 229-6145

Southern Radio Corp., 1625 W. Morehead St., Charlotte, N. C. 28208, (704) 376-4461, Mktg./Adv. Mgr.: J. B. Smith; Gen. Sls. Mgr.: A. R. Singleton, Ind. Sls. Mgr.: C. H. Helms; Inside Sls. Cont.: A. R. Singleton

Southern Radio Corp., Stadium Rd., P. O. Box 467, Columbia, S. C. 29202, (803) 254-3114, Branch Mgr.: C. K. Williams

Southern Radio Supply Co., 1909 Tulane Ave., New Orleans, La., (504) 524-2343

Southland Electrncs., 1771 N. Hercules Ave., Clearwater, Fla. 33515, (813) 443-4514, Branch Mgr.: P. Lamarche

Southwest Eelectrical Supply, 804 S. Solano Dr., Las Cruces, N. M. 88001, Branch Mgr.: M. Blumkin

Southwest Elctrncs., Inc., 5700 Savoy La., Houston, Tex. 77036, (713) 782-3060, Mktg./Adv. Mgr.: C. L. Benckenstein; Gen. Sls. Mgr.: J. G. Peters; Ind. Sls. Mgr.: J. G. Peters; Inside Sls. Cont.: J. Chavez Jr.

Southwest Elctrncs., Inc., 2005 Exeter, Irving (Dallas), Tex. 75062, (214) 256-3344, Branch Mgr.: G. Chatelain

Southwest Radio Supply, 1820 N. Harwood, Dallas, Tex. 75201, (214) 741-6272, Gen. Sls. Mgr.: R. J. Webb; Inside Sls. Cont.: R. J. Webb

Southwestern Region, 206 Wiggs La., Weatherford, Tex. 76086, (817) 594-4770, Branch Mgr.: C. Beard

Specialty Dist. Co., 1276 Belt Line Highway, S. Mobile, Ala. 36609, (205) 344-0450, Branch Mgr.: L. Turner

Specialty Dist. Co., 428 Roosevelt Ave., Albany, Ga. 31701, (912) 435-1711, Branch Mgr.: L. Perrott

Specialty Dist. Co., 230 Epps Bridge Rd., Athens, Ga. 30601, (404) 548-1334, Branch Mgr.: E. M. Bradley

Specialty Distributing Co., Inc., 380 White Ave., S. E. Marietta, Ga. 30060, (404) 422-4333, Branch Mgr.: M. W. Kaylor

Specialty Dist. Co., 763 Juniper St. N. E., Atlanta, Ga. 30308, (404) 873-2521, Mktg./Adv. Mgr.: J. E. Eaton; Gen. Sls. Mgr.: F. E. Stanley; Ind. Sls. Mgr.: E. Laughlin; Inside Sls. Cont.: E. Laughlin

Specialty Dist. Co., 1251 Gordon Park Rd., Augusta, Ga. 30903, (404) 722-1526, Branch Mgr.: W. N. Evans

Specialty Dist. Co., 2812 Carrie St., Brunswick, Ga. 31521, (912) 265-1927, Branch Mgr.: M. Hutto

Specialty Dist. Co., 1112 Brookhaven Blvd., Columbus, Ga. 31902, (404) 327-7414, Branch Mgr.: J. H. Russell

Specialty Dist. Co., 529 Arch St., Macon, Ga. 31208, (912) 746-8564, Branch Mgr.: W. McCurry, Jr.

Specialty Dist. Co., 380 White Ave. S. E., Marietta, Ga. 30060, (404) 442-4333, Branch Mgr.: M. W. Kaylor

Specialty Dist. Co., 612 E. Broad St., Savannah, Ga. 31402, (912) 234-1684, Branch Mgr.: R. H. Brown

Specialty Dist. Co., 916 Marion St., Valdosta, Ga. 31601, (912) 242-4910, Branch Mgr.: H. Hall

Specialty Dist. Co., 1313 Central Ave., Chattanooga, Tenn. 37401, (615) 267-9531, Branch Mgr.: N. E. Ingle

Specialty Elctrncs. Ltd., 2690 Pitfield Blvd., Montreal, Can., (514) 336-4500

S & R. Corp, 2420 E. Oakton, Arlington Heights, Ill., (312) 593-2545

Standard Elctrncs., Inc., 2828 W. State St., Olean, N. Y. 14760, (716) 372-1800, Branch Mgr.: W. Adsit

Standard Elctrncs., Inc., 1800 Lyell Ave., Rochester, N. Y. 14606, (716) 254-7950, Branch Mgr.: M. Schilling

Standard Elctrncs., Inc., 837 Hiawatha Blvd. W., Syracuse, N. Y. 13201, (315) 422-0421, Branch Mgr.: C. Lowell

Standard Elctrncs. Supply Co., Inc., 701 Snow Hill Road, Salisbury, Md. 21801, (301) 742-7142

Standard Supply Co., 225 E. 6th So., Salt Lake City, Utah 84110, (801) 355-2971, TWX: 910-925-5651, Gen. Sls. Mgr.: R. R. Larson; Inside Sls. Cont.: L. Steffensen

Srepco-Elctrncs. Spfd., 1300 St. Paris Rd., Springfield, Ohio 45503, (513) 399-8811, Branch Mgr.: J. W. Schuyler

Srepco-Pioneer, 314 Leo St., Dayton, Ohio, (513) 224-0871

Stack Industrial Elctrncs., Inc., 45 Washington St., Binghamton, N. Y. 13902, (607) 723-6326, Mktg./Adv. Mgr.: D. Gilchrist; Ind. Sls. Mgr.: B. McCormick; Inside Sls. Cont.: S. Leonard

Standard Distributors, 432 W. Poplar, Harrisbury, Ill. 62946, (618) 252-1478, Gen. Sls. Mgr.: E. Powell

Standard Elctrncs., Inc., 3519 Union Rd., Buffalo, N. Y. 14225, (716) 685-4220, Gen. Sls. Mgr.: W. Humston, Ind. Sls. Mgr.: G. Hintermeier

Standard Elctrncs., Inc., 107 Duane Ave., Endicott, N. Y. 13762, (607) 754-3102, Branch Mgr.: V. Wales

Standard Elctrncs. Inc., 2201 Pine Ave., Niag. Falls, N. Y. 14301, (716) 284-0437, Branch Mgr.: P. Gravino

Stanley Communications Co., 6819 Scott Hamilton Dr., Little Rock, Ark. 72209, (501) 562-9200, Branch Mgr.: H. C. Montgomery

Stark, H., Elctrncs. Supply Co., 112 3rd Ave. N., Minneapolis, Minn. 55401, (612) 332-1325, TWX: 910-576-2714, Mktg./Adv. Mgr.: H. D. Stark; Gen. Sls. Mgr.: W. Miller; Ind. Sls. Mgr.: D. Swenson; Inside Sls. Cont.: D. Osgood

Stepco Elctrncs. Parts Corp., 1269 Barnum Ave., Stratford, Conn., (203) 375-5961, Branch Mgr.: J. Potosky

State Elctrnc. Parts Corp., 36 Rt 10, Hanover, N. J. 07936, (201) 887-2550, TWX: 710-986-8250, Mktg./Adv. Mgr.: B. Behrent; Inside Sls. Cont.: B. Behrent

State Labs Inc., 215 Park Ave. S., N. Y., N. Y. 10003, (212) 677-8400, Mktg./Adv. Mgr.: G. Schindler; Ind. Sls. Mgr.: L. Farrar; Inside Sls. Cont.: M. Blumberg

Steinberg Elctrncs., Inc., 2520 N. Broad St., Philadelphia, Pa. 19132, (215) 223-9400, Mktg./Adv. Mgr.: L. Steinberg; Inside Sls. Cont.: L. Steinberg

Stephenson TV Supplies, 536 7th St., Parkersburg, W. Va. 26101, (304) 428-6311, Mktg./Adv. Mgr.: H. E. Rasel; Inside Sls. Cont.: H. E. Rasel

Sterling, S., Co., 9421 Pflumm Rd., Lenexa, Kan. 66215, (913) 888-2995, Branch Mgr.: J. Cetinske

Sterling, S., Co., 1001 E. Touhy, Des Plaines, Ill. 60018, (312) 298-8454

Sterling, S., Co., 17500 W. McNichols Rd., Detroit, Mich. 48235, (313) 255-1970, Branch Mgr.: D. Frandsen

Sterling, S., Co., 11734 Lackland Ind. Dr., St. Louis, Mo. 63141, (314) 567-3636, TWX: 910-764-0839, Branch Mgr.: L. Ramsey

Sterling, S. Co., 5827 Mayfield Rd., Cleveland, Ohio 44124, (216) 442-8080, Telex: 98-0444, Mktg./Adv. Mgr.: H. Crows

Sterling, S., Co., 2673 Culver Ave., Dayton, Ohio 45429, (513) 298-7573, TWX: 28-8249, Branch Mgr.: B. Dullea

Sterling, S., Co., 2 Parkway Center, Pittsburgh, Pa. 15220, (412) 922-5720, Branch Mgr.: F. Kozel

Sterling Elctrncs., Inc., 1930 N. 22nd. Ave., Phoenix, Arix., (602) 258-4531

Sterling Elctrncs., 1061 Industrial Rd., San Carlos, Cal., (415) 592-2353

Sterling Elctrns., Sun Valley, Cal., (213) 767-5030

Sterling Elctrncs., 6158 Mission Gorge Rd., San Diego, Cal., (714) 283-6575

Sterling Elctrncs., 5029 Veterans Hwy., Metairie, La., (504) 887-7921

Sterling Elctrncs., 51 Spring St., Watertown, Mass., (617) 926-9720

Sterling Elctrncs., 774 Pfieffer Blvd., Perth Amboy, N. J.

Sterling Elctrncs., Albuquerque, N. M., (505) 247-2486

Sterling Elctrncs., 2875 Merrell Rd., Dallas, Tex., (214) 357-9131

Sterling Elctrncs., Box 1229, 4201 S. W. Freeway, Houston, Tex., (713) 623-6600

Sterling Elctrncs., 5608 6th Ave. So., Seattle, Wash. 98108, (206) 762-9100, Inside Sls. Cont.: S. Benning

Stewart, A. T., 711 Broadway, Tacoma, Wash. 98401, (206) 272-1112, Gen. Sls. Mgr.: M. L. Coquillette; Inside Sls. Cont.: D. L. Kessler

Stoddard Supply Company, Inc., 354 S. Cannon Ave., P. O. Box 500, Hagerstown, Md. 21740, (301) 733-3390, Ind. Sls. Cont.: M. Fleming; Inside Sls. Cont.: J. Ralls

Stotts-Friedman, 2035 Fastern Ave. S. E., Grand Rapids, Mich., (616) 241-6731

Stotts - Friedman Co. (The), 108 N. Jefferson St., Dayton, Ohio 45402, (513) 224-1111

Stuart Elec. Sup. Co., 2999 S. Second W., Salt Lake City, Utah, (801) 466-8605

Suburban Supply, 117 Benedict St., Waterbury, Conn., (203) 757-1251

Suedekum Electrnc. Supply Co., Hiway 13 East, Reeds Station Rd., Carbondale, Ill. 62901, (618) 549-7361, Branch Mgr.: P. Rotolo

Suedekum Elctrnc. Supply Co., 2215 Broadway, Cape Girardeau, Mo. 63701, (314) 335-8202, Mktg./Adv. Mgr.: C. W. Suedekum, Jr.; Inside Sls. Cont.: E. Hall

Summit Distributors Inc., 916 Main St., Buffalo, N. Y. 14202, (716) 884-3450, TWX: 710-522-1692, Mktg./Adv. Mgr.: G. Seidman; Inside Sls. Cont.: G. Seidman

Summit Elctrncs. of Rochester, 292 Commerce Dr., Rochester, N. Y. 14623, (716) 334-8110, Branch Mgr.: B. Earnst

Sun Radio Co., P. O. Box 390, Akron, Ohio 44309, (216) 434-2171, Inside Sls. Cont.: E. Kline

Sunland Supply Co. Inc., 2227 Texas Ave., El Paso, Tex. 79901, (915) 533-5901, Mktg./Adv. Mgr.: W. M. Shapiro; Gen. Sls. Mgr.: I. J. Grosser; Inside Sls. Cont.: G. Calvillo

Sunray Elctrncs., Inc., 2275 Springboro Rd., Dayton, Ohio 45439, (513) 293-3421, Gen. Sls. Mgr.: R. Faulkner; Inside Sls. Cont.: R. Faulkner

Super Elctrnc. Supply, 1425 W. Baltimore St., Baltimore, Md. 21223, (301) 566-5200, Mktg./Adv. Mgr.: B. Gamerman; Gen. Sls. Mgr.: J. Gamerman; Ind. Sls. Mgr.: M. Gamerman; Inside Sls. Cont.: A. Gamerman

Superior Electric & Distrg. Co., 721 W. Franklin St. Box 3156, Evansville, Ind., (812) 423-7838

Superior Elctrnc. Parts Co., 5708 Superior, Cleveland, Ohio 44103, (216) 431-3666, Mktg./Adv. Mgr.: M. Singer; Inside Sls. Cont.: E. Erich

Swan Elctrncs., Inc., 1316 W. Pine St., Hattiesburg, Miss. 39402, (601) 584-5494, Branch Mgr.: B. Lasseter

Swan Elctrncs., Inc., 342 N. Gallatin St., Jackson, Miss. 39207, (601) 352-5516, Mktg./Adv. Mgr.: J. W. Vandevere, V.P.; Gen. Sls. Mgr.: L. A. Swan; Ind. Sls. Mgr.: J. W. Vandevere; Inside Sls. Cont.: J. Findley

Swieco, Inc., Box 670, 1518 E. Lancaster St., Ft. Worth, Tex., (817) 335-6521

Swift, C. W., & Assoc., 15216 Burbank Blvd., Van Nuys, Cal., (213) 989-1133

Switch Controls Inc., 7792 W. 2nd Court, Hialeah, Fla., (305) 822-0892

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Taylor E. E. Co., 465 Central Ave., Albany, N. Y. 12206, (518) IV 9-5600, Mktg./Adv. Mgr.: H. Cameron; Gen. Sls. Mgr.: G. Yelle; Ind. Sls. Mgr.: G. Yelle; Inside Sls. Cont.: B. Balle

Taylor Elctrc. Co., 1000 W. Donges Bay Rd., Mequon, Wisc. 53092, (414) 241-4321, TWX: 910-262-3414, Ind. Sls. Mgr.: C. Matthias

Team Central, Inc., 720 29th Ave. S. E., Minneapolis, Minn. 55414, (612) 331-8511, V. P. Mktg.: L. Fisher

Team Electronics, 6200 Bass Lake Rd., Crystal, Minn. 55429, (612) 535-4810, Mktg./Adv. Mgr.: R. J. Walsh; Inside Sls. Cont.: F. Caruso

Team Electronics, 1534 White Bear, St. Paul, Minn. 55106, (612) 774-0381, Branch Mgr.: R. Foote

Team Elctrncs., No. 29, M & M Plaza, Box 212, Menominee, Mich. 49858, (906) 864-2213, Branch Mgr.: B. Falkenberg

Team Electronics, 1801 Marshall St., Manitowoc, Wisc. 54220

Technico, Div. of Allied Cntrl. Sls. Corp., 1404 Bare Hills Ave., Baltimore, Md. 21209, (301) 828-6416, TWX: 710-232-1813, Mktg./Adv. Mgr.: B. Regan; Gen. Sls. Mgr.: B. Babes; Ind. Sls. Mgr.: B. Simpson; Inside Sls. Cont.: B. Sanders

Technico, Div. of Allied Cntrl. Sls. Corp., 6223 Tri-Port Court, Greensboro, N. C. 27410, (919) 294-1065, Branch Mgr.: G. Doboski

Technico, Div. of Allied Cntrl. Sls. Corp., 231 S. Easton Rd., Glenside, Pa. 19038, (215) 674-3858, Branch Mgr.: J. McDonald

Technico, 1525 Linden Ave., Willow Grove, Pa., (215) 674-3858

Tedco of Melbourne Inc., 437 S. Babcock St., Melbourne, Fla. 32901, (305) 727-2311, Mktg./Adv. Mgr.: T. Woodbury; Gen. Sls. Mgr.: B. Moss; Ind. Sls. Mgr.: J. Baker; Inside Sls. Cont.: P. Hancock

Tel-Rad Elctrncs. Inc., 311 E. Short St., Lexington, Ky. 40507, (606) 254)1349, Inside Sls. Cont.: L. L. Moon

Tele-Radio Inc., 5202 Bissonnet, Bellaire, Tex. 77401, (713) 666-2481, Mktg./Adv. Mgr.: R. Johns; Gen. Sls. Mgr.: R. Johns; Inside Sls. Cont.: D. Johns

Television Prts. Co. Inc., 315 Market St., E. Liverpool, Ohio 43920, (216) 386-5700, Branch Mgr.: R. T. Keys

Television Prts. Co. Inc., 1116 Merchant St., Ambridge, Pa. 15003, (412) 266-7700, Branch Mgr.: J. Cardinale

Television Prts. Co. Inc., 158 N. Main St., Butler, Pa. 16001, (412) 287-5917, Branch Mgr.: C. T. Hiles

Television Prts. Co. Inc., 518 Fifth Ave., New Brighton, Pa. 15066, (412) 846-3000, Mktg./Adv. Mgr.: A. Bandura; Gen. Sls. Mgr.: J. Bandura; Ind. Sls. Mgr.: I. Bodell; Inside Sls. Cont.: F. Kienast

Television Prts. Co. Inc., 917 Moravia St., New Castle, Pa. 16101, (412) 658-8383, Branch Mgr.: B. Camerot

Television Whlesle Supply Co. Inc., 818 Jackson St., P. O. Box 841, Monroe, La. 71201, (318) 323-3505, Gen. Sls. Mgr.: H. Waldroup or S. W. Martin; Inside Sls. Cont.: H. Waldroup

Terminal Hudson Elctrns., 880 Maude Ave., Mt. View, Cal., (415) 969-9240

Terminal Supply Co., 500 Oliver St., Troy, Mich., (313) 689-4200

Terminal-Hudson Elctrncs. Inc., 236 W. 17th St., New York, N. Y. 10011, (212) 243-5200

Texas Elctrncs. Co., 9429 Manchester, Houston, Tex. 77012, (713) 923-4621, Branch Mgr.: V. DuBose

Texas Elctrncs. Co., 1236 7th St. Box 1407, Port Arthur, Tex. 77640, (713) 982-9401, Mktg./Adv. Mgr.: D. D. Wiltshire; Gen. Sls. Mgr.: D. D. Wiltshire; Ind. Sls. Mgr.: P. Mathews; Inside Sls. Cont.: A. Arciva

Texas Instrument Supply Co., 12151 E. Skelly Dr., Tulsa, Okla. 74115, (918) LU 3-8121

Texas Instrument Supply Co., 6000 Denton Dr., Dallas, Tex. 75235, (214) 238-6821

Texas Instrument Supply Co., 3939 Ann Arbor Dr., Houston, Tex. 77042, (713) 785-4800

Texaswitch Inc., 2942 Congressman La., Dallas, Tex., (214) 357-1768

Thompson Electrnc. Sup. Inc., 182 E. Long St., Columbus, Ohio 43215, (614) 288-6191, Inside Sls. Cont.: B. Lee

Thompson, R. R., 1761 E. Genesee Ave., Saginaw, Mich. 48601, (517) 754-0441, Inside Sls. Cont.: R. R. Thompson, V. P.

Thor Electrncs. Corp. 741 Livingston St., Elizabeth N. J. 07207, (201) 354-2420, Mktg./Adv. Mgr.: N. Maxwell; Gen Sls. Mgr.: R. Gettis; Inside Sls. Cont.: A. Crudele

Time Elctrncs. West, 900 W. Olive St., Inglewood, Cal. 90301, (213) 673-5900, Branch Mgr.: A. Odintz

Time Electronics, Hauppauge N. Y.

Toler, R. Radio Co. Inc., 3632 Woodson Rd., St. John, Mo. 63114, (314) 426-3260, Mktg./Adv. Mgr.: R. L. Toler; Ind. Sls. Mgr.: H. A. Toler; Inside Sls. Cont.: R. Toler

Treasure State Gas & Elec. Co. 827 S. Montana St., Butte, Mont. 59701, (406) 723-3269, Gen. Sls. Mgr.: J. J. Kirby, Jr.; Inside Sls. Cont.: K. Stamp

Treasure State Prts. Supply, 10 E. Main, Bozeman, Mont. 59715, (406) 587-0342, Branch Mgr.: B. Doherty

Trevose Electronics, 4033 Brownsville Rd., Trevose, Pa. 19047, (215) 357-1400, Mktg./Adv. Mgr.: P. Funk; Gen. Sls. Mgr.: E. Funk; Ind. Sls. Mgr.: D. Halgash; Inside Sls. Cont.: D. Funk

Triangle Elctrncs. Co., 6580 Frankstown Ave., Pittsburgh, Pa. 15206, (412) 441-9659, Mktg./Adv. Mgr.: S. Levine; Gen. Sls. Mgr.: J. Newberg; Ind. Sls. Mgr.: R. Morehead; Inside Sls. Cont.: S. Medgaus

Trice Wholesale Elctrncs., 4701 N. Stiles, Oklahoma City, Okla., (405) 524-4415

Trinidad Electronics, 3185 S. Highland Dr., Las Vegas, Nev. 89102, (702) 732-2395, Branch Mgr.: J. Neff & F. Turner

Trio Elec. Supply Co. Inc., 5208 Sycamore Dr., Pensacola, Fla. 32503, (904) 476-5580, TWX: 702426, Mktg./Adv. Mgr.: R. O. Dreifus; Gen. Sls. Mgr.: J. R. Taylor; Ind. Sls. Mgr.: J. L. Taylor; Inside Sls. Cont.: I. D. Atkins

Tri-State Electrical Supply Inc., 3320 S. Wabash at Chestnut, Michigan City, Ind. 46360, (219) 872-5551, Inside Sls. Cont.: R. Caddo

Tri-State Elctrncs. Inc., 23 E. 15th St., Scottsbluff, Neb. 69631, (308) 635-2531, Mktg./Adv. Mgr.: J. Talbot; Gen. Sls. Mgr.: J. Talbot

Trojan Elctrnic. Supply, 15 Middleburg St., Troy, N. Y. 12181, (518) 274-4481, Mktg./Adv. Mgr.: A. Stewart; Gen. Sls. Mgr.: H. Page; Inside Sls. Cont.: H. Page

Trott Elctrns. Inc., 932 Hertel Ave., Buffalo, N. Y. (716) 876-0880

Tucker Assocs., 1018 Derwydd La., Berwyn, Pa., (215) 644-0142

Tuco Elctrncs. Corp., 2483 New York Ave., Melville, N. Y. 11746, (516) 271-1022, Inside Sls. Cont.: E. A. Furst

Tustin Elctrncs. Co., 7269 Revere St., Philadelphia, Pa. 19149, (215) 338-7740, Mktg./Adv. Mgr.: H. Weiss; Ind. Sls. Mgr.: Mr. Lewis

T V Laboratory & Communications Inc., 213 Litchfield St., Torrington, Conn. 06790, (203) 482-4595, Inside Sls. Cont.: H. S. Gerbi, Pres.

T.V. Specialities, Inc., 320 W. Third St., Dover, Ohio 44622, (216) 364-6678, Mktg./Adv. Mgr.: C. R. Border; Gen. Sls. Mgr.: C. R. Border; Inside Sls. Cont.: D. Ackerman

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Uffer, Frank G. & Co., 1318 Madison Ave., Memphis, Tenn. 38104, (901) 725-6743, Mktg./Adv. Mgr.: F. G. Uffer; Inside Sls. Cont.: F. G. Uffer

Union Supply Co., 231 S. Third St., Burlington, Iowa 52601, (319) 754-5745, Gen. Sls. Mgr.: G. Kruse; Inside Sls. Cont.: J. Skourup

Union Supply Co., 927 S. Eighteenth, Centerville, Iowa 52544, (515) 856-3207, Branch Mgr.: W. Bryant

Union Supply Co., 236 Eighth Ave. S., Clinton, Iowa 52732, (319) 242-4572, Branch Mgr.: L. Denklau

Union Supply Co., 315 E. Second, Davenport, Iowa 52801, (319) 322-3531, Branch Mgr. R. Sterner

Union Supply Co., 230 E. Benton, Iowa City, Iowa 52240 (319) 338-6165, Branch Mgr.: D. Walker

United Appliance Dist. Inc., 94 John St., New Britain, Conn. 06051, (203) 223-2731, Mktg./Adv. Mgr.: R. Norkun; Inside Sls. Cont.: I. Black
United Elctrnc. Supply Corp., 150 Production Court, New Britain, Conn. 06051, (203) 223-3641, Branch Mgr.: A. Jacobs
United-Page Inc., 481 Getty Ave., Paterson, N. J. 07503, (201) 279-7500, TWX: 710-988-5917, Mktg./Adv. Mgr.: M. VanRenzler; Gen. Sls. Mgr.: R. Haberman; Ind. Sls. Mgr.: S. Spector; Inside Sls. Cont.: F. Geisler, M. Fomin, L. Morelli
United Radio Inc., Summit & Reinhold Dr., Cincinnati, Ohio 45237, (513) 761-4030, Gen. Sls. Mgr.: E. Closterman; Ind. Sls. Mgr.: R. Kufer; Inside Sls. Cont.: W. Huenefeld
United Radio Inc. (URI), 313 Bakewell St., Covington, Ky. 41011 (606) 581-9000, Branch Mgr.: A. Whitaker
United Radio Inc., (URI), 3117 Harrison Ave., Cincinnati, Ohio 45211, (513) 622-2610, Branch Mgr.: H. Koth
United Radio Supply Inc., 974 West 6th St., Eugene, Ore. 97402, (503) 342-3381, Branch Mgr. H. A. Leaders
United Radio Supply Inc., 123 N. E. 7th Ave., Portland, Ore. 97232, (503) 233-7151, Mktg./Adv. Mgr.: A. H. Cusson; Gen. Sls. Mgr.: A. H. Cusson; Ind. Sls Mgr.: G. S. Wooldridge; Inside Sls. Cont.: W. E. O'Hara
Unity Electronics, 107 Trumbull St., Elizabeth, N. J. 07206, (201) 351-4200, TWX: 710-5888, Mktg./Adv. Mgr.: G. Page; Gen. Sls. Mgr.: M. Vermes; Ind. Sls. Mgr.: G. Page; Inside Sls. Cont.: S. Baber
University Elctrncs. Inc., 258 E. Beaver, State College, Pa. 16801, (814) 238-3093, Branch Mgr.: R. Smeal
U. S. Radio & TV Supplies Inc., 6346 S. Ashland Ave., Chicago, Ill. 60636, (312) 925-4111, Gen. Sls. Mgr.: I. Casper; Inside Sls. Cont.: I. Casper
U-Tronics Inc., 273 Linwood Ave., Fairfield, Conn. 06430, (203) 255-4521, Ind. Sls. Mgr.: J. O'Brien; Inside Sls. Cont.: J. O'Brien
Urbik, J., 3 50th St. N. E., Cedar Rapids, Iowa, (319) 377-8244

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Valley Industrial Elctrns. Inc., Commercial Dr., Yorkville, N. Y., (315) 736-3393
Valley Sound, 20 First Ave., Chicopee, Mass.
Van Sickle Radio Elec. Inc., 1915 Washington, St. Louis, Mo. 63103, (314) 621-5000, Mktg./Adv. Mgr.: S. F. Brouk; Ind. Sls. Mgr.: S. F. Brouk; Inside Sls. Cont.: S. F. Brouk
VanSickle Radio Supply Co., 4131 N. Keyston Ave., Indianapolis, Ind. 46205, (317) LI7-3589
Varah, L. A. Ltd., 1250 W. 6th Ave., Vancouver, Canada (604) 736-6411
Vertex Elctrncs. Inc., 91 Milbar Blvd., Farmingdale, N. Y. 11735, (516) 293-9880, Inside Sls. Cont.: E. Markey
Victorville Elctrncs. Supply, 15390 7th St., Victorville, Cal. 92392, (714) CH 5-3401, Branch Mgr.: B. E. Jones
Vinson Assoc. Inc., 2145 S. Clermont, Denver, Colo., (303) 757-5151
Vinson Assoc. Inc., 1108 Alvarado Dr. N. E., Albuquerque, N. M., (505) 265-5991
Virginia Radio Supply Co. Inc., 715 Henry Ave., Charlottesville, Va. 22902, (804) 296-4184, Mktg./Adv. Mgr.: E. N. Strother; Inside Sls. Cont.: E. Nix
Vitus Elec. Supply Co., 140 E. 5th Ave., Eugene, Ore., (503) 345-4377

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Wackied Radio, Ottawa, Can. (613) 728-1821
Waco Elctrns., 7117-3rd Ave., Scottsdale, Ariz., (602) 947-4297
Waco Elctrns., 4616 Ironton St., Denver, Colo. 80239, (303) 343-8474, TWX: 910-932-0121, Gen. Sls. Mgr.: S. Clark; Inside Sls. Cont.: B. Hoover
Waco Elctrns., 420 Washington S. E., Albuquerque, N. M., (505) 268-2409, TWX: 910-989-0622, Branch Mgr.: D. Fair
Waldhaus Elctrns., 1132 Norman St., Bridgeport, Conn. 06604, (203) 335-7985, Mktg./Adv. Mgr.: B. Waldaus; Gen. Sls. Mgr.: R. Zelle; Inside Sls. Cont.: B. Waldhaus
Walker Radio Co., Inc., P.O. Box 25921 - 102 Granite, N.W. Albuquerque, N.M. 87125, (505) 247-2288, Mktg./Adv. Mgr. D. Wilson, Ind. Sls. Mgr.: D. Wilson, Inside Sls. Cont. D. Wilson
Walters Radio Supply Inc. 3635 Main St., Kansas City, Mo., (816) 531-7015
Waltronic Sales, Village Corner Shopping Ctr, Box AN, Los Altos, Cal. (451) 941-3141
Ware Radio Supply Corp., 913 Centre St., Brockton, Mass. 02402, (617) 583-0810, Mktg./Adv. Mgr. G. E. Andrews, Gen. Sls. Mgr. G. E. Andrews, Ind. Sls Mgr. G. E. Andrews, Inside Sls Cont.: D. Andrews
Warren Radio Co., 518 Third St., La Salle, Ill. 61301, (815) 223-4028, Branch Mgr.: F. Donovan
Warren Radio Co., 800 SW Jefferson, Peoria, Ill. 61605, (309) 674-5998, Branch Mgr.: J. Kirwan
Warren Radio Co., 511 20th St., Rock Island, Ill. 61201, (309) 788-5424, Branch Mgr.: J. Robinson
Warren Radio Co., 110 Second Ave., Sterling, Ill. 61081, (815) 765-6253, Branch Mgr.: G. Peterson
Warren Radio Co., 742 S. Main St., Elkhart, Ind. 46514, (219) 523-2398, Branch Mgr.: W. McKrill
Warren Radio Co., 625 East Wayne, Ft. Wayne, Ind. 46802, (219) 743-5344, Branch Mgr.: P. King
Warren Radio Co., 732 N. Capitol, Indianapolis, Ind. 46204, (317) 634-5566, Branch Mgr.: R. King
Warren Radio Co., 505 S. Main St., Burlington, Iowa 52601, (319) 752-5441, Branch Mgr.: E. Hustak
Warren Radio Co., 1205 E River Dr., Davenport, Iowa 52803, (319) 323-8051, Branch Mgr.: K. Smith
Warren Radio Co., 98 East 10th St., Dubuque, Iowa 52001, (319) 582-4300, Branch Mgr.: R Heinz
Warren Radio Co., 922 Maiden La., Iowa City, Iowa 52240, (319) 354-1660, Branch Mgr.: D. Kissinger
Warren Radio Co., 455 S. 31st St., Paducah, Ky. 42002, (502) 442-4367, Branch Mgr. M. Jones
Warren Radio Co., 93 Bidwell W., Battle Creek, Mich. 49015, (616) 965-3338, Branch Mgr.: M. Hadden
Warren Radio Co., 1201 Woodward Hgts, Ferndale, Mich. 48220, (313) 547-9600, Branch Mgr.: F. Kaiser
Warren Radio Co., 320 Michigan NE., Grand Rapids, Mich. 49503, (616) 456-5385, Branch Mgr.: G. Gane
Warren Radio Co., 1710 Westnedge S., Kalamazoo, Mich. 49008, (616) 381-4203, Branch Mgr.: M. Hadden
Warren Radio Co., 311 S. Cedar, Owosso, Mich. 48867, (517) 723-5239, Branch Mgr.: T. Shearer
Warren Radio Co., 71 South Broadway, Akron, Ohio, (216) 434-6668, Branch Mgr.: D. Brown
Warren Radio Co., 5842 Ridge Rd., Cleveland, Ohio 44129, (216) 888-5225, Branch Mgr.: T. Moon
Warren Radio Co., 565 S. Metcalf, Lima, Ohio, 45804, (419) 228-1691, Branch Mgr.: P. King
Warren Radio Co., 1002 Adams St., Toledo, Ohio 43624, (419) 248-3364, Mktg./Adv. Mgr.: J. Rupley, Gen. Sls. Mgr. K. Kesmeyer, Ind. Sls. Mgr.: H. Kistner, Inside Sls. Cont.: D. Kalinowski
Warren Radio Co., Highway 51 North, Dyersburg, Tenn. 38024, (901) 285-3850, Branch Mgr.: M. Wilson
Warren Radio Co., 190 S. Cooper, Memphis, Tenn. 38104, (901) 274-2460, Branch Mgr.: P. Reeser
Warren Radio Inc. 2208 Washington St., Jamestown, N.Y. 14701, (716) 484-1141, Branch Mgr.: M. Stoeltzing
Warren Radio Inc., 1315 Peach St., Erie, Pa. 16512, (814) 454-5285. Mktg./Adv. Mgr.: R. W. Jordan, Gen. Sls Mgr.: H. Haurwitz, Ind. Sls. Mgr.: F. Grygier. Inside Sls Cont.: N. Allen
Warren Radio Inc. 1198 Park Ave., Meadville, Pa. 16335, (814) 336-3147, Branch Mgr.: W. Hoellein
Warren Supply Co. 196 E. 6th, Sioux Falls, S. D. 57102, (605) 336-1830, Mktg./Adv. Mgr.: K. Anderson, Gen. Sls. Mgr.: R. Warren
Washington Elec. Inc., 2217 Third Ave., Seattle, Wash. (206) 682-8981
Wassco, 509 Centinella Ave., Inglewood, Cal. 90302, (213) 678-4121
Watertown Elctrncs, 531 State St., Watertown, N.Y. 13601, (315) 788-5090, Mktg./Adv. Mgr. R. Hartness, Gen. Sls. Mgr. R. Hartness, Ind. Sls. Mgr. R. Hartness, Inside Sls. Cont.: R. Hartness
Wayne Electric, 3162 N. Elston Ave., Chicago, Ill., (312) 267-5400
Waytex Co., 2633 Louisiana Ave., Minneapolis, Minn. (612) 925-4242
Weatherford Co., R. V., 1917 N. 25th Dr., Carson Ind. Pk., Phoenix, Ariz. 85009, (602) 272-7144
Weatherford Co., R. V., 1550 Babbitt Ave., Anaheim, Cal. 92805, (714) 547-0891
Weatherford Co., R. V., 6921 San Fernando Rd., Glendale, Cal. 91201, (213) 849-3451, V.P.-Marketing: J. C. Minyard
Weatherford Co., R. V., 3240 Hillview Ave., Palo Alto, Cal. 94304, (415) 493-5373
Weatherford Co., R. V., 7872 Raytheon Rd., San Diego, Cal. 92111, (714) 278-7400
Weatherford Co., R. V., 1095 E. Third St., Pomona, Cal. 91766, (714) 623-1261
Weatherford Co., R. V., 3905 S. Mariposa, Englewood, Colo. 80110, (303) 761-5432
Weatherford Co., R. V., 6101 Marble N.E. Marberry Plaza, Albuquerque, N.M. 87108 (505) 265-5671
Weatherford Co., R. V., 10836 Grissom Lane, Dallas, Tex. 75229, (214) 243-1571
Weatherford Co., R. V., 6134 Maynard Ave., Seattle, Wash. 98108, (206) 762-4200
Wedemeyer Elctrn. Supply Co., 2280 S. Ind'l Hwy., Ann Arbor, Mich. (313) 665-8611
Wehle Electric Co., 25 Washington St., Binghamton, N. Y. 13901, (607) 722-2394, Branch Mgr.: R. Boughton, V.P.
Wehle Electric Co., 475 Ellicott St., Buffalo, N. Y. 14203, (716) 854-3270, Telex: 91-515, Mktg./Adv. Mgr.: R. B. Taylor, Gen. Sls. Mgr.: A. Distephano, Branch Mgr.: A. Dachauer
Wehle Electric Co., 900 E. Church St., Elmira, N.Y. 14701, (607) 734-5105, Branch Mgr.: L. Shanor
Wehle Electric Co., 306 Andrews St., Rochester, N.Y. 14604, (716) 232-6480, Branch Mgr.: J. Kelsey
Wehle Electric Co., 200 Boss Rd., Syracuse, N.Y. 13211, (315) 437-3135, Branch Mgr.: N. B. DeSilva
Wesco Elctrncs., 5650 Jillson St., Los Angeles, Cal. 90040, (213) 685-9525, TWX: 910-580-3106
Wesco Elctrncs., 3973 E. Bayshore Rd., Palo Alto, Cal. 94303, (415) 968-3475
Westates Elctrncs. Corp., 20151 Bahama St., Chatsworth, Cal. (213) 341-4411
West Burgh Electric Prods., 16 Scott St., Jamestown, N.Y. (716) 483-1539
West Chester Electric & Elctrncs., 716 E. Market St., West Chester, Pa. 19380, (215) 696-7500, TWX: 835441, Mktg./Adv. Mgr.: T. R. Roberts, Gen. Mgr.: R. Aughe, Ind. Sls. Mgr.: T. R. Roberts
Westchester Elctrncs., Inc., 181 Stillwater Ave., Stamford, Conn. 06902, (203) FI8-7361, Branch Mgr.: R. Betstadt
Westchester Elctrncs., Inc., 602 Mamaroneck Ave., White Plains., N. Y. 10605, (914) 949-2400, Mktg./Adv. Mgr.: M. L. Blaustein; Gen. Sls. Mgr.: M. Blaustein; Ind. Sls. Mgr.: B. Berwick; Inside Sls. Cont.: B. Berwick
Westconn Elctrncs., Inc., 195 Colorado Ave., Bridgeport, Conn. 06605, (203) 367-7747, Gen. Sls. Mgr.: S. Greenstein; Inside Sls. Cont.: R. Adams
Western Elctrnc. Supply Co., 1781 5th St., Muskegon, Mich. 49440, (616) 722-7628, Mktg./Adv. Mgr.: F. J. Hall; Gen. Sls. Mgr.: F. J. Hall; Ind. Sls. Mgr.: F. J. Hall; Inside Sls. Cont.: H. M. Barrett
Western Elctrncs. Co., 717 Dexter Ave. N., Seattle, Wash. 98109, (206) 284-0200, Mktg./Adv. Mgr.: I. H. Rowell; Gen. Sls. Mgr.: H. T. Horn; Ind. Sls. Mgr.: O. Fjarlie; Inside Sls. Cont.: J. Yurisich
Western International Co., Inc., 72 N. Broadway, Yonkers, N. Y. 10701, (914) 969-5888, Inside Sls. Cont.: L. Maldover
Western Radio, 1415 India St., San Diego, Cal. 92101, (714) 239-0361
Western Region, 166 Overhill Rd., Orinda, Cal. 94565, (415) 254-7299, Branch Mgr.: W. Herlihy
Westlake Elec. Sys., 415 Westlake Ave. N., Seattle, Wash.
Westland Electrncs., 1118 Elko Dr., Sunnyvale, Cal., (408) 734-1900, Branch Mgr.: D. Strickland
White Electric Co., 903 W. Pike St., Clarksburgh, W. Va. 26301, (304) 624-5591, Gen. Sls. Mgr.: H. Sheets; Inside Sls. Cont.: B. Green
Whittaker Elctrns Ltd., 43 Trout Brooke, Downsville, Ont. Can., (416) 247-7454
Wholesale Electrn. Supply, 2423 Southern, Shreveport, La. 71104, (318) 422-2063, Branch Mgr.: B. Norris
Wholesale Electrnc. Supply, 610 N.E. 36th St., Oklahoma City, Okla. 73105, (405) 528-2391, Brnch Mgr.: L. Gatewood
Wholesale Electrnc. Supply, 507 Presslen St., Austin, Tex. 78703, (512) 478-9568, Mktg./Adv. Mgr.: J. P. Patterson
Wholesale Electrnc. Supply, Ross at Central Expressway, Dallas, Tex. 75201, (214) 824-3001, Mktg./Adv. Mgr.: J. Leedom, Gen. Sls. Mgr.: B. Holman, Ind. Sls Mgr.: B. Miller
Wholesale Electrnc. Supply, 550 S. Freeway, Fort Worth, Tex. 76104, (817) 336-0461, Branch Mgr.: D. Garlington
Wholesale Electrnc. Supply, 203 South High, Longview, Tex. 75601, (214) 758-7781, Branch Mgr.: C. Renner

Wholesale Electrnc. Supply, 1400 Washington, Waco, Tex. 76702, (817) 752-9252, Branch Mgr.: B. Swatzel

Wholesale Electrnc. Supply, 1508 11th, Wichita Falls, Tex. 76310, (817) 723-8106, Branch Mgr.: V. Culpepper

Wholesale Radio Equip., Inc., P. O. Box NN, Lake Charles, La. 70601, (318) 439-2431, Inside Sls. Cont.: C. Keys

Wholesale Radio Supply, 515 E. Bay St., Charleston, S. C., (803) 722-2634

Wible Radio Supply, Inc. 3723 S. Lawrence, Tacoma, Wash. 98411, (206) GR4-9471, Mktg./Adv. Mgr.: G. E. Clark; Gen. Sls. Mgr.: G. E. Clark; Ind. Sls. Mgr.: G. E. Clark; Inside Sls. Cont.: G. N. Scott

Wicks Radio Equipment Co., 513 S. Staples, Corpus Christi, Tex. 78401, (512) 883-4481, Inside Sls. Cont.: L. Rios

Wicks Radio Equipment Co., 1003 N. William, Victoria, Tex. 77901, (512) 575-0405, Branch Mgr.: L. Sullivan

Wilco Radio Dists., 383 E. 138 St., Bronx, N. Y. 10454, (212) 669-1655, Mktg./Adv. Mgr.: P. Wilk; Gen. Sls. Mgr.: P. Wilk; Ind. Sls. Mgr.: P. Wilk; Inside Sls. Cont.: L. Powell

Wilkinson Brothers Co., Box 1169, Dallas, Tex. 75221, (214) 747-1571, Mktg./Adv. Mgr.: E. Wilkinson; Gen. Sls. Mgr.: J. McPuckett; Ind. Sls. Mgr.: K. Wallace; Inside Sls. Cont.: M. McCasland

Wilkinson Brothers Co., 628 Centre St., Dallas, Tex. 75208, (214) 941-0361, Branch Mgr.: K. Frasier

William Elctrncs. Supply, 1863 Woodbridge Ave., Edison, N. J. 08817, (201) 985-3700, Inside Sls. Cont.: L. Axelrod

Williams, H. A. Co., 1003 Washington St., Columbus, Ind. 47201, (812) 372-4404, Mktg./Adv. Mgr.: P. Mendenhall

H. A. Williams Co., 1114 S. F St., Richmond, Ind. 47374, (317) 935-3185, Branch Mgr.: B. Nelson

Williams, H. A. & Son, 204 S. Rogers St., Bloomington, Ind. 47401, (812) 332-4779, Branch Mgr.: P. Baise

Wilshire Elctrncs., 617 Main St., Westover Plaza, Binghamton, N. Y. (607) 797-1236

Wilshire Elctrncs./Phila., 855 Industry Hwy., Cinnaminson, N. J. (609) 786-8990

Wilshire Elctrncs./New England, 205 Alewife Brood Pkwy., Cambridge, Mass., (617) 491-3300

Wilshire Elctrncs./NYS, 617 Main St., Johnson City, N. Y. 13790, (607) 797-1236, Mktg./Adv. Mgr.: R. Rogan; Gen. Sls. Mgr.: R. Rogan; Ind. Sls. Mgr.: C. Koflan; Inside Sales Cont.: C. Koflan, D. Griffis, J. Colvin

Wilson Elec. Co., Box 4266, 557 Pine St., Macon, Ga. 31208, (912) 746-5654

Winteradio Electrnc. Supply Corp., 1468 W. 25th St., Cleveland, Ohio 44113, (216) 621-5080, Gen. Sls. Mgr.: D. Grodell; Inside Sls. Cont.: T. Shaw

Winteradio Elctrnc. Supply Corp., 5373 Ridge Rd., Parma, Ohio 44129, (216) 886-6868, Branch Mgr.: A. J. Hrouda

Winteradio Electrnc. Supply Corp., 4432 Mayfield Rd., S. Euclid, Ohio 44121, (216) 382-7676, Branch Mgr.: E. Kuczek

Witmal Electrncs. Corp., 157 Manhattan Ave., Brooklyn, N. Y. 11206, (212) 388-0945, Mktg./Adv. Mgr.: V. J. Cordella; Gen. Sls. Mgr.: V. J. Cordella; Ind. Sls. Mgr.: C. Balich; Inside Sls. Cont.: C. Balich

Wofford Electrnc. Parts Co., 7537 Edna St., Houston, Tex. 77017, (713) 644-1838, Mktg./Adv. Mgr.: W. D. Wofford, Jr.; Gen. Sls. Mgr.: W. D. Wofford, Jr.; Ind. Sls. Mgr.: W. D. Wofford, Jr.; Inside Sls Cont.: T. Holley

World Elctrnc., Inc., 206 Jersey Ave., Virginia Beach, Va.

Worth Electrncs., Inc., 3509 W. Rosedale, Ft. Worth, Tex. 76107, (817) 738-2103, Ind. Sls. Mgr.: J. King; Inside Sls. Cont.: R. Jenkins

Wyle Distribution Group, 124 Maryland St., El Segundo, Cal. 90245, (213) 322-8100, TWX: 910-348-7111, Mktg./Adv. Mgr.: N. Strunin; V. P. in charge of Electrncs. Dist.: S. Spiegel

— Y —

Yale Audio of Florida Corp., 2732 Florida Ave., Tampa, Fla. 33602, (813) 229-9468, Mktg./Adv. Mgr.: D. Kentwood; Gen. Sls. Mgr.: Y. Brevda

Yale Radio Electric Co., 6616 Sunset Blvd., Hollywood, Calif. 90028, (213) 465-3186, Mktg./Adv. Mgr.: R. W. Yale; Gen. Sls. Mgr.: J. Michaels; Inside Sls. Cont.: S. Weiss

York Radio & T. V. Corp., 701 N. Main St., Bloomington, Ill. 61701, (309) 829-3303, Branch Mgr.: D. Erlenbusch

York Radio & T. V. Corp, 214 S. Walnut St., Champaign, Ill. 61820, (217) 352-0577, Branch Mgr.: I. Andrbae

York Radio & T. V. Corp, 590 Broadway, Decatur, Ill. 62525, (217) 423-3484, Gen. Sls. Mgr.: G. Boyd; Ind. Sls. Mgr.: P. Clark; Inside Sls. Cont.: P. Clark

York Radio & T. V. Corp., 2222 E. Maple St., Kankakee, Ill. 60901, (815) 932-7483, Branch Mgr.: H. Flanigan

York Radio & T. V., 821 Fayette St., Peoria, Ill. 61602, (309) 676-4005, Branch Mgr.: J. Plank

York Radio & T. V. Corp, 350 N. Walnut St., Springfield, Ill. 62702, (217) 544-2711, Branch Mgr.: H. Esker

York Radio & T. V., 509 Ohio St., Terre Haute, Ind. 47801, (812) 235-6025, Branch Mgr.: J. Wiederoder

York Radio & T. V., 222 S. Fifth St., Columbia, Mo. 65201, (314) 449-0851, Branch Mgr.: R. Henderson

York Radio & T. V., 804 Broadway, Hannibal, Mo. 63401, (314) 221-4593, Branch Mgr.: D. Waddel

Yonkers Elctrnc. Supply, Inc., 541 Nepperhan Ave., Yonkers, N. Y. 10703, (914) 969-6044, Gen. Sls. Mgr.: A. Stangel

Yukon Radio Supply, 3222 Commercial Dr., Anchorage, Alaska 99501, (907) 277-7117, TWX: 25-101, Mktg./Adv. Mgr.: J. P. Bagoy; Gen. Sls. Mgr.: J. Vahtsevanos; Ind. Sls. Mgr.: C. H. Sappah; Inside Sls. Cont.: J. P. Bagoy

Yukon Radio Supply, 1112 Cushman, Fairbanks, Alaska 99701, (907) 452-1011, Branch Mgr.: N. G. Bosnakis

— Z —

Zack Electrncs., 654 High St., Palo Alto Cal. 94301, (415) 326-5432, TWX: 910-372-6152, Branch Mgr.: C. L. Rockwell

Zack Electrncs., 1444 Market St., San Francisco, Cal. 94102, (415) 626-1444, TWX: 910-372-6152, Mktg./Adv. Mgr.: V. N. Zachariah; Gen. Sls. Mgr.: D. Onken; Ind. Sls. Mgr.: D. Onken; Inside Sls. Cont.: L. Christian

Zackit Corp. of Monterey, 350 Del Monte Ave., Monterey, Cal. 93940, (408) 375-3144, Branch Mgr.: E. Ledin

Zackit Corp. of Sacramento, 1831 J St., Sacramento, Cal. 95814, (916) 446-3131, Branch Mgr.: G. Platis

Zackit Corp. of Ballejo, 1815 Sonoma Blvd., Vallejo, Cal. 94590, (707) 644-6676, Branch Mgr.: W. Thompson

Zentronics, Ltd., Toronto, Can., (416) 787-1271

Zerega Distributing Co., 715 Virginia, Seattle, Wash. 98101, (206) 682-2525, Mktg./Adv. Mgr.: E. Zerega; Gen. Sls. Mgr.: J. Manza; Inside Sls. Cont.: S. Dahlen

Zimmerman Wholesalers, 114 E. Washington St., Hagerstown, Md. 21740, (301) 733-0550, Mktg./Adv. Mgr.: G. O. Zimmerman; Gen. Sls. Mgr. G. O. Zimmerman

This is the last page of the ALPHABETICAL LISTING OF DISTRIBUTORS.
The Geographic Listing follows

Distributors Directory
GEOGRAPHICALLY ARRANGED

This is the geographic listing of more than 1,000 electronic distributors and their branch locations in geographic arrangement. It lists distributors by state, alphabetically, and alphabetically by city within that state. The listing for each distributor duplicates the information that appears for him in the preceding alphabetical listing. If you know the name of the distributor you want to reach, you can find it quickly in the alpha directory. If you need to know who the distributors are in your area, use this geo portion of the directory to determine a complete listing of distributors in any given city or state.

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1973-74

This directory was completely revised and updated for this edition prior to publication. Thus the information is current as of Spring 1973.

ALABAMA

ALBERTVILLE
ELECTRONIC PARTS & SUPPLY CO., 118 W. Main St., P.O. Box 428, 35950, (205) 878-3041, Sls. Contact: S. M. Heaton

ANNISTON
RADIO DIST. & SUPPLY CO., 125-27 W. 10th St., 36201, (205) 236-8654, Pres: G. T. Mosteller, Jr.

BIRMINGHAM
FORBES DIST. CO., 1416 Fourth Ave. S., 35233
MG ELECTRIC & EQUIP. CO., 3112 6th Ave. South, 35233, (205) 328-4525

DECATUR
FORBES DIST. CO., 1522 5th Ave. S.E., 35601

DOTHAN
CARMICHAEL WHOLESALE SUPPLY CO., 138-40 S. Foster St., 36301, (205) 792-0066, Mktg./Adv. Mgr.: John L. Bryan

GADSDEN
RADIO DIST. & SUPPLY CO., 121 E. Broad St., 35903, (205) 547-1636,

HUNTSVILLE
ATLAS WIRE & CABLE CO. INC., Box 3148, 35810, (265) 854-1616
COMPAR, 904 Bob Wallace Ave., Suite 114, 36801, (205) 539-8476
CRAMER/EW HUNTSVILLE, INC., 2310 Bob Wallace Ave., S.W., 35805, (205) 539-5722
HALL MARK ELECTRONICS, Box 1133, 35807 (205) 539-0691
INDUSTRIAL ELEC. SUPPLY, 2112 Memorial Pkwy. S.
MEKCO ASSOCIATES, 217 Curtis Dr., 35801, (205) 881-3721
M. C. SALES, INC., 904 Bob Wallace Ave., (205) 539-8476
MOCK ELECTRONICS, INC., 2310 Memorial Pkwy. S.W.
POWELL ELECTRONICS, INC., 803 Oster Dr., 35807, (205) 539-2731, TWX: 810-726-2231

MOBILE
ELECTRONIC DISCOUNT STORE, 1770 Beltline Highway, 36609, (205) 478-5422
ELECTRONIC SUPPLY CO., 561 Holcombe Ave., 36606, (205) 478-0455, Sls. Mgr.: Dave Guess
FORBES ELEC. DIST., 14 Midtown Pk., 36606
SPECIALTY DIST. CO., 1276 Belt Line Highway S., 36609, (205) 344-0450

MONTGOMERY
FORBES ELEC. DIST., 915 Court St., 36104

MUSCLE SHOALS
JONES ELECTRONICS INC., 902 Woodward Ave., 35660, (205) 383-1241, Sls. Mgr.: S. Jones

OPELIKA
SOUTHERN ELECTRONICS CORP., 36801, (205) 745-5298, Ind. Sls. Mgr.: R. C. Scott

SELMA
RADIO PARTS, INC., 1125 Church St., 36701, (205) 872-7451

TROY
RADIO PARTS, INC., 208 College St., 36801, (205) 566-0375

TUSCALOOSA
RADIO PARTS, INC., 402 20th Ave., 35401, (205) 758-5585, Sls. Contact: John Smith

ALASKA

ANCHORAGE
YUKON RADIO SUPPLY, 3222 Commercial Dr., 99501, (907) 277-7117, TWX: 25-101, Sls. Mgr.: J. Vahtsevanos

FAIRBANKS
YUKON RADIO SUPPLY, 1112 Cushman, 99701, (907) 452-1011

NOME
KELLERS REFRIGERATION, Box 906, (907) 443-2340

ARIZONA

MESA
HI FI SALES, INC., 764 W. Main St., 85201, (602) 969-1338, Sls. Mgr.: Dave Ross

NOGALES
GUARANTEE ELECTRONICS CORP., 301 Morley Ave., 85621, (602) 287-5781

PHOENIX
BLACK & RYAN DIST., P.O. Box 2935, 2645 E. Washington, 85036, (602) 275-6311, Sls Contact: Doug Ealy
CRAMER/ARIZONA, 2816 N. 16th St., 85006, (602) 263-1112
DALIS ELECTRONIC SUPPLY, 917 North 7th St., 85006, (602) 258-8151, Sls. Mgr.: Ed Loya
HAMILTON/AVNET ELECTRONICS, 1739 N. 28th Ave., 85009, (602) 269-1391
KIERULFF, 2633 East Buckeye Rd., 85034, (602) 273-7331, TWX: 910-951-1550
LIBERTY ELECTRONICS/ARIZONA, 3612 N. 16th St., 85016, (602) 264-4438
METERMASTER PHOENIX, 2633 E. Buckeye Rd., 85034, (602) 273-733
MIRCO ELECTRONIC DIST., 2104 W. Peoria Ave., (602) 944-2281
MOLTRONICS INC., 2746 W. Palm La., 85009, (602) 272-7951, TWX: 910-951-1512, Mktg./Adv. Mgr.: Glenn L. Higgins
RICHEY ELECTRONICS ARIZONA, 4527 Exeter Blvd., 85108, (602) 959-2301
STERLING ELECTRONICS, INC., 1930 N. 22nd Ave., (602) 258-4531
WEATHERFORD CO., R. V., 1917 N. 25th Dr., Carson Ind. Pk., 85009, (602) 272-7144

SCOTTSVILLE
BARNHILL FIVE, INC., 1329 E. Stetson Dr., (602) 947-7841
COMPAR ARIZONA, P.O. Box 1607, 85252, (602) 947-4336, TWX: 910-950-1293
WACO ELECTRONICS, 7117 3rd Ave., (602) 947-4297

TEMPE
OMNI SPECTRA INC., 1040 W. Alameda Dr., (606) 966-1471

TUCSON
DALIS ELECTRONIC SUPPLY, 3380 E. Ajo Way, 85713, (602) 889-6391
INLAND ELECTRONIC SUPPLY CO., 715 E. Broadway, 85719, (602) 624-4402, Sls. Mgr.: Bill Spivey

ARKANSAS

FORT SMITH
ARKO-INTERSTATE ELECTRIC CO., 37 So. 4th St., 72901, (501) 782-4061
CARTER ELECTRONIC SUPPLY CO., INC., 301 Towson Ave., 72901, (501) 783-4129, Mktg./Adv. Mgr.: Clint Dunn

LITTLE ROCK
CARLETON-BATES CO., 6821 Scott Hamilton Dr., 72209, (501) 562-9100, Sls. Mgr.: Joe Carlton
STANLEY COMMUNICATIONS CO., 6814 Scott Hamilton Dr., 72209, (501) 562-9200

PINE BLUFF
CARLTON-BATES CO., 1510 State St., 71601, (501) 535-1354

TEXARKANA
INTERSTATE ELECTRIC CO., 307 E. Front St., 75501, (501) 772-3751

CALIFORNIA

ANAHEIM
BALL ELECTRONICS, 2960 Ball Rd., 92640, (714) 328-1310
HENRY RADIO INC., 931 No. Euclid St., 92801, (714) 772-9200
SHELCO ELECTRONICS SUPPLY, 501 S. Brookhurst St., 92804, (714) 772-1441
WEATHERFORD CO., R. V., 1550 Babbitt Ave., 92805, (714) 547-0891

AZUSA
BALDWIN PARK ELECTRONICS SUPPLY CORP., The Shelco Bldg., 305 E. Gladstone St., 91702, (213) 969-1793, Sls. Mgr.: Lou Schelin
SHELCO ELECTRONICS SUPPLY, 305 E. Gladstone St., 91702, (213) 969-1793

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ERIC ELECTRONICS, 111 Glenn Way, 94002, (415) 593-8284, Mktg./Adv. Mgr.: D. Turnquist
BUENA PARK
S. J. ELECTRONICS INC., 6001 Beach Blvd., 90621, (714) 521-1906, Sls. Mgr.: A. E. Duhamell
BURLINGAME
COMPAR CORP., 828 Airport Blvd., 94010, (415) 347-9501, TWX: 910-374-2841, Production Mgr.: J. Louie
ROSE ELECTRONICS, 846 Stanton Rd., 94010, (415) 697-0224, TWX: 910-371-7250, Sls. Mgr.: Bill Hubbs
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HI-REL DIST. SALES, 20507 S. Belshaw Ave., (213) 537-6500
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CHICO
DUNLAP ELECTRONICS, 824 Cherry St., 95926, (916) 342-8313
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MAR VAC ELECTRONICS, 1829 Newport Blvd., 92627, (714) 540-3280
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JSH ELECTRONICS, INC., 8549 Higuera St., 90230, (213) 870-4616, TWX: 910-340-6356, Ind. Sls. Mgr.: L. W Novin
DOWNEY
NET ELECTRONICS, INC., 8218 Firestone Blvd., 90241, (213) 923-4591, Sls. Mgr.: Dan Levy
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MARSHALL CO., G. S., 4674 Telstar Ave.
EL SEGUNDO
LIBERTY ELECTRONICS, 124 Maryland St., 90245, (213) 322-8100
WYLE DISTRIBUTION GROUP, 124 Maryland St., 90245, (213) 322-8100, TWX: 910-348-7111, Mktg./Adv. Mgr.: Nat Strunin
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J. C. ARBUCKLE CO., 2349 Kern St., 93721, (209) 264-6554, Sls. Mgr.: Paul Huscild
DUNLAP ELECTRONICS, 1750 McKinley, 93703, (209) 268-6111
INLAND ELECTRONIC SUPPLIES, 461 N. Fresno St., 93701, (209) 266-9666, Sls. Contact: W. E. Phillips
GARDENA
COMPAR LOS ANGELES, 2014 W. 139th St., 90249, (213) 327-6550, TWX: 910-346-6316
SANTA MONICA-BELL ELECTRONICS, 306 E. Alondra Blvd., 90247, (213) 321-5802, TWX: 910-346-6336, Sls. Mgr.: A. Adler
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HURLEY ELECT. OF INGLEWOOD, 210 E. Hardy Blvd., 90301, (213) OR 8-7644
NEWARK ELECTRONICS, 4747 W. Century Blvd., 90304, (213) 678-0441, TELEX: 65-3518
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METERMASTER, 5646 Jillson St., 90040, (213) 685-4340
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RADIO PRODUCTS SALES INC., 1501 S. Hill St., 90015, (213) 748-1271 TWX: 910-321-2416, Sls. Mgr.: C. F. Sexton
RADIO PARTS SALES INC., 5220 S. Vermont Ave., 90037, (213) 759-9177, Sls. Mgr.: B. Movel
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WESCO ELECTRONICS, 5650 Jillson St., 90040, (213) 685-9525, TWX: 910-580-3106
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HAMILTON/AVNET ELECTRONICS, 340 E. Middlefield Rd., 94040, (415) 961-7000
HI REL DISTR. SLS., 645 Clyde Ave., (415) 967-5731
POWELL ELECTRONICS INC., 411 Fairchild Dr., 94040, (415) 964-0820, TWX: 910-379,6970
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SHELLEY-RODABAUGH, INC., 2455 Old Middlefield Way, (415) 969-1820
TERMINAL HUDSON ELECTRONICS, 880 Maude Ave., (415) 969-9240
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SEMICOMP, 4100 Birch, (714) 833-3070
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DISTRO INC., 12517 Burbank Blvd., 91607, (213) 980-8888, Sls. Contact: Ken Williams
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BRILL ELECTRONICS, 610 E. 10th St., 94604, (415) 834-5888, TWX: 910-366-7204, Sls. Mgr.: Paul Seitz
CASS ALTSHULER CO., 807 7th Ave., 94606, (415) 834-4225, Sls. Mgr.: Kirk Altshuler
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OCEANSIDE
ELECTRONICS CENTER, 307 S. Hill, 92054, (714) 722-5855
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WESTERN REGION, 166 Overhill Rd., 94565, (415) 254-7299
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INTERMARK ELECTRONICS, Sub of Intermark Inc.
KIERULFF, 3969 East Bayshore Rd. 94303, (415) 968-6292, TWX: 910-379-6430
METERMASTER, 3969 E. Bayshore Rd., 94303, (415) 968-6292
WEATHERFORD CO., R. V., 3240 Hillview Ave., 94304, (415) 493-5373
WESCO ELECTRONICS 3973 E. Bayshore Rd., 94303, (415) 968-3475
ZACK ELECTRONICS, 654 High St., 94301, (415) 326-5432, TWX: 910-372-6152
PASADENA
EMPIRE ELECTRONIC DIST. INC., 37 East Union St., 91103, (213) 681-2711, Sls. Mgr.: E Rimsky
LAFAYETTE RADIO ELECTRONICS, 1252 E. Colorado Blvd.
POMONA
WEATHERFORD CO., R. V., 1095 E. Third St., 91766, (714) 623-1261
REDDING
DUNLAP ELECTRONICS, 3060 Bechelli La., 96001, (916) 243-6513
REDONDA BEACH
MARK ELECTRONICS INC., 2315½ Artesia Blvd., 90278, (213) 772-2141, Sls. Mgr.: Roy Weil
REDWOOD CITY
ELECTRICAL SALES PROD., 465 Convention Way, (415) 364-2621
SCHAD, JOHN E. INC., 1740 Broadway, 94063, (415) 368-3858
RIVERSIDE
ELECTRONIC SUPPLY, 2486 Third St., 92507, (714) 683-7300, Sls. Mgr.: Barry G. Hasterok
SACRAMENTO
ARCAL SOUND & VIDEO, 2001 El Camino, 95821, (916) 927-4502
DUNLAP ELECTRONICS, 1800 18th St., 95814, (916) 444-8070
ZACKIT CORP. OF SACRAMENTO, 1831 J St., 95814, (916) 446-3131
SACRAMENTO ELECTRONIC SUPPLY CO., 1219 South St., (916) 441-4821
SALINAS
PENINSULA ELECTRONIC SUPPLY INC., 40 W. Gabilan St., 93901, (408) 422-5318
SAN BERNARDINO
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SAN CARLOS
STERLING ELECTRONICS, 1061 Industrial Rd., (415) 592-2353
INTERMARK 100 Industrial Way, (415) 592-1641
SAN DIEGO
COMPAR SAN DIEGO, 7138 Convoy Ct., 92111, (714) 565-0444
CRAMER/SAN DIEGO, 8975 Complex Dr., 92123, (714) 565-1881
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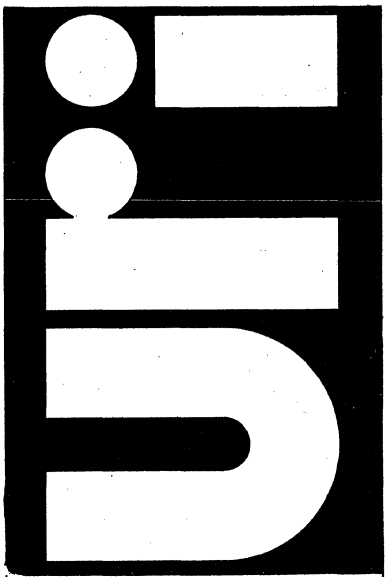

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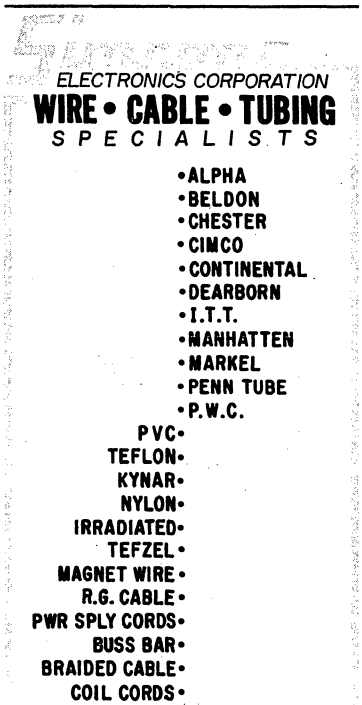

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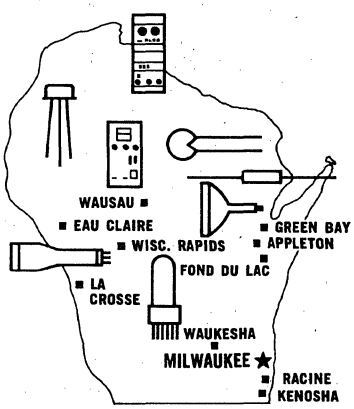

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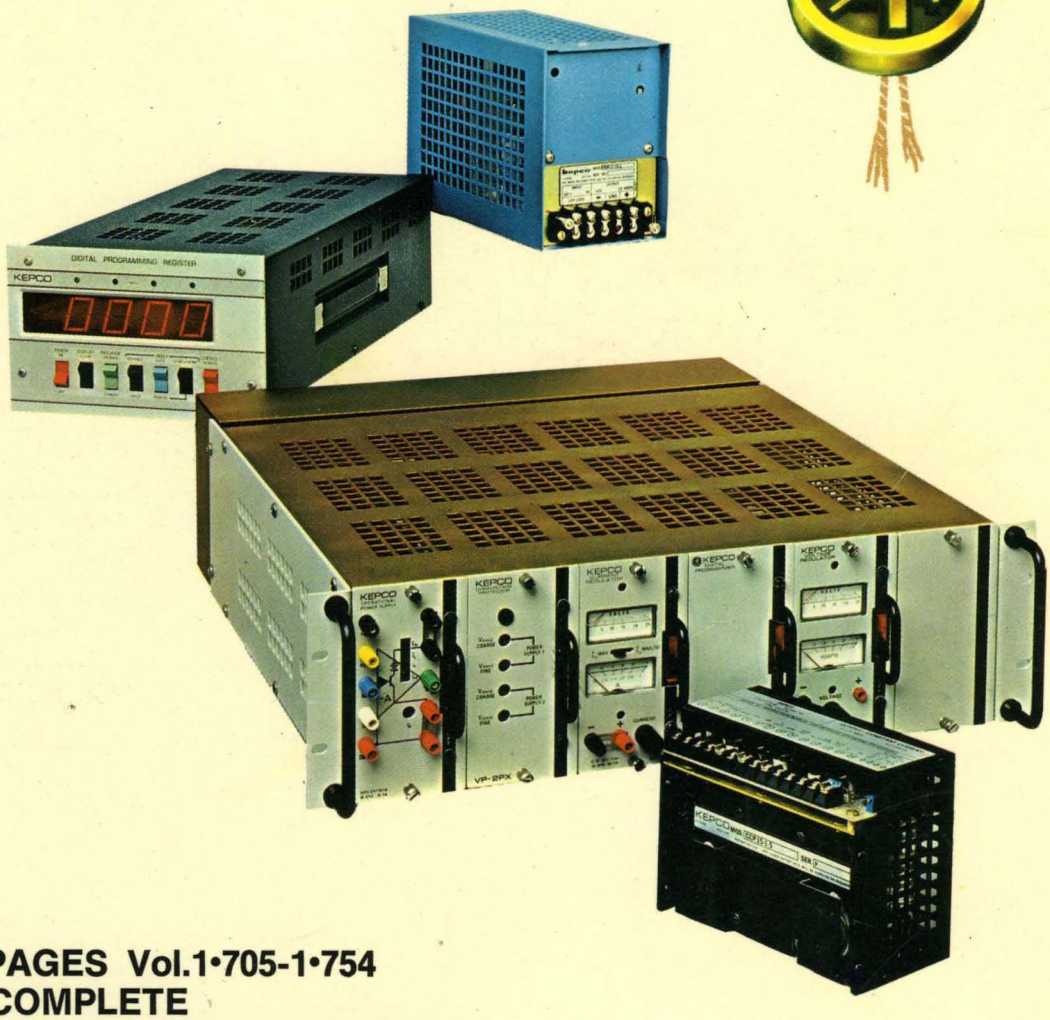

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